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**2015 8th Grade Timeline Ocean County Curriculum**

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| **Unit** | **Weeks** |
| Introduction to Engineering and Design | 2 |
| Structure and Properties of Matter | 9 |
| Chemical Reactions | 8 |
| Interdependent Relationships in Ecosystems | 3 |
| Growth, Development, and Reproduction | 8 |
| Natural Selection and Adaptations | 8 |
| Human Impacts | 2 |

The sequence of units is recommended based on the 2013 Next Generation Science Standards.

**See the** [**Engineering Design standards**](http://www.nextgenscience.org/msets1-engineering-design) **or the attached hard copy.**

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| **2015 Ocean County Science Curriculum** | | |
| **Grade 8**  **Unit: Structure and Properties of Matter** | | |
| ***How can particles combine to produce a substance with different properties?***  ***How does thermal energy affect particles?***  Students build understandings of what occurs at the atomic and molecular scale. Students apply understanding that pure substances have characteristic properties and are made from a single type of atom or molecule. They also provide a molecular level accounts to explain states of matter and changes between states. The crosscutting concepts of cause and effect; scale, proportion and quantity; structure and function; interdependence of science, engineering, and technology; and influence of science, engineering and technology on society and the natural world are called out as organizing concepts for these disciplinary core ideas. Students demonstrate proficiency in developing and using models, and obtaining, evaluating, and communicating information. Students use these scientific and engineering practices to demonstrate understanding of the core ideas. | | |
| **#** | **STUDENT LEARNING OBJECTIVES (SLO)** | **Corresponding**  **DCIs and PEs** |
| **1** | Identify unknown substances based on data regarding their physical and chemical properties. | PS1.A |
| **2** | Predict the physical and chemical properties of elements based on their positions on the Periodic Table. | PS1.A |
| **3** | **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.] [Assessment Boundary: Assessment does not include valence electrons and bonding energy, discussing the ionic nature of subunits of complex structures, or a complete depiction of all individual atoms in a complex molecule or extended structure.] | **MS-PS1-1** |
| **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 drawings and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.] | **MS-PS1-4** |
| **5** | **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.] [Assessment Boundary: Assessment is limited to qualitative information.] | **MS-PS1-3** |

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| The performance expectations above were developed using [the following elements from the NRC document *A Framework for K-12 Science Education*](http://nextgenscience.org/msps-spm-structure-properties-matter#framework): | | |
| **Science and Engineering Practices**  [**Developing and Using Models**](http://www.nap.edu/openbook.php?record_id=13165&page=56)  [Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems.](http://www.nap.edu/openbook.php?record_id=13165&page=56)   * [Develop a model to predict and/or describe phenomena. (MS-PS1-1),(MS-PS1-4)](http://www.nap.edu/openbook.php?record_id=13165&page=56)   [**Obtaining, Evaluating, and Communicating Information**](http://www.nap.edu/openbook.php?record_id=13165&page=74)  [Obtaining, evaluating, and communicating information in 6–8 builds on K–5 and progresses to evaluating the merit and validity of ideas and methods.](http://www.nap.edu/openbook.php?record_id=13165&page=74)   * [Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or now supported by evidence. (MS-PS1-3)](http://www.nap.edu/openbook.php?record_id=13165&page=74)   - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  ***Connections to Nature of Science***    **Scientific Knowledge is Open to Revision in Light of New Evidence**   * Science findings are frequently revised and/or reinterpreted based on new evidence. (MS-ESS2-3)   [***21st Century themes and skills***](http://www.p21.org/storage/documents/21stcskillsmap_science.pdf) ***(This link is taken from the Partnership for 21st Century Skills)***   * creativity and innovation * critical thinking and problem solving * communication * collaboration * information literacy * media literacy * information and communications technology (ICT) * literacy * flexibility and adaptability * initiative and self direction * social and cross cultural skills * productivity and accountability * leadership and responsibility | **Disciplinary Core Ideas**  [**PS1.A: Structure and Properties of Matter**](http://www.nap.edu/openbook.php?record_id=13165&page=106)   * [Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (MS-PS1-1)](http://www.nap.edu/openbook.php?record_id=13165&page=106) * [Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-3) *(Note: This Disciplinary Core Idea is also addressed by MS-PS1-2.)*](http://www.nap.edu/openbook.php?record_id=13165&page=106) * [Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (MS-PS1-4)](http://www.nap.edu/openbook.php?record_id=13165&page=106) * [In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (MS-PS1-4)](http://www.nap.edu/openbook.php?record_id=13165&page=106) * [Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (MS-PS1-1)](http://www.nap.edu/openbook.php?record_id=13165&page=106) * [The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. (MS-PS1-4)](http://www.nap.edu/openbook.php?record_id=13165&page=106)   [**PS1.B: Chemical Reactions**](http://www.nap.edu/openbook.php?record_id=13165&page=109)   * [Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-3) *(Note: This Disciplinary Core Idea is also addressed by MS-PS1-2 and MS-PS1-5.)*](http://www.nap.edu/openbook.php?record_id=13165&page=109)   [**PS3.A: Definitions of Energy**](http://www.nap.edu/openbook.php?record_id=13165&page=120)   * [The term “heat” as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. *(secondary to MS-PS1-4)*](http://www.nap.edu/openbook.php?record_id=13165&page=120) * [The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system’s material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. Temperature is not a direct measure of a system's total thermal energy. The total thermal energy (sometimes called the total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material. *(secondary to MS-PS1-4)*](http://www.nap.edu/openbook.php?record_id=13165&page=120) | **Crosscutting Concepts**  [**Cause and Effect**](http://www.nap.edu/openbook.php?record_id=13165&page=87)   * [Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS1-4)](http://www.nap.edu/openbook.php?record_id=13165&page=87)   [**Scale, Proportion, and Quantity**](http://www.nap.edu/openbook.php?record_id=13165&page=89)   * [Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-PS1-1)](http://www.nap.edu/openbook.php?record_id=13165&page=89)   [**Structure and Function**](http://www.nap.edu/openbook.php?record_id=13165&page=96)   * [Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS1-3)](http://www.nap.edu/openbook.php?record_id=13165&page=96)      - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  ***Connections to Engineering, Technology,***  ***and Applications of Science***    **Interdependence of Science, Engineering, and Technology**   * Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-PS1-3)   [**Influence of Science, Engineering and Technology on Society and the Natural World**](http://www.nap.edu/openbook.php?record_id=13165&page=212)   * [The uses of technologies and any limitation on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-PS1-3)](http://www.nap.edu/openbook.php?record_id=13165&page=212) |

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| *Connections to other DCIs in this grade-band:*  [**MS.LS2.A**](http://nextgenscience.org/msls2-ecosystems-interactions-energy-dynamics) (MS-PS1-3); [**MS.LS4.D**](http://nextgenscience.org/msls2-ecosystems-interactions-energy-dynamics) (MS-PS1-3); [**MS.ESS3.A**](http://nextgenscience.org/msess3-earth-human-activity) (MS-PS1-3); [**MS.ESS3.C**](http://nextgenscience.org/msess3-earth-human-activity) (MS-PS1-3) |
| *Articulation of DCIs across grade-bands:*  [**5.PS1.A**](http://nextgenscience.org/5ps1-matter-interactions) (MS-PS1-1); [**HS.PS1.A**](http://nextgenscience.org/hsps1-matter-interactions) (MS-PS1-1),(MS-PS1-4); [**HS.PS1.B**](http://nextgenscience.org/hsps1-matter-interactions) (MS-PS1-4); [**HS.PS3.A**](http://nextgenscience.org/hsps3-energy) (MS-PS1-4); [**HS.LS2.A**](http://nextgenscience.org/hsls2-ecosystems-interactions-energy-dynamics) (MS-PS1-3); [**HS.LS4.D**](http://nextgenscience.org/hsls4-biological-evolution-unity-diversity) (MS-PS1-3); [**HS.ESS1.A**](http://nextgenscience.org/hsess1-earth-place-universe) (MS-PS1-1); [**HS.ESS3.A**](http://nextgenscience.org/hsess3-earth-human-activity) (MS-PS1-3) |
| *Interdisciplinary Connections:*   |  |  | | --- | --- | | *ELA/Literacy -* | | | [**RST.6-8.1**](http://www.corestandards.org/ELA-Literacy/RST/6-8) | [Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.](http://www.corestandards.org/ELA-Literacy/RST/6-8)(MS-PS1-3) | | [**RST.6-8.7**](http://www.corestandards.org/ELA-Literacy/RST/6-8) | [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).](http://www.corestandards.org/ELA-Literacy/RST/6-8) *(MS-PS1-1),(MS-PS1-4)* | | [**WHST.6-8.8**](http://www.corestandards.org/ELA-Literacy/WHST/6-8) | [Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.](http://www.corestandards.org/ELA-Literacy/WHST/6-8) (MS-PS1-3) | | *Mathematics -* | | | [**MP.2**](http://www.corestandards.org/Math/Practice/MP2) | [Reason abstractly and quantitatively.](http://www.corestandards.org/Math/Practice/MP2) (MS-PS1-1) | | [**MP.4**](http://www.corestandards.org/Math/Practice/MP4) | [Model with mathematics.](http://www.corestandards.org/Math/Practice/MP4) *(MS-PS1-1)* | | [**6.RP.A.3**](http://www.corestandards.org/Math/Content/6/RP) | [Use ratio and rate reasoning to solve real-world and mathematical problems.](http://www.corestandards.org/Math/Content/6/RP) *(MS-PS1-1)* | | [**6.NS.C.5**](http://www.corestandards.org/Math/Content/6/NS) | [Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.](http://www.corestandards.org/Math/Content/6/NS) (MS-PS1-4) | | [**8.EE.A.3**](http://www.corestandards.org/Math/Content/8/EE) | [Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.](http://www.corestandards.org/Math/Content/8/EE) *(MS-PS1-1)* | |

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| **Grade Level: 8** | **Title of Unit: Structure and Properties of Matter** |
| **Stage 1 - Desired Results** | |
| **Understandings:**  *Students will understand that…*   * there is an atomic and molecular scale and what occurs at each level. * pure substances have characteristic properties and are made from a single type of atom or molecule * the crosscutting concepts of cause and effect; scale, proportion and quantity; structure and function; interdependence of science, engineering, and technology; and influence of science, engineering and technology on society and the natural world are called out as organizing concepts for these disciplinary core ideas. | **Essential Questions:**   * How can particles combine to produce a substance with different properties? * How does thermal energy affect particles? |
| **Knowledge:**  *Students will know…*   * substances are made from different types of atoms, which combine with one another in various ways. * atoms form molecules that range in size from two to thousands of atoms. (MS-PS1-1) * solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (MS-PS1-1) * each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-3) * substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-3) * gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (MS-PS1-4) * in a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (MS-PS1-4) * the changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. (MS-PS1-4) * the term “heat” as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. (secondary to MS-PS1-4) | **Skills:**  *Students will be able to…*   * develop models to describe the atomic composition of simple molecules and extended structure*s.* * develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. * demonstrate proficiency in developing and using models, and obtaining, evaluating, and communicating information. Students use these scientific and engineering practices to demonstrate understanding of the core ideas. * gather and make sense of information to describe that synthetic materials come from natural resources and impact. * identify unknown substances based on data regarding their physical and chemical properties. * predict the physical and chemical properties of elements based on their positions on the Periodic Table. * provide a molecular level account to explain states of matter and changes between states. * use these scientific and engineering practices to demonstrate understanding of the core ideas. |

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| **Stage 2- Assessment Evidence:** |
| **Performance Tasks and other evidence:**   * Summative Assessments   + RST- Research Simulation Task   + Unit tests and quizzes   + Labs and engineering based projects * Formative Assessments   + Graphic Organizers & Guided Note Taking   + Directed Reading   + Cooperative Group Learning Safety in the Chemistry Laboratory • Laboratory Procedures • Constructing a Model • Conservation of Mass   + Homework   + Journal Entries |
| **Stage 3 – Learning Plan** |
| **Digital information and technology integration:** Indicate any special considerations as well as materials, resources (online, print, video, audio) or equipment.  **Suggested EDP Activities:**   * Spaghetti Tower Challenge (Please note that that this challenge occurs in 6th-8th grade and has been scaffolded.)   + 8th grade requirements-Design a self supporting tower that is a minimum of 30 cm tall, which can hold a large free standing marshmallow.   + <http://www.keslerscience.com/spaghetti-and-marshmallows-tower-lab/> * Density of Water:   + <http://www.middleschoolchemistry.com/lessonplans/chapter3/lesson3>   **Learning Activities:**   * **Mystery lab:** Plan and do an investigation that uses physical characteristics and chemical properties to identify an unknown substance.   + Curious Crystals (PISA2):<http://www.inquiryinaction.org/classroomactivities/activity.php?id=7>   + Mystery Powder * Plan and do an investigation to determine if a chemical reaction has occurred in common substances (ie melting ice, burning sugar, mixing zinc with HCl) * Dancing Raisins Lab * Density (PISA2) * Safety in the Chemistry Laboratory * Constructing a Model * Conservation of Mass * The Atomic Mass of Candium Activity * Melting Point Lab * Melting Blocks (Apply knowledge gained in 7th grade to explain thermal energy in terms of chemistry.) * Oobleck vs. gak |
| **Modifications: (ELLs, Special Education, Gifted and Talented)**  **\*** Follow all IEP modifications/504 plan  \* Teacher tutoring  \* Peer tutoring  \* Cooperative learning groups  \* Modified assignments  \* Differentiated instruction  **Presentation accommodations allow a student to:**  **\*** Listen to audio recordings instead of reading text  \* Learn content from audiobooks, movies, videos and digital media instead of reading print versions  \* Work with fewer items per page or line and/or materials in a larger print size  \* Have a designated reader  \* Hear instructions orally  \* Record a lesson, instead of taking notes  \* Have another student share class notes with him  \* Be given an outline of a lesson  \* Use visual presentations of verbal material, such as word webs and visual organizers  \* Be given a written list of instructions  **Response accommodations allow a student to:**  **\*** Give responses in a form (oral or written) that’s easier for him  \* Dictate answers to a scribe  \* Capture responses on an audio recorder  \* Use a spelling dictionary or electronic spell-checker  \* Use a word processor to type notes or give responses in class  \* Use a calculator or table of “math facts”  **Setting accommodations allow a student to:**  **\*** Work or take a test in a different setting, such as a quiet room with few distractions  \* Sit where he learns best (for example, near the teacher)  \* Use special lighting or acoustics  \* Take a test in small group setting  \* Use sensory tools such as an exercise band that can be looped around a chair’s legs (so fidgety kids can kick it and quietly get their energy out)  **Timing accommodations allow a student to:**  **\*** Take more time to complete a task or a test  \* Have extra time to process oral information and directions  \* Take frequent breaks, such as after completing a task  **Scheduling accommodations allow a student to:**  **\*** Take more time to complete a project  \* Take a test in several timed sessions or over several days  \* Take sections of a test in a different order  \* Take a test at a specific time of day  **Organization skills accommodations allow a student to:**  **\***  Use an alarm to help with time management  \* Mark texts with a highlighter  \* Have help coordinating assignments in a book or planner  \* Receive study skills instruction  **Assignment modifications allow a student to:**  **\*** Complete fewer or different homework problems than peers  \* Write shorter papers  \* Answer fewer or different test questions  \* Create alternate projects or assignments  **Curriculum modifications allow a student to:**  **\*** Learn different material (such as continuing to work on multiplication while classmates move on to fractions)  \* Get graded or assessed using a different standard than the one for classmates |

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| ***2015 Ocean County Science Curriculum*** | | |
| **Grade 8**  **Unit: Chemical Reactions** | | |
| ***What happens when new materials are formed? What stays the same and what changes?***  Students understand what occurs at the atomic and molecular scale during chemical reactions. Students provide molecular level accounts to explain that chemical reactions involve regrouping of atoms to form new substances, and that atoms rearrange during chemical reactions. Students are also able to apply an understanding of the design and the process of optimization in engineering to chemical reaction systems. The crosscutting concepts of patterns and energy and matter are called out as organizing concepts for these disciplinary core ideas. In these performance expectations, students are expected to demonstrate proficiency in developing and using models, analyzing and interpreting data, and designing solutions. Students use these scientific and engineering practices to demonstrate understanding of the core ideas. | | |
| **#** | **STUDENT LEARNING OBJECTIVES (SLO)** | **Corresponding**  **DCIs and PEs** |
| **1** | Design qualitative investigations to differentiate between physical and chemical changes in matter. | PS1.A; PS1.B |
| **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.] [Assessment Boundary: Assessment is limited to analysis of the following properties: density, melting point, boiling point, solubility, flammability, and odor.] | **MS-PS1-2** |
| **3** | **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.] [Assessment Boundary: Assessment does not include the use of atomic masses, balancing symbolic equations, or intermolecular forces.] | **MS-PS1-5** |
| **4** | Compare the properties of reactants with the properties of the products when two or more substances are combined and react chemically. | PS1.B |
| **5** | **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.] [Assessment Boundary: Assessment is limited to the criteria of amount, time, and temperature of substance in testing the device.] | **MS-PS1-6** |

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| The performance expectations above were developed using [the following elements from the NRC document *A Framework for K-12 Science Education*](http://nextgenscience.org/msps-cr-chemical-reactions#framework): | | |
| **Science and Engineering Practices**  [**Developing and Using Models**](http://www.nap.edu/openbook.php?record_id=13165&page=56)  [Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems.](http://www.nap.edu/openbook.php?record_id=13165&page=56)   * [Develop a model to predict and/or describe phenomena. (MS-PS1-1),(MS-PS1-4)](http://www.nap.edu/openbook.php?record_id=13165&page=56) * [Develop a model to describe unobservable mechanisms. (MS-PS1-5)](http://www.nap.edu/openbook.php?record_id=13165&page=56)   [**Analyzing and Interpreting Data**](http://www.nap.edu/openbook.php?record_id=13165&page=61)  [Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.](http://www.nap.edu/openbook.php?record_id=13165&page=61)   * [Analyze and interpret data to determine similarities and differences in findings. (MS-PS1-2)](http://www.nap.edu/openbook.php?record_id=13165&page=61)   [**Constructing Explanations and Designing Solutions**](http://www.nap.edu/openbook.php?record_id=13165&page=67)  [Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories.](http://www.nap.edu/openbook.php?record_id=13165&page=67)   * [Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. (MS-PS1-6)](http://www.nap.edu/openbook.php?record_id=13165&page=67)   - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    ***Connections to Nature of Science***    **Scientific Knowledge is Based on Empirical Evidence**   * Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-PS1-2)   **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena**   * Laws are regularities or mathematical descriptions of natural phenomena. (MS-PS1-5)   [***21st Century themes and skills***](http://www.p21.org/storage/documents/21stcskillsmap_science.pdf) ***(This link is taken from the Partnership for 21st Century Skills)***   * creativity and innovation * critical thinking and problem solving * communication * collaboration * information literacy * media literacy * information and communications technology (ICT) * literacy * flexibility and adaptability * initiative and self direction * social and cross cultural skills * productivity and accountability * leadership and responsibility | **Disciplinary Core Ideas**  [**PS1.A: Structure and Properties of Matter**](http://www.nap.edu/openbook.php?record_id=13165&page=106)   * [Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-2) *(Note: This Disciplinary Core Idea is also addressed by MS-PS1-3.)*](http://www.nap.edu/openbook.php?record_id=13165&page=106)   [**PS1.B: Chemical Reactions**](http://www.nap.edu/openbook.php?record_id=13165&page=109)   * [Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2),(MS-PS1-5) *(Note: This Disciplinary Core Idea is also addressed by MS-PS1-3.)*](http://www.nap.edu/openbook.php?record_id=13165&page=109) * [The total number of each type of atom is conserved, and thus the mass does not change. (MS-PS1-5)](http://www.nap.edu/openbook.php?record_id=13165&page=109) * [Some chemical reactions release energy, others store energy. (MS-PS1-6)](http://www.nap.edu/openbook.php?record_id=13165&page=109)   [**ETS1.B: Developing Possible Solutions**](http://www.nap.edu/openbook.php?record_id=13165&page=206)   * [A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. *(secondary to MS-PS1-6)*](http://www.nap.edu/openbook.php?record_id=13165&page=206)   [**ETS1.C: Optimizing the Design Solution**](http://www.nap.edu/openbook.php?record_id=13165&page=208)   * [Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process - that is, some of the characteristics may be incorporated into the new design. *(secondary to MS-PS1-6)*](http://www.nap.edu/openbook.php?record_id=13165&page=208) * [The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. *(secondary to MS-PS1-6)*](http://www.nap.edu/openbook.php?record_id=13165&page=208) | **Crosscutting Concepts**  [**Patterns**](http://www.nap.edu/openbook.php?record_id=13165&page=85)   * [Macroscopic patterns are related to the nature of microscopic and atomic-level structure. (MS-PS1-2)](http://www.nap.edu/openbook.php?record_id=13165&page=85)   [**Energy and Matter**](http://www.nap.edu/openbook.php?record_id=13165&page=94)   * [Matter is conserved because atoms are conserved in physical and chemical processes. (MS-PS1-5)](http://www.nap.edu/openbook.php?record_id=13165&page=94) * [The transfer of energy can be tracked as energy flows through a designed or natural system. (MS-PS1-6)](http://www.nap.edu/openbook.php?record_id=13165&page=94) |
| ***Connections to other DCIs in this grade-band:***  [**MS.PS3.D**](http://nextgenscience.org/msls1-molecules-organisms-structures-processes) (MS-PS1-2),(MS-PS1-6); [**MS.LS1.C**](http://nextgenscience.org/msls1-molecules-organisms-structures-processes) (MS-PS1-2),(MS-PS1-5); [**MS.LS2.B**](http://nextgenscience.org/msls2-ecosystems-interactions-energy-dynamics) (MS-PS1-5); [**MS.ESS2.A**](http://nextgenscience.org/msess2-earth-systems) (MS-PS1-2),(MS-PS1-5) | | |
| ***Articulation of DCIs across grade-bands:***  [**5.PS1.B**](http://nextgenscience.org/5ps1-matter-interactions) (MS-PS1-2),(MS-PS1-5); [**HS.PS1.A**](http://nextgenscience.org/hsps1-matter-interactions) (MS-PS1-6); [**HS.PS1.B**](http://nextgenscience.org/hsps1-matter-interactions) (MS-PS1-2),(MS-PS1-5),(MS-PS1-6); [**HS.PS3.A**](http://nextgenscience.org/hsps3-energy) (MS-PS1-6); [**HS.PS3.B**](http://nextgenscience.org/hsps3-energy) (MS-PS1-6); [**HS.PS3.D**](http://nextgenscience.org/hsps3-energy) (MS-PS1-6) | | |
| ***Interdisciplinary Connections:***   |  |  | | --- | --- | | *ELA/Literacy -* | | | [**RST.6-8.1**](http://www.corestandards.org/ELA-Literacy/RST/6-8) | [Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.](http://www.corestandards.org/ELA-Literacy/RST/6-8)*(MS-PS1-2)* | | [**RST.6-8.3**](http://www.corestandards.org/ELA-Literacy/RST/6-8) | [Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.](http://www.corestandards.org/ELA-Literacy/RST/6-8) (MS-PS1-6) | | [**RST.6-8.7**](http://www.corestandards.org/ELA-Literacy/RST/6-8) | [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).](http://www.corestandards.org/ELA-Literacy/RST/6-8) (MS-PS1-2),*(MS-PS1-5)* | | [**WHST.6-8.7**](http://www.corestandards.org/ELA-Literacy/WHST/6-8) | [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.](http://www.corestandards.org/ELA-Literacy/WHST/6-8) (MS-PS1-6) | | *Mathematics -* | | | [**MP.2**](http://www.corestandards.org/Math/Practice/MP2) | [Reason abstractly and quantitatively.](http://www.corestandards.org/Math/Practice/MP2) (MS-PS1-2),(MS-PS1-5) | | [**MP.4**](http://www.corestandards.org/Math/Practice/MP4) | [Model with mathematics.](http://www.corestandards.org/Math/Practice/MP4) (MS-PS1-5) | | [**6.RP.A.3**](http://www.corestandards.org/Math/Content/6/RP) | [Use ratio and rate reasoning to solve real-world and mathematical problems.](http://www.corestandards.org/Math/Content/6/RP) *(MS-PS1-2)*,(MS-PS1-5) | | [**6.SP.B.4**](http://www.corestandards.org/Math/Content/6/SP) | [Display numerical data in plots on a number line, including dot plots, histograms, and box plots.](http://www.corestandards.org/Math/Content/6/SP) *(MS-PS1-2)* | | [**6.SP.B.5**](http://www.corestandards.org/Math/Content/6/SP) | [Summarize numerical data sets in relation to their context.](http://www.corestandards.org/Math/Content/6/SP) (MS-PS1-2) | | | |

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| **Grade Level: 8** | **Title of Unit: Chemical Reactions** |
| **Stage 1 - Desired Results** | |
| **Understandings:**  *Students will understand that…*   * what occurs at the atomic and molecular scale during chemical reactions. * the crosscutting concepts of patterns and energy and matter are called out as organizing concepts for these disciplinary core ideas. | **Essential Questions:**   * What happens when new materials are formed? * What stays the same and what changes? |
| **Knowledge:**  *Students will know…*   * each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-2) * substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2),(MS-PS1-5) * the total number of each type of atom is conserved, and thus the mass does not change. (MS-PS1-5) * some chemical reactions release energy, others store energy. (MS-PS1-6) * a solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (secondary to MS-PS1-6) * the iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (secondary to MS-PS1-6) * although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process that is, some of the characteristics may be incorporated into the new design. | **Skills:**  *Students will be able to…*   * analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. * develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. * undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes. * design qualitative investigations to differentiate between physical and chemical changes in matter. * provide molecular level accounts to explain that chemical reactions involve regrouping of atoms to form new substances, and that atoms rearrange during chemical reactions. * apply an understanding of the design and the process of optimization in engineering to chemical reaction systems. * demonstrate proficiency in developing and using models, analyzing and interpreting data, and designing solutions. |

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| **Stage 2- Assessment Evidence:** |
| **Performance Tasks and other evidence:**   * Summative Assessments   + RST- Research Simulation Task   + Unit tests and quizzes   + Labs and engineering based projects * Formative Assessments   + Graphic Organizers & Guided Note Taking   + Directed Reading   + Cooperative Group Learning   + Homework   + Journal Entries |
| **Stage 3 – Learning Plan** |
| **Digital information and technology integration:** Indicate any special considerations as well as materials, resources (online, print, video, audio) or equipment.   * Alka Seltzer film canister rockets:   + <http://imaginationstationtoledo.org/content/2010/08/film-canister-rockets-2/>   + <http://www.stevespanglerscience.com/blog/cool-science-products/alka-seltzer-rockets/> * Pill Coating   + <https://www.teachengineering.org/view_activity.php?url=collection/cub_/activities/cub_biomed/cub_biomed_lesson05_activity1.xml> * Elephant Toothpaste   + <http://www.pbs.org/parents/adventures-in-learning/2013/10/the-great-elephant-toothpaste-experiment/>   + <http://sciencebob.com/fantastic-foamy-fountain/>   **Learning Activities:**   * Baking Soda and Vinegar - Chemistry in a Bag * Chalk and Vinegar * Invisible Ink (Acids and Bases) * Conservation of Mass   **Enrich:**   * Balancing chemical equations * Ionic bonding * Covalent bonding |
| **Modifications: (ELLs, Special Education, Gifted and Talented)**  \* Follow all IEP modifications/504 plan  \* Teacher tutoring  \* Peer tutoring  \* Cooperative learning groups  \* Modified assignments  \* Differentiated instruction  **Presentation accommodations allow a student to:**  \* Listen to audio recordings instead of reading text  \* Learn content from audiobooks, movies, videos and digital media instead of reading print versions  \* Work with fewer items per page or line and/or materials in a larger print size  \* Have a designated reader  \* Hear instructions orally  \* Record a lesson, instead of taking notes  \* Have another student share class notes with him  \* Be given an outline of a lesson  \* Use visual presentations of verbal material, such as word webs and visual organizers  \* Be given a written list of instructions  **Response accommodations allow a student to:**  \* Give responses in a form (oral or written) that’s easier for him  \* Dictate answers to a scribe  \* Capture responses on an audio recorder  \* Use a spelling dictionary or electronic spell-checker  \* Use a word processor to type notes or give responses in class  \* Use a calculator or table of “math facts”  **Setting accommodations allow a student to:**  \* Work or take a test in a different setting, such as a quiet room with few distractions  \* Sit where he learns best (for example, near the teacher)  \* Use special lighting or acoustics  \* Take a test in small group setting  \* Use sensory tools such as an exercise band that can be looped around a chair’s legs (so fidgety kids can kick it and quietly get their energy out)  **Timing accommodations allow a student to:**  \* Take more time to complete a task or a test  \* Have extra time to process oral information and directions  \* Take frequent breaks, such as after completing a task  **Scheduling accommodations allow a student to:**  \* Take more time to complete a project  \* Take a test in several timed sessions or over several days  \* Take sections of a test in a different order  \* Take a test at a specific time of day  **Organization skills accommodations allow a student to:**  \* Use an alarm to help with time management  \* Mark texts with a highlighter  \* Have help coordinating assignments in a book or planner  \* Receive study skills instruction  **Assignment modifications allow a student to:**  \* Complete fewer or different homework problems than peers  \* Write shorter papers  \* Answer fewer or different test questions  \* Create alternate projects or assignments  **Curriculum modifications allow a student to:**  \* Learn different material (such as continuing to work on multiplication while classmates move on to fractions)  \* Get graded or assessed using a different standard than the one for classmates |

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| ***2015 Ocean County Science Curriculum*** | | |
| **Grade 8**  **Unit: Interdependent Relationships in Ecosystems** | | |
| ***How do organisms interact with other organisms in the physical environment to obtain matter and energy?***  Students construct explanations for the interactions in ecosystems and the scientific, economic, political, and social justifications used in making decisions about maintaining biodiversity in ecosystems. Students use models, construct evidence-based explanations, and use argumentation from evidence. Students understand that organisms and populations of organisms are dependent on their environmental interactions both with other organisms and with nonliving factors. They also understand the limits of resources influence the growth of organisms and populations, which may result in competition for those limited resources. Crosscutting concepts of matter and energy, systems and system models, and cause and effect are used by students to support understanding the phenomena they study. | | |
| **#** | **STUDENT LEARNING OBJECTIVES (SLO)** | **Corresponding**  **DCIs and PEs** |
| **1** | Describe how one population of organisms may affect other plants and/or animals in an ecosystem. | LS2.A |
| **2** | Predict the impact of humans altering biotic and abiotic factors has on an ecosystem. | LS2. C |
| **3** | Model the effect of positive and negative changes in population size on a symbiotic pairing. | LS2. A |
| **4** | **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-LS2-5** |
| **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.] | **MS-LS2-2** |

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| The performance expectations above were developed using [the following elements from the NRC document *A Framework for K-12 Science Education*](http://nextgenscience.org/msls-ire-interdependent-relationships-ecosystems#framework): | | |
| **Science and Engineering Practices**  [**Constructing Explanations and Designing Solutions**](http://www.nap.edu/openbook.php?record_id=13165&page=67)  [Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.](http://www.nap.edu/openbook.php?record_id=13165&page=67)   * [Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. (MS-LS2-2)](http://www.nap.edu/openbook.php?record_id=13165&page=67)   [**Engaging in Argument from Evidence**](http://www.nap.edu/openbook.php?record_id=13165&page=71)  [Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).](http://www.nap.edu/openbook.php?record_id=13165&page=71)   * [Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-LS2-5)](http://www.nap.edu/openbook.php?record_id=13165&page=71)   - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  ***Connections to Nature of Science***  **Scientific Knowledge is Based on Empirical Evidence**   * Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-LS4-1)   [***21st Century themes and skills***](http://www.p21.org/storage/documents/21stcskillsmap_science.pdf) ***(This link is taken from the Partnership for 21st Century Skills)***   * creativity and innovation * critical thinking and problem solving * communication * collaboration * information literacy * media literacy * information and communications technology (ICT) * literacy * flexibility and adaptability * initiative and self direction * social and cross cultural skills * productivity and accountability * leadership and responsibility | **Disciplinary Core Ideas**  [**LS2.A: Interdependent Relationships in Ecosystems**](http://www.nap.edu/openbook.php?record_id=13165&page=150)   * [Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. (MS-LS2-2)](http://www.nap.edu/openbook.php?record_id=13165&page=150)   [**LS2.C: Ecosystem Dynamics, Functioning, and Resilience**](http://www.nap.edu/openbook.php?record_id=13165&page=154)   * [Biodiversity describes the variety of species found in Earth’s terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem’s biodiversity is often used as a measure of its health. (MS-LS2-5)](http://www.nap.edu/openbook.php?record_id=13165&page=154)   [**LS4.D: Biodiversity and Humans**](http://www.nap.edu/openbook.php?record_id=13165&page=166)   * [Changes in biodiversity can influence humans’ resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. *(secondary to MS-LS2-5)*](http://www.nap.edu/openbook.php?record_id=13165&page=166)   [**ETS1.B: Developing Possible Solutions**](http://www.nap.edu/openbook.php?record_id=13165&page=206)   * [There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. *(secondary to MS-LS2-5)*](http://www.nap.edu/openbook.php?record_id=13165&page=206) | **Crosscutting Concepts**  [**Patterns**](http://www.nap.edu/openbook.php?record_id=13165&page=85)   * [Patterns can be used to identify cause and effect relationships. (MS-LS2-2)](http://www.nap.edu/openbook.php?record_id=13165&page=85)   [**Stability and Change**](http://www.nap.edu/openbook.php?record_id=13165&page=98)   * [Small changes in one part of a system might cause large changes in another part. (MS-LS2-5)](http://www.nap.edu/openbook.php?record_id=13165&page=98)   - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  ***Connections to Engineering, Technology, and  Applications of Science***    [**Influence of Science, Engineering, and Technology on Society and the Natural World**](http://www.nap.edu/openbook.php?record_id=13165&page=212)   * [The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-LS2-5)](http://www.nap.edu/openbook.php?record_id=13165&page=212)   - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  ***Connections to Nature of Science***    **Science Addresses Questions About the Natural and Material World**   * Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS2-5) |

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| *Connections to other DCIs in this grade-band:*  [**MS.LS1.B**](http://nextgenscience.org/msls1-molecules-organisms-structures-processes) (MS-LS2-2); [**MS.ESS3.C**](http://nextgenscience.org/msess3-earth-human-activity) (MS-LS2-5) |
| *Articulation of DCIs across grade-bands:*  [**1.LS1.B**](http://nextgenscience.org/1ls1-molecules-organisms-structures-processes) (MS-LS2-2); [**HS.LS2.A**](http://nextgenscience.org/hsls2-ecosystems-interactions-energy-dynamics) (MS-LS2-2),(MS-LS2-5); [**HS.LS2.B**](http://nextgenscience.org/hsls2-ecosystems-interactions-energy-dynamics) (MS-LS2-2); [**HS.LS2.C**](http://nextgenscience.org/hsls2-ecosystems-interactions-energy-dynamics) (MS-LS2-5); [**HS.LS2.D**](http://nextgenscience.org/hsls2-ecosystems-interactions-energy-dynamics) (MS-LS2-2); [**HS.LS4.D**](http://nextgenscience.org/hsls4-biological-evolution-unity-diversity) (MS-LS2-5); [**HS.ESS3.A**](http://nextgenscience.org/hsess3-earth-human-activity) (MS-LS2-5); [**HS.ESS3.C**](http://nextgenscience.org/hsess3-earth-human-activity) (MS-LS2-5); [**HS.ESS3.D**](http://nextgenscience.org/hsess3-earth-human-activity) (MS-LS2-5) |
| *Interdisciplinary Connections:*   |  |  | | --- | --- | | *ELA/Literacy -* | | | [**RST.6-8.1**](http://www.corestandards.org/ELA-Literacy/RST/6-8) | [Cite specific textual evidence to support analysis of science and technical texts.](http://www.corestandards.org/ELA-Literacy/RST/6-8) (MS-LS2-2) | | [**RST.6-8.8**](http://www.corestandards.org/ELA-Literacy/RST/6-8) | [Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.](http://www.corestandards.org/ELA-Literacy/RST/6-8) (MS-LS2-5) | | [**RI.8.8**](http://www.corestandards.org/ELA-Literacy/RI/6) | [Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims.](http://www.corestandards.org/ELA-Literacy/RI/6) (MS-LS2-5) | | [**WHST.6-8.2**](http://www.corestandards.org/ELA-Literacy/WHST/6-8) | [Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.](http://www.corestandards.org/ELA-Literacy/WHST/6-8) (MS-LS2-2) | | [**WHST.6-8.9**](http://www.corestandards.org/ELA-Literacy/WHST/6-8) | [Draw evidence from literary or informational texts to support analysis, reflection, and research.](http://www.corestandards.org/ELA-Literacy/WHST/6-8) (MS-LS2-2) | | [**SL.8.1**](http://www.corestandards.org/ELA-Literacy/SL/8) | [Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others’ ideas and expressing their own clearly.](http://www.corestandards.org/ELA-Literacy/SL/8) *(MS-LS2-2)* | | [**SL.8.4**](http://www.corestandards.org/ELA-Literacy/SL/8) | [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.](http://www.corestandards.org/ELA-Literacy/SL/8) *(MS-LS2-2)* | | *Mathematics -* | | | [**MP.4**](http://www.corestandards.org/Math/Practice/MP4) | [Model with mathematics.](http://www.corestandards.org/Math/Practice/MP4) *(MS-LS2-5)* | | [**6.RP.A.3**](http://www.corestandards.org/Math/Content/6/RP) | [Use ratio and rate reasoning to solve real-world and mathematical problems.](http://www.corestandards.org/Math/Content/6/RP) *(MS-LS2-5)* | | [**6.SP.B.5**](http://www.corestandards.org/Math/Content/6/SP) | [Summarize numerical data sets in relation to their context.](http://www.corestandards.org/Math/Content/6/SP) *(MS-LS2-2)* | |

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| **Grade Level: 8** | **Title of Unit:** Interdependent Relationships in Ecosystems |
| **Stage 1 - Desired Results** | |
| **Understandings:**  *Students will understand that…*   * organisms and populations of organisms are dependent on their environmental interactions both with other organisms and with nonliving factors. * the limits of resources influence the growth of organisms and populations, which may result in competition for those limited resources. * crosscutting concepts of matter and energy, systems and system models, and cause and effect are used to support understanding of the phenomena they study. | **Essential Questions:**   * How do organisms interact with other organisms in the physical environment to obtain matter and energy? |
| **Knowledge:**  *Students will know…*   * predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. (MS-LS2-2) * biodiversity describes the variety of species found in Earth’s terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem’s biodiversity is often used as a measure of its health. (MS-LS2-5) * changes in biodiversity can influence humans’ resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. | **Skills:**  *Students will be able to…*   * construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. * construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. * describe how one population of organisms may affect other plants and/or animals in an ecosystem. * predict the impact of humans altering biotic and abiotic factors has on an ecosystem. * model the effect of positive and negative changes in population size on a symbiotic pairing. * construct explanations for the interactions in ecosystems and the scientific, economic, political, and social justifications used in making decisions about maintaining   biodiversity in ecosystems.   * use models, construct evidence-based explanations, and use argumentation from evidence. |

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| **Stage 2- Assessment Evidence:** |
| **Performance Tasks and other evidence:**   * Summative Assessments   + RST- Research Simulation Task   + Unit tests and quizzes   + Labs and engineering based projects * Formative Assessments   + Graphic Organizers & Guided Note Taking   + Directed Reading   + Cooperative Group Learning   + Homework   + Journal Entries |
| **Stage 3 – Learning Plan** |
| **Digital information and technology integration:** Indicate any special considerations as well as materials, resources (online, print, video, audio) or equipment.   * Biodiversity Webquest   + <http://schoolwires.henry.k12.ga.us/cms/lib08/GA01000549/Centricity/Domain/3354/BiodiversityWebquest.pdf>   + http://www.amnh.org/explore/ology/biodiversity * Barnegat Bay Food web to show predator/prey relationship: <https://docs.google.com/presentation/d/1BBg5W9Ez2WJeIBGpZkT2bhT2zcQwBiY4d20mF5LGiag/edit#slide=id.p> * Barnegat Bay Alliance Activities--Biodiversity, Predator/Prey, Populations<http://www.pinelandsalliance.org/downloads/pinelandsalliance_666.pdf> * “Where did your dinner come from?” activity: <https://voyager8.wikispaces.com/file/view/Energy+Roles+page+42.pdf> * Competition among organisms   + <http://woodstown.org/cms/lib4/NJ01001783/Centricity/Domain/8/Texts/ACS/resources/ab/ch9/act5.pdf> * Oh Deer! Activity   + <http://www.beaconlearningcenter.com/documents/313_01.pdf> * Tragedy of Commons (modify to meet needs of curriculum)   + <http://www.clake.org/view/585.pdf> |
| **Modifications: (ELLs, Special Education, Gifted and Talented)**  **\*** Follow all IEP modifications/504 plan  \* Teacher tutoring  \* Peer tutoring  \* Cooperative learning groups  \* Modified assignments  \* Differentiated instruction  **Presentation accommodations allow a student to:**  **\*** Listen to audio recordings instead of reading text  \* Learn content from audiobooks, movies, videos and digital media instead of reading print versions  \* Work with fewer items per page or line and/or materials in a larger print size  \* Have a designated reader  \* Hear instructions orally  \* Record a lesson, instead of taking notes  **\*** Have another student share class notes with him  \* Be given an outline of a lesson  \* Use visual presentations of verbal material, such as word webs and visual organizers  \* Be given a written list of instructions  **Response accommodations allow a student to:**  **\*** Give responses in a form (oral or written) that’s easier for him  \* Dictate answers to a scribe  \* Capture responses on an audio recorder  \* Use a spelling dictionary or electronic spell-checker  \* Use a word processor to type notes or give responses in class  \* Use a calculator or table of “math facts”  **Setting accommodations allow a student to:**  **\*** Work or take a test in a different setting, such as a quiet room with few distractions  \* Sit where he learns best (for example, near the teacher)  \* Use special lighting or acoustics  \* Take a test in small group setting  \* Use sensory tools such as an exercise band that can be looped around a chair’s legs (so fidgety kids can kick it and quietly get their energy out)  **Timing accommodations allow a student to:**  **\*** Take more time to complete a task or a test  \* Have extra time to process oral information and directions  \* Take frequent breaks, such as after completing a task  **Scheduling accommodations allow a student to:**  **\*** Take more time to complete a project  \* Take a test in several timed sessions or over several days  \* Take sections of a test in a different order  \* Take a test at a specific time of day  **Organization skills accommodations allow a student to:**  **\*** Use an alarm to help with time management  \* Mark texts with a highlighter  \* Have help coordinating assignments in a book or planner  \* Receive study skills instruction |

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| ***2015 Ocean County Science Curriculum*** | | |
| **Grade 8**  **Unit: Growth Development Reproduction** | | |
| ***How do organisms grow, develop, and reproduce?***  Students understand how the environment and genetic factors determine the growth of an individual organism. They also demonstrate understanding of the genetic implications for sexual and asexual reproduction. Students develop evidence to support their understanding of the structures and behaviors that increase the likelihood of successful reproduction by organisms. They have a beginning understanding of the ways humans can select for specific traits, the role of technology, genetic modification, and the nature of ethical responsibilities related to selective breeding. At the end of the unit, students can explain how selected structures, functions, and behaviors of organisms change in predictable ways as they progress from birth to old age. | | |
| **#** | **STUDENT LEARNING OBJECTIVES (SLO)** | **CORRESPONDING**  **PEs** |
| **1** | **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-LS1-4** |
| **2** | **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.] [*Assessment Boundary: Assessment does not include genetic mechanisms, gene regulation, or biochemical processes.*] | **MS-LS1-5** |
| **3** | **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.] [*Assessment Boundary: Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.*] | **MS-LS3-1** |
| **4** | **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.] | **MS-LS3-2** |
| **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-LS4-5** |

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| The SLOs were developed using [the following elements from the NRC document *A Framework for K-12 Science Education*](http://www.nextgenscience.org/msls-gdro-growth-development-reproduction-organisms#framework): | | |
| **Science and Engineering Practices**  [**Developing and Using Models**](http://www.nap.edu/openbook.php?record_id=13165&page=56)  [Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.](http://www.nap.edu/openbook.php?record_id=13165&page=56)   * Develop and use a model to describe phenomena. (MS-LS3-1),(MS-LS3-2)   [**Constructing Explanations and Designing Solutions**](http://www.nap.edu/openbook.php?record_id=13165&page=67)  [Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories.](http://www.nap.edu/openbook.php?record_id=13165&page=67)   * [Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students’ own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-LS1-5)](http://www.nap.edu/openbook.php?record_id=13165&page=67)   [**Engaging in Argument from Evidence**](http://www.nap.edu/openbook.php?record_id=13165&page=71)  [Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).](http://www.nap.edu/openbook.php?record_id=13165&page=71)   * [Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-LS1-4)](http://www.nap.edu/openbook.php?record_id=13165&page=71)   [**Obtaining, Evaluating, and Communicating Information**](http://www.nap.edu/openbook.php?record_id=13165&page=74)  [Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods.](http://www.nap.edu/openbook.php?record_id=13165&page=74)   * [Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-LS4-5)](http://www.nap.edu/openbook.php?record_id=13165&page=74)   - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    ***Connections to Nature of Science***    **Scientific Knowledge is Based on Empirical Evidence**   * Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-PS1-2)   **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena**   * Laws are regularities or mathematical descriptions of natural phenomena. (MS-PS1-5)   [***21st Century themes and skills***](http://www.p21.org/storage/documents/21stcskillsmap_science.pdf) ***(This link is taken from the Partnership for 21st Century Skills)***   * creativity and innovation * critical thinking and problem solving * communication * collaboration * information literacy * media literacy * information and communications technology (ICT) * literacy * flexibility and adaptability * initiative and self direction * social and cross cultural skills * productivity and accountability * leadership and responsibility | **Disciplinary Core Ideas**  [**LS1.B: Growth and Development of Organisms**](http://www.nap.edu/openbook.php?record_id=13165&page=145)   * [Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. *(secondary to MS-LS3-2)*](http://www.nap.edu/openbook.php?record_id=13165&page=145) * [Animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4)](http://www.nap.edu/openbook.php?record_id=13165&page=145) * [Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4)](http://www.nap.edu/openbook.php?record_id=13165&page=145) * [Genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5)](http://www.nap.edu/openbook.php?record_id=13165&page=145)   [**LS3.A: Inheritance of Traits**](http://www.nap.edu/openbook.php?record_id=13165&page=158)   * [Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. (MS-LS3-1)](http://www.nap.edu/openbook.php?record_id=13165&page=158) * [Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2)](http://www.nap.edu/openbook.php?record_id=13165&page=158)   [**LS3.B: Variation of Traits**](http://www.nap.edu/openbook.php?record_id=13165&page=160)   * [In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS3-2)](http://www.nap.edu/openbook.php?record_id=13165&page=160) * [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. (MS-LS3-1)](http://www.nap.edu/openbook.php?record_id=13165&page=160)   [**LS4.B: Natural Selection**](http://www.nap.edu/openbook.php?record_id=13165&page=163)   * [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. (MS-LS4-5)](http://www.nap.edu/openbook.php?record_id=13165&page=163) | **Crosscutting Concepts**  [**Cause and Effect**](http://www.nap.edu/openbook.php?record_id=13165&page=87)   * [Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS3-2)](http://www.nap.edu/openbook.php?record_id=13165&page=87) * [Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS1-4),(MS-LS1-5),(MS-LS4-5)](http://www.nap.edu/openbook.php?record_id=13165&page=87)   [**Structure and Function**](http://www.nap.edu/openbook.php?record_id=13165&page=96)   * [Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS3-1)](http://www.nap.edu/openbook.php?record_id=13165&page=96)   ***Connections to Engineering, Technology, and  Applications of Science***  [**Interdependence of Science, Engineering, and Technology**](http://www.nap.edu/openbook.php?record_id=13165&page=210)   * [Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS4-5)](http://www.nap.edu/openbook.php?record_id=13165&page=210)   ***Connections to Nature of Science***  **Scientific Knowledge Assumes an Order and Consistency in Natural Systems**   * Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS4-1),(MS-LS4-2)   **Science Addresses Questions About the Natural and Material World**   * Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS4-5) |

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| ***Connections to other DCIs in this grade-band:***  [**MS.LS1.A**](http://www.nextgenscience.org/msls1-molecules-organisms-structures-processes) (MS-LS3-1); [**MS.LS2.A**](http://www.nextgenscience.org/msls2-ecosystems-interactions-energy-dynamics) (MS-LS1-4),(MS-LS1-5); [**MS.LS4.A**](http://www.nextgenscience.org/msls4-biological-evolution-unity-diversity) (MS-LS3-1) |
| ***Articulation of DCIs across grade-bands:***  [**3.LS1.B**](http://www.nextgenscience.org/3ls1-molecules-organisms-structures-processes) (MS-LS1-4),(MS-LS1-5); [**3.LS3.A**](http://www.nextgenscience.org/3ls3-heredity-inheritance-variation-traits) (MS-LS1-5),(MS-LS3-1),(MS-LS3-2); [**3.LS3.B**](http://www.nextgenscience.org/3ls3-heredity-inheritance-variation-traits) (MS-LS3-1),(MS-LS3-2); [**HS.LS1.A**](http://www.nextgenscience.org/hsls1-molecules-organisms-structures-processes) (MS-LS3-1); [**HS.LS1.B**](http://www.nextgenscience.org/hsls1-molecules-organisms-structures-processes) (MS-LS3-1),(MS-LS3-2); [**HS.LS2.A**](http://www.nextgenscience.org/hsls2-ecosystems-interactions-energy-dynamics) (MS-LS1-4),(MS-LS1-5); [**HS.LS2.D**](http://www.nextgenscience.org/hsls2-ecosystems-interactions-energy-dynamics) (MS-LS1-4); [**HS.LS3.A**](http://www.nextgenscience.org/hsls3-heredity-inheritance-variation-traits) (MS-LS3-1),(MS-LS3-2); [**HS.LS3.B**](http://www.nextgenscience.org/hsls3-heredity-inheritance-variation-traits) (MS-LS3-1),(MS-LS3-2),(MS-LS4-5); [**HS.LS4.C**](http://www.nextgenscience.org/hsls4-biological-evolution-unity-diversity) (MS-LS4-5) |
| ***Interdisciplinary Connections:***   |  |  | | --- | --- | | *ELA/Literacy -* | | | [**RST.6-8.1**](http://www.corestandards.org/ELA-Literacy/RST/6-8) | [Cite specific textual evidence to support analysis of science and technical texts.](http://www.corestandards.org/ELA-Literacy/RST/6-8) (MS-LS1-4),(MS-LS1-5),(*(MS-LS3-1),(MS-LS3-2)*,(MS-LS4-5) | | [**RST.6-8.2**](http://www.corestandards.org/ELA-Literacy/RST/6-8) | [Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.](http://www.corestandards.org/ELA-Literacy/RST/6-8) *(MS-LS1-5)* | | [**RST.6-8.4**](http://www.corestandards.org/ELA-Literacy/RST/6-8) | [Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.](http://www.corestandards.org/ELA-Literacy/RST/6-8) *(MS-LS3-1),(MS-LS3-2)* | | [**RST.6-8.7**](http://www.corestandards.org/ELA-Literacy/RST/6-8) | [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).](http://www.corestandards.org/ELA-Literacy/RST/6-8) (MS-LS3-1),(MS-LS3-2) | | [**RI.6.8**](http://www.corestandards.org/ELA-Literacy/RI/6) | [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.](http://www.corestandards.org/ELA-Literacy/RI/6) (MS-LS1-4) | | [**WHST.6-8.1**](http://www.corestandards.org/ELA-Literacy/WHST/6-8) | [Write arguments focused on discipline content.](http://www.corestandards.org/ELA-Literacy/WHST/6-8) (MS-LS1-4) | | [**WHST.6-8.2**](http://www.corestandards.org/ELA-Literacy/WHST/6-8) | [Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.](http://www.corestandards.org/ELA-Literacy/WHST/6-8) *(MS-LS1-5)* | | [**WHST.6-8.8**](http://www.corestandards.org/ELA-Literacy/WHST/6-8) | [Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.](http://www.corestandards.org/ELA-Literacy/WHST/6-8)*(MS-LS4-5)* | | [**WHST.6-8.9**](http://www.corestandards.org/ELA-Literacy/WHST/6-8) | [Draw evidence from informational texts to support analysis, reflection, and research.](http://www.corestandards.org/ELA-Literacy/WHST/6-8) (MS-LS1-5) | | [**SL.8.5**](http://www.corestandards.org/ELA-Literacy/SL/8) | [Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.](http://www.corestandards.org/ELA-Literacy/SL/8) *(MS-LS3-1),(MS-LS3-2)* | | *Mathematics -* | | | [**MP.4**](http://www.corestandards.org/Math/Practice/MP4) | [Model with mathematics.](http://www.corestandards.org/Math/Practice/MP4) *(MS-LS3-2)* | | [**6.SP.A.2**](http://www.corestandards.org/Math/Content/6/SP) | [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.](http://www.corestandards.org/Math/Content/6/SP) *(MS-LS1-4),(MS-LS1-5)* | | [**6.SP.B.4**](http://www.corestandards.org/Math/Content/6/SP) | [Summarize numerical data sets in relation to their context.](http://www.corestandards.org/Math/Content/6/SP) *(MS-LS1-4),(MS-LS1-5)* | | [**6.SP.B.5**](http://www.corestandards.org/Math/Content/6/SP) | [Summarize numerical data sets in relation to their context.](http://www.corestandards.org/Math/Content/6/SP) *(MS-LS3-2)* | |

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| **Grade Level: 8** | **Title of Unit: Growth, Development, and Reproduction of Organisms** |
| **Stage 1 - Desired Results** | |
| **Understandings:**  *Students will understand that…*   * the environment and genetic factors determine the growth of an individual organism. * the genetic implications for sexual and asexual reproduction. * there are structures and behaviors that increase the likelihood of successful reproduction by organisms. * the ways humans can select for specific traits, the role of technology, genetic modification, and the nature of ethical responsibilities related to selective breeding (Please note that students are only beginning to understand this concept.) * how selected structures, functions, and behaviors of organisms change in predictable ways as they progress from birth to old age. | **Essential Questions:**   * How do organisms grow, develop, and reproduce? |
| **Knowledge:**  *Students will know…*   * animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4) * plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4) * genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5) * construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. (MS-LS3-1) * genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. (MS-LS3-1) * 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. (MS-LS3-1) * organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary to MS-LS3-2) * in sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS3-2) * 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. (MS-LS4-5) | **Skills:**  *Students will be able to…*   * 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. * construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. * develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. * develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. * gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. |

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| **Stage 2- Assessment Evidence:** |
| **Performance Tasks and other evidence:**   * Summative Assessments   + RST- Research Simulation Task   + Unit tests and quizzes   + Labs and engineering based projects * Formative Assessments   + Graphic Organizers & Guided Note Taking   + Directed Reading   + Cooperative Group Learning   + Homework   + Journal Entries |
| **Stage 3 – Learning Plan** |
| **Digital information and technology integration:** Indicate any special considerations as well as materials, resources (online, print, video, audio) or equipment.   * Genetics Project (ex: baby project, Dragon Inheritance, Reebops, Cootie Genetics) * Genetic Activity website:   + <http://www.teach-nology.com/teachers/lesson_plans/science/biology/genetics/> * Candy DNA   + <http://teach.genetics.utah.edu/content/begin/dna/Have%20Your%20DNA%20and%20Eat%20It%20Too.pdf> * Flower Dissection   + Suggested flower - Lily   **Enrich:** DNA Extraction with wheat germ, strawberries, kiwi, etc. |
| **Modifications: (ELLs, Special Education, Gifted and Talented)**  **\*** Follow all IEP modifications/504 plan  \* Teacher tutoring  \* Peer tutoring  \* Cooperative learning groups  \* Modified assignments  \* Differentiated instruction  **Presentation accommodations allow a student to:**  **\***  Listen to audio recordings instead of reading text  \* Learn content from audiobooks, movies, videos and digital media instead of reading print versions  \* Work with fewer items per page or line and/or materials in a larger print size  \* Have a designated reader  \* Hear instructions orally  \* Record a lesson, instead of taking notes  \* Have another student share class notes with him  \* Be given an outline of a lesson  \* Use visual presentations of verbal material, such as word webs and visual organizers  \* Be given a written list of instructions  **Response accommodations allow a student to:**  **\*** Give responses in a form (oral or written) that’s easier for him  \* Dictate answers to a scribe  \* Capture responses on an audio recorder  \* Use a spelling dictionary or electronic spell-checker  \* Use a word processor to type notes or give responses in class  \* Use a calculator or table of “math facts”  **Setting accommodations allow a student to:**  **\***  Work or take a test in a different setting, such as a quiet room with few distractions  \* Sit where he learns best (for example, near the teacher)  \* Use special lighting or acoustics  \* Take a test in small group setting  \* Use sensory tools such as an exercise band that can be looped around a chair’s legs (so fidgety kids can kick it and quietly get their energy out)  **Timing accommodations allow a student to:**  **\***  Take more time to complete a task or a test  \* Have extra time to process oral information and directions  **\*** Take frequent breaks, such as after completing a task  **Scheduling accommodations allow a student to:**  **\*** Take more time to complete a project  \* Take a test in several timed sessions or over several days  \* Take sections of a test in a different order  \* Take a test at a specific time of day  **Organization skills accommodations allow a student to:**  **\***  Use an alarm to help with time management  \* Mark texts with a highlighter  \* Have help coordinating assignments in a book or planner  \* Receive study skills instruction  **Assignment modifications allow a student to:**  **\*** Complete fewer or different homework problems than peers  \* Write shorter papers  \* Answer fewer or different test questions  \* Create alternate projects or assignments  **Curriculum modifications allow a student to:**  **\*** Learn different material (such as continuing to work on multiplication while classmates move on to fractions)  \* Get graded or assessed using a different standard than the one for classmates |

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| ***2015 Ocean County Science Curriculum*** | | |
| **Grade 8**  **Unit: Natural Selection and Adaptations** | | |
| ***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?***  Students 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. They have a grade-appropriate understanding and use of the practices of analyzing graphical displays; using mathematical models; and gathering, reading, and communicating information. The crosscutting concept of cause and effect is central to this topic. | | |
| **#** | **STUDENT LEARNING OBJECTIVES (SLO)** | **Corresponding**  **PEs** |
| **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.] [Assessment Boundary: Assessment does not include the names of individual species or geological eras in the fossil record.] | **MS-LS4-1** |
| **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-LS4-2** |
| **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.] [Assessment Boundary: Assessment of comparisons is limited to gross appearance of anatomical structures in embryological development.] | **MS-LS4-3** |
| **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-LS4-4** |
| **5** | **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.] [*Assessment Boundary: Assessment does not include Hardy Weinberg calculations.*] | **MS-LS4-6** |

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| The SLOs were developed using [the following elements from the NRC document *A Framework for K-12 Science Education*](http://www.nextgenscience.org/msls-nsa-natural-selection-adaptations#framework): | | |
| **Science and Engineering Practices**  [**Analyzing and Interpreting Data**](http://www.nap.edu/openbook.php?record_id=13165&page=61)  [Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.](http://www.nap.edu/openbook.php?record_id=13165&page=61)   * [Analyze displays of data to identify linear and nonlinear relationships. (MS-LS4-3)](http://www.nap.edu/openbook.php?record_id=13165&page=61) * [Analyze and interpret data to determine similarities and differences in findings. (MS-LS4-1)](http://www.nap.edu/openbook.php?record_id=13165&page=61)   [**Using Mathematics and Computational Thinking**](http://www.nap.edu/openbook.php?record_id=13165&page=64)  [Mathematical and computational thinking in 6–8 builds on K–5 experiences and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments.](http://www.nap.edu/openbook.php?record_id=13165&page=64)   * [Use mathematical representations to support scientific conclusions and design solutions. (MS-LS4-6)](http://www.nap.edu/openbook.php?record_id=13165&page=64)   [**Constructing Explanations and Designing Solutions**](http://www.nap.edu/openbook.php?record_id=13165&page=67)  [Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.](http://www.nap.edu/openbook.php?record_id=13165&page=67)   * [Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events. (MS-LS4-2)](http://www.nap.edu/openbook.php?record_id=13165&page=67) * [Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena. (MS-LS4-4)](http://www.nap.edu/openbook.php?record_id=13165&page=67)   - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  ***Connections to Nature of Science***    **Scientific Knowledge is Based on Empirical Evidence**   * Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-LS4-1)   [***21st Century themes and skills***](http://www.p21.org/storage/documents/21stcskillsmap_science.pdf) ***(This link is taken from the Partnership for 21st Century Skills)***   * creativity and innovation * critical thinking and problem solving * communication * collaboration * information literacy * media literacy * information and communications technology (ICT) * literacy * flexibility and adaptability * initiative and self direction * social and cross cultural skills * productivity and accountability * leadership and responsibility | **Disciplinary Core Ideas**  [**LS4.A: Evidence of Common Ancestry and Diversity**](http://www.nap.edu/openbook.php?record_id=13165&page=162)   * [The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1)](http://www.nap.edu/openbook.php?record_id=13165&page=162) * [Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. (MS-LS4-2)](http://www.nap.edu/openbook.php?record_id=13165&page=162) * [Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. (MS-LS4-3)](http://www.nap.edu/openbook.php?record_id=13165&page=162)   [**LS4.B: Natural Selection**](http://www.nap.edu/openbook.php?record_id=13165&page=163)   * [Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4)](http://www.nap.edu/openbook.php?record_id=13165&page=163)   [**LS4.C: Adaptation**](http://www.nap.edu/openbook.php?record_id=13165&page=164)   * [Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS4-6)](http://www.nap.edu/openbook.php?record_id=13165&page=164) | **Crosscutting Concepts**  [**Patterns**](http://www.nap.edu/openbook.php?record_id=13165&page=85)   * [Patterns can be used to identify cause and effect relationships. (MS-LS4-2)](http://www.nap.edu/openbook.php?record_id=13165&page=85) * [Graphs, charts, and images can be used to identify patterns in data. (MS-LS4-1),(MS-LS4-3)](http://www.nap.edu/openbook.php?record_id=13165&page=85)   [**Cause and Effect**](http://www.nap.edu/openbook.php?record_id=13165&page=87)   * [Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS4-4),(MS-LS4-6)](http://www.nap.edu/openbook.php?record_id=13165&page=87)    - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  ***Connections to Nature of Science***  **Scientific Knowledge Assumes an Order and Consistency in Natural Systems**   * Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS4-1),(MS-LS4-2) |

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| *Connections to other DCIs in this grade-band:*  [**MS.LS2.A**](http://www.nextgenscience.org/msls2-ecosystems-interactions-energy-dynamics) (MS-LS4-4),(MS-LS4-6); [**MS.LS2.C**](http://www.nextgenscience.org/msls2-ecosystems-interactions-energy-dynamics) (MS-LS4-6); [**MS.LS3.A**](http://www.nextgenscience.org/msls3-heredity-inheritance-variation-traits) (MS-LS4-2),(MS-LS4-4); [**MS.LS3.B**](http://www.nextgenscience.org/msls3-heredity-inheritance-variation-traits) (MS-LS4-2),(MS-LS4-4),(MS-LS4-6); [**MS.ESS1.C**](http://www.nextgenscience.org/msess1-earth-place-universe) (MS-LS4-1),(MS-LS4-2),(MS-LS4-6); [**MS.ESS2.B**](http://www.nextgenscience.org/msess2-earth-systems) (MS-LS4-1) |
| *Articulation of DCIs across grade-bands:*  [**3.LS3.B**](http://www.nextgenscience.org/3ls3-heredity-inheritance-variation-traits) (MS-LS4-4); [**3.LS4.A**](http://www.nextgenscience.org/3ls4-biological-evolution-unity-diversity) (MS-LS4-1),(MS-LS4-2); [**3.LS4.B**](http://www.nextgenscience.org/3ls4-biological-evolution-unity-diversity) (MS-LS4-4); [**3.LS4.C**](http://www.nextgenscience.org/3ls4-biological-evolution-unity-diversity) (MS-LS4-6); [**HS.LS2.A**](http://www.nextgenscience.org/hsls2-ecosystems-interactions-energy-dynamics) (MS-LS4-4),(MS-LS4-6); [**HS.LS2.C**](http://www.nextgenscience.org/hsls2-ecosystems-interactions-energy-dynamics) (MS-LS4-6); [**HS.LS3.B**](http://www.nextgenscience.org/hsls3-heredity-inheritance-variation-traits) (MS-LS4-4),(MS-LS4-6); [**HS.LS4.A**](http://www.nextgenscience.org/hsls4-biological-evolution-unity-diversity) (MS-LS4-1),(MS-LS4-2),(MS-LS4-3); [**HS.LS4.B**](http://www.nextgenscience.org/hsls4-biological-evolution-unity-diversity) (MS-LS4-4),(MS-LS4-6); [**HS.LS4.C**](http://www.nextgenscience.org/hsls4-biological-evolution-unity-diversity) (MS-LS4-4),(MS-LS4-6); [**HS.ESS1.C**](http://www.nextgenscience.org/hsess1-earth-place-universe) (MS-LS4-1),(MS-LS4-2) |
| *Interdisciplinary Connections:*   |  |  | | --- | --- | | *ELA/Literacy -* | | | [**RST.6-8.1**](http://www.corestandards.org/ELA-Literacy/RST/6-8) | [Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.](http://www.corestandards.org/ELA-Literacy/RST/6-8) *(MS-LS4-1)*,(MS-LS4-2),*(MS-LS4-3),(MS-LS4-4)* | | [**RST.6-8.7**](http://www.corestandards.org/ELA-Literacy/RST/6-8) | [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).](http://www.corestandards.org/ELA-Literacy/RST/6-8) (MS-LS4-1),(MS-LS4-3) | | [**RST.6-8.9**](http://www.corestandards.org/ELA-Literacy/RST/6-8) | [Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.](http://www.corestandards.org/ELA-Literacy/RST/6-8) *(MS-LS4-3),(MS-LS4-4)* | | [**WHST.6-8.2**](http://www.corestandards.org/ELA-Literacy/WHST/6-8) | [Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.](http://www.corestandards.org/ELA-Literacy/WHST/6-8) (MS-LS4-2),(MS-LS4-4) | | [**WHST.6-8.9**](http://www.corestandards.org/ELA-Literacy/WHST/6-8) | [Draw evidence from informational texts to support analysis, reflection, and research.](http://www.corestandards.org/ELA-Literacy/WHST/6-8) (MS-LS4-2),(MS-LS4-4) | | [**SL.8.1**](http://www.corestandards.org/ELA-Literacy/SL/8) | [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.](http://www.corestandards.org/ELA-Literacy/SL/8) *(MS-LS4-2),(MS-LS4-4)* | | [**SL.8.4**](http://www.corestandards.org/ELA-Literacy/SL/8) | [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.](http://www.corestandards.org/ELA-Literacy/SL/8) *(MS-LS4-2),(MS-LS4-4)* | | *Mathematics -* | | | [**MP.4**](http://www.corestandards.org/Math/Practice/MP4) | [Model with mathematics.](http://www.corestandards.org/Math/Practice/MP4) (MS-LS4-6) | | [**6.RP.A.1**](http://www.corestandards.org/Math/Content/6/RP) | [Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.](http://www.corestandards.org/Math/Content/6/RP) *(MS-LS4-4),(MS-LS4-6)* | | [**6.SP.B.5**](http://www.corestandards.org/Math/Content/6/SP) | [Summarize numerical data sets in relation to their context.](http://www.corestandards.org/Math/Content/6/SP) *(MS-LS4-4),(MS-LS4-6)* | | [**6.EE.B.6**](http://www.corestandards.org/Math/Content/6/EE) | [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.](http://www.corestandards.org/Math/Content/6/EE) *(MS-LS4-1),(MS-LS4-2)* | | [**7.RP.A.2**](http://www.corestandards.org/Math/Content/7/RP) | [Recognize and represent proportional relationships between quantities.](http://www.corestandards.org/Math/Content/7/RP) *(MS-LS4-4),(MS-LS4-6)* | |

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| **Grade Level: 8** | **Title of Unit: Natural Selection and Adaptations** |
| **Stage 1 - Desired Results** | |
| **Understandings:**  *Students will understand that…*   * the role of variation in natural selection and how this leads to speciation. * the use of the practices (grade appropriate) of analyzing graphical displays; using mathematical models; and gathering, reading, and communicating information. * the crosscutting concept of cause and effect is central to this topic. | **Essential Questions:**   * 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:**  *Students will know…*   * the collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1) * anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. (MS-LS4-2) * comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. (MS-LS4-3) * natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4) * adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS4-6) | **Skills:**  *Students will be able to…*   * analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. * apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. * 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. * construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals’ probability of surviving and reproducing in a specific environment. * use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. * analyze data from the fossil record to describe evidence of the history of life on Earth and construct explanations for similarities in organisms. |

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| **Stage 2- Assessment Evidence** |
| **Performance Tasks and other evidence:**   * Summative Assessments   + RST- Research Simulation Task   + Unit tests and quizzes   + Labs and engineering based projects * Formative Assessments   + Graphic Organizers & Guided Note Taking   + Directed Reading   + Cooperative Group Learning   + Homework   + Journal Entries |
| **Stage 3 – Learning Plan** |
| **Digital information and technology integration:** Indicate any special considerations as well as materials, resources (online, print, video, audio) or equipment.   * [Hide a Butterfly Activity](http://www.uen.org/Lessonplan/preview.cgi?LPid=36734) * Adaptation Labs   + bird beak: http://www.wfisd.net/cms/lib/tx01000557/centricity/domain/2487/birdbeaklab.pdf   + elephant tusks: <http://www.ifaw.org/sites/default/files/education-publications/ca/cae_aaw11_extension_lesson_adaptations.pdf> |
| **Modifications: (ELLs, Special Education, Gifted and Talented)**  **\*** Follow all IEP modifications/504 plan  \* Teacher tutoring  \* Peer tutoring  \* Cooperative learning groups  \* Modified assignments  \* Differentiated instruction  **Presentation accommodations allow a student to:**  **\*** Listen to audio recordings instead of reading text  \* Learn content from audiobooks, movies, videos and digital media instead of reading print versions  \* Work with fewer items per page or line and/or materials in a larger print size  \* Have a designated reader  \* Hear instructions orally  \* Record a lesson, instead of taking notes  \* Have another student share class notes with him  \* Be given an outline of a lesson  \* Use visual presentations of verbal material, such as word webs and visual organizers  \* Be given a written list of instructions  **Response accommodations allow a student to:**  **\***  Give responses in a form (oral or written) that’s easier for him  \* Dictate answers to a scribe  \* Capture responses on an audio recorder  \* Use a spelling dictionary or electronic spell-checker  \* Use a word processor to type notes or give responses in class  \* Use a calculator or table of “math facts”  **Setting accommodations allow a student to:**  **\*** Work or take a test in a different setting, such as a quiet room with few distractions  \* Sit where he learns best (for example, near the teacher)  \* Use special lighting or acoustics  \* Take a test in small group setting  \* Use sensory tools such as an exercise band that can be looped around a chair’s legs (so fidgety kids can kick it and quietly get their energy out)  **Timing accommodations allow a student to:**  **\***  Take more time to complete a task or a test  \* Have extra time to process oral information and directions  \* Take frequent breaks, such as after completing a task  **Scheduling accommodations allow a student to:**  **\*** Take more time to complete a project  \* Take a test in several timed sessions or over several days  \* Take sections of a test in a different order  \* Take a test at a specific time of day  **Organization skills accommodations allow a student to:**  **\*** Use an alarm to help with time management  \* Mark texts with a highlighter  \* Have help coordinating assignments in a book or planner  \* Receive study skills instruction |

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| ***2015 Ocean County Science Curriculum*** | | |
| **Grade 8**  **Unit: Human Impacts** | | |
| ***How can natural hazards be predicted?***  ***How do human activities affect Earth systems?***  Students make sense of 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. The crosscutting concepts of patterns; cause and effect; and interdependence of science, engineering, and technology are used as organizing concepts for these disciplinary core ideas. | | |
| **#** | **STUDENT LEARNING OBJECTIVES** | **Performance Expectation and DCIs and PEs** |
| **1** | [Use variables to represent quantities in a real-world data, and construct simple equations and inequalities to inform the development of technologies to mitigate the effects of natural hazards.](http://www.corestandards.org/Math/Content/7/EE)  [Clarification Statement: Examples of natural hazards can be taken from severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of hurricanes, tornadoes, forest fires, or floods.] | ESS3.B |
| **2** | Write and present the findings of a student led investigation of human consumption of a natural resource that may alter the biosphere, hydrosphere, atmosphere, or geosphere and the consequences (positive or negative) of that behavior. [Clarification Statement: Students will have gathered relevant information from multiple print and digital sources, using search terms effectively; assessing the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.] | ESS3.C |
| **3** | **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-ESS3-2** |
| **4** | **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-ESS3-3** |
| **5** | **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-ESS3-4** |

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| The performance expectations above were developed using [the following elements from the NRC document *A Framework for K-12 Science Education*](http://nextgenscience.org/msess-hi-human-impacts#framework): | | |
| **Science and Engineering Practices**  [**Analyzing and Interpreting Data**](http://www.nap.edu/openbook.php?record_id=13165&page=61)  [Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.](http://www.nap.edu/openbook.php?record_id=13165&page=61)   * [Analyze and interpret data to determine similarities and differences in findings. (MS-ESS3-2)](http://www.nap.edu/openbook.php?record_id=13165&page=61)   [**Constructing Explanations and Designing Solutions**](http://www.nap.edu/openbook.php?record_id=13165&page=67)  [Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.](http://www.nap.edu/openbook.php?record_id=13165&page=67)   * [Apply scientific principles to design an object, tool, process or system. (MS-ESS3-3)](http://www.nap.edu/openbook.php?record_id=13165&page=67)   [**Engaging in Argument from Evidence**](http://www.nap.edu/openbook.php?record_id=13165&page=71)  [Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).](http://www.nap.edu/openbook.php?record_id=13165&page=71)   * [Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-ESS3-4)](http://www.nap.edu/openbook.php?record_id=13165&page=71)   - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  ***Connections to Nature of Science***    **Scientific Knowledge is Based on Empirical Evidence**   * Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-LS4-1)   [***21st Century themes and skills***](http://www.p21.org/storage/documents/21stcskillsmap_science.pdf) ***(This link is taken from the Partnership for 21st Century Skills)***   * creativity and innovation * critical thinking and problem solving * communication * collaboration * information literacy * media literacy * information and communications technology (ICT) * literacy * flexibility and adaptability * initiative and self direction * social and cross cultural skills * productivity and accountability * leadership and responsibility | **Disciplinary Core Ideas**  [**ESS3.B: Natural Hazards**](http://www.nap.edu/openbook.php?record_id=13165&page=192)   * [Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. (MS-ESS3-2)](http://www.nap.edu/openbook.php?record_id=13165&page=192)   [**ESS3.C: Human Impacts on Earth Systems**](http://www.nap.edu/openbook.php?record_id=13165&page=194)   * [Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth’s environments can have different impacts (negative and positive) for different living things. (MS-ESS3-3)](http://www.nap.edu/openbook.php?record_id=13165&page=194) * [Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. (MS-ESS3-3),(MS-ESS3-4)](http://www.nap.edu/openbook.php?record_id=13165&page=194) | **Crosscutting Concepts**  [**Patterns**](http://www.nap.edu/openbook.php?record_id=13165&page=85)   * [Graphs, charts, and images can be used to identify patterns in data. (MS-ESS3-2)](http://www.nap.edu/openbook.php?record_id=13165&page=85)   [**Cause and Effect**](http://www.nap.edu/openbook.php?record_id=13165&page=87)   * [Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. (MS-ESS3-3)](http://www.nap.edu/openbook.php?record_id=13165&page=87) * [Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS3-4)](http://www.nap.edu/openbook.php?record_id=13165&page=87)   - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  ***Connections to Engineering, Technology, and                      Applications of Science***  [**Influence of Science, Engineering, and Technology on Society and the Natural World**](http://www.nap.edu/openbook.php?record_id=13165&page=212)   * [All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ESS3-4)](http://www.nap.edu/openbook.php?record_id=13165&page=212) * [The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-ESS3-2),(MS-ESS3-3)](http://www.nap.edu/openbook.php?record_id=13165&page=212)   - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  ***Connections to Nature of Science***  **Science Addresses Questions About the Natural and Material World**   * Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-ESS3-4) |

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| *Connections to other DCIs in this grade-band:*  [**MS.PS3.C**](http://nextgenscience.org/msps3-energy) (MS-ESS3-2); [**MS.LS2.A**](http://nextgenscience.org/msls2-ecosystems-interactions-energy-dynamics) (MS-ESS3-3),(MS-ESS3-4); [**MS.LS4.D**](http://nextgenscience.org/msls2-ecosystems-interactions-energy-dynamics) (MS-ESS3-3),(MS-ESS3-4) |
| *Articulation of DCIs across grade-bands*  [**3.LS2.C**](http://nextgenscience.org/3ls2-ecosystems-interactions-energy-dynamics) (MS-ESS3-3),(MS-ESS3-4); [**3.LS4.D**](http://nextgenscience.org/3ls4-biological-evolution-unity-diversity) (MS-ESS3-3),(MS-ESS3-4); [**3.ESS3.B**](http://nextgenscience.org/3ess3-earth-human-activity) (MS-ESS3-2); [**4.ESS3.B**](http://nextgenscience.org/4ess3-earth-human-activity) (MS-ESS3-2); [**5.ESS3.C**](http://nextgenscience.org/5ess3-earth-human-activity) (MS-ESS3-3),(MS-ESS3-4); [**HS.LS2.A**](http://nextgenscience.org/hsls2-ecosystems-interactions-energy-dynamics) (MS-ESS3-4); [**HS.LS2.C**](http://nextgenscience.org/hsls2-ecosystems-interactions-energy-dynamics) (MS-ESS3-3),(MS-ESS3-4); [**HS.LS4.C**](http://nextgenscience.org/hsls4-biological-evolution-unity-diversity) (MS-ESS3-3),(MS-ESS3-4); [**HS.LS4.D**](http://nextgenscience.org/hsls4-biological-evolution-unity-diversity) (MS-ESS3-3),(MS-ESS3-4); [**HS.ESS2.B**](http://nextgenscience.org/hsess2-earth-systems) (MS-ESS3-2); [**HS.ESS2.C**](http://nextgenscience.org/hsess2-earth-systems) (MS-ESS3-3); [**HS.ESS2.D**](http://nextgenscience.org/hsess2-earth-systems) (MS-ESS3-2),(MS-ESS3-3); [**HS.ESS2.E**](http://nextgenscience.org/hsess2-earth-systems) (MS-ESS3-3),(MS-ESS3-4); [**HS.ESS3.A**](http://nextgenscience.org/hsess3-earth-human-activity) (MS-ESS3-4); [**HS.ESS3.B**](http://nextgenscience.org/hsess3-earth-human-activity) (MS-ESS3-2); [**HS.ESS3.C**](http://nextgenscience.org/hsess3-earth-human-activity) (MS-ESS3-3),(MS-ESS3-4); [**HS.ESS3.D**](http://nextgenscience.org/hsess3-earth-human-activity) (MS-ESS3-2);(MS-ESS3-3) |
| *Common Core State Standards Connections:*   |  |  | | --- | --- | | *ELA/Literacy -* | | | [**RST.6-8.1**](http://www.corestandards.org/ELA-Literacy/RST/6-8) | [Cite specific textual evidence to support analysis of science and technical texts.](http://www.corestandards.org/ELA-Literacy/RST/6-8) *(MS-ESS3-2)*,(MS-ESS3-4) | | [**RST.6-8.7**](http://www.corestandards.org/ELA-Literacy/RST/6-8) | [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).](http://www.corestandards.org/ELA-Literacy/RST/6-8) (MS-ESS3-2) | | [**WHST.6-8.1**](http://www.corestandards.org/ELA-Literacy/WHST/6-8) | [Write arguments focused on discipline content.](http://www.corestandards.org/ELA-Literacy/WHST/6-8) (MS-ESS3-4) | | [**WHST.6-8.7**](http://www.corestandards.org/ELA-Literacy/WHST/6-8) | [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.](http://www.corestandards.org/ELA-Literacy/WHST/6-8) (MS-ESS3-3) | | [**WHST.6-8.8**](http://www.corestandards.org/ELA-Literacy/WHST/6-8) | [Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.](http://www.corestandards.org/ELA-Literacy/WHST/6-8) (MS-ESS3-3) | | [**WHST.6-8.9**](http://www.corestandards.org/ELA-Literacy/WHST/6-8) | [Draw evidence from informational texts to support analysis, reflection, and research. (MS-ESS3-4)](http://www.corestandards.org/ELA-Literacy/WHST/6-8) | | *Mathematics -* | | | [**MP.2**](http://www.corestandards.org/Math/Practice/MP2) | [Reason abstractly and quantitatively.](http://www.corestandards.org/Math/Practice/MP2) (MS-ESS3-2) | | [**6.RP.A.1**](http://www.corestandards.org/Math/Content/6/RP) | [Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.](http://www.corestandards.org/Math/Content/6/RP) *(MS-ESS3-3),(MS-ESS3-4)* | | [**7.RP.A.2**](http://www.corestandards.org/Math/Content/7/RP) | [Recognize and represent proportional relationships between quantities.](http://www.corestandards.org/Math/Content/7/RP) *(MS-ESS3-3),(MS-ESS3-4)* | | [**6.EE.B.6**](http://www.corestandards.org/Math/Content/6/EE) | [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.](http://www.corestandards.org/Math/Content/6/EE) *(MS-ESS3-2),(MS-ESS3-3),(MS-ESS3-4)* | | [**7.EE.B.4**](http://www.corestandards.org/Math/Content/7/EE) | [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.](http://www.corestandards.org/Math/Content/7/EE) *(MS-ESS3-2),(MS-ESS3-3),(MS-ESS3-4)* | |

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| **Grade Level: 8** | **Title of Unit:** Human Impacts |
| **Stage 1 - Desired Results** | |
| **Understandings:**  *Students will understand that…*   * data from the fossil record is used to describe evidence of the history of life on Earth and construct explanations for similarities in organisms. * the role of variation in natural selection and how this leads to speciation. * the (grade appropriate) practices of analyzing graphical displays; using mathematical models; and gathering, reading, and communicating information. * the crosscutting concept of cause and effect is central to this topic. | **Essential Questions:**   * How can natural hazards be predicted? * How do human activities affect Earth systems? |
| **Knowledge:**  *Students will know…*   * that mapping the history of natural hazards in a region,combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. (MS-ESS3-2) * human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth’s environments can have different impacts (negative and positive) for different living things. (MS-ESS3-3) * as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. (MS-ESS3-3),(MS-ESS3-4) | **Skills:**  *Students will be able to…*   * analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. * apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. * construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. * use variables to represent quantities in a real-world data, and construct simple equations and inequalities to inform the development of technologies to mitigate the effects of natural hazards. * write and present the findings of a student led investigation of human consumption of a natural resource that may alter the biosphere, hydrosphere, atmosphere, or geosphere and the consequences (positive or negative) of that behavior. |

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| **Stage 2- Assessment Evidence:** |
| **Performance Tasks and other evidence:**   * Summative Assessments   + RST- Research Simulation Task   + Unit tests and quizzes   + Labs and engineering based projects * Formative Assessments   + Graphic Organizers & Guided Note Taking   + Directed Reading   + Cooperative Group Learning   + Homework   + Journal Entries |
| **Stage 3 – Learning Plan** |
| **Digital information and technology integration:** Indicate any special considerations as well as materials, resources (online, print, video, audio) or equipment.   * Research/data analysis/graphing to show evidence of hurricane frequencies and intensities to predict the future effects of global warming and future natural hazards   **EDP Suggested Activities:**   * “Artificial Floating Islands”, An integrated stem unit (Science Scope, July 2015, Vol. 38 No. 9): <http://static.nsta.org/files/ss1509_63.pdf> * Don’t Run-Off:   + <https://bgcutah.org/wp-content/uploads/2014/08/dont_runoff_2014_01.pdf> * Design and build a solar house with solar cells   + <https://www.teachengineering.org/view_activity.php?url=collection/duk_/activities/duk_solarcar_tech_act/duk_solarcar_tech_act.xml> * Design and build a solar boat * Design and build a solar oven   + <https://www.teachengineering.org/view_activity.php?url=collection/duk_/activities/duk_solaroven_tech_act/duk_solaroven_tech_act.xml>   + <http://www.hometrainingtools.com/a/build-a-solar-oven-project> * Alternative Energy: Windmills   + <http://www.sciencenter.org/climatechange/d/cart_activity_guide_wind_works.pdf>   + <https://pll.asu.edu/p/sites/default/files/lrm/attachments/Windmill%20Challenge.pdf> * Toxic Popcorn   + <http://tryengineering.org/lessons/popcorn.pdf>   + <http://tryengineering.org/lesson-plans/toxic-popcorn-design-challenge> * Human Impact Barnegat Bay Watershed   + Design and build a more effective storm drain   + <http://ocean.njaes.rutgers.edu/hinges/index.html> |
| **Modifications: (ELLs, Special Education, Gifted and Talented)**  \* Follow all IEP modifications/504 plan  \* Teacher tutoring  \* Peer tutoring  \* Cooperative learning groups  \* Modified assignments  \* Differentiated instruction  **Presentation accommodations allow a student to:**  \* Listen to audio recordings instead of reading text  \* Learn content from audiobooks, movies, videos and digital media instead of reading print versions  \* Work with fewer items per page or line and/or materials in a larger print size  \* Have a designated reader  \* Hear instructions orally  \* Record a lesson, instead of taking notes  \* Have another student share class notes with him  \* Be given an outline of a lesson  \* Use visual presentations of verbal material, such as word webs and visual organizers  \* Be given a written list of instructions  **Response accommodations allow a student to:**  \* Give responses in a form (oral or written) that’s easier for him  \* Dictate answers to a scribe  \* Capture responses on an audio recorder  \* Use a spelling dictionary or electronic spell-checker  \* Use a word processor to type notes or give responses in class  \* Use a calculator or table of “math facts”  **Setting accommodations allow a student to:**  \* Work or take a test in a different setting, such as a quiet room with few distractions  \* Sit where he learns best (for example, near the teacher)  \* Use special lighting or acoustics  \* Take a test in small group setting  \* Use sensory tools such as an exercise band that can be looped around a chair’s legs (so fidgety kids can kick it and quietly get their energy out)  **Timing accommodations allow a student to:**  \* Take more time to complete a task or a test  \* Have extra time to process oral information and directions  \* Take frequent breaks, such as after completing a task  **Scheduling accommodations allow a student to:**  \* Take more time to complete a project  \* Take a test in several timed sessions or over several days  \* Take sections of a test in a different order  \* Take a test at a specific time of day  **Organization skills accommodations allow a student to:**  \* Use an alarm to help with time management  \* Mark texts with a highlighter  \* Have help coordinating assignments in a book or planner  \* Receive study skills instruction  **Assignment modifications allow a student to:**  \* Complete fewer or different homework problems than peers  \* Write shorter papers  \* Answer fewer or different test questions  \* Create alternate projects or assignments  **Curriculum modifications allow a student to:**  \* Learn different material (such as continuing to work on multiplication while classmates move on to fractions)  \* Get graded or assessed using a different standard than the one for classmates |

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| MS-ETS1 Engineering Design | | |
| Students who demonstrate understanding can:   |  |  | | --- | --- | | **MS-ETS1-1.** | **Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.** | | **MS-ETS1-2.** | **Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.** | | **MS-ETS1-3.** | **Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.** | | **MS-ETS1-4.** | **Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.** | | | |
| The performance expectations above were developed using [the following elements from the NRC document *A Framework for K-12 Science Education*](http://www.nextgenscience.org/msets1-engineering-design#framework): | | |
| Science and Engineering Practices[Asking Questions and Defining Problems](http://www.nap.edu/openbook.php?record_id=13165&page=54) [Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.](http://www.nap.edu/openbook.php?record_id=13165&page=54)   * [Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS-ETS1-1)](http://www.nap.edu/openbook.php?record_id=13165&page=54)  [Developing and Using Models](http://www.nap.edu/openbook.php?record_id=13165&page=56) [Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.](http://www.nap.edu/openbook.php?record_id=13165&page=56)   * [Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. (MS-ETS1-4)](http://www.nap.edu/openbook.php?record_id=13165&page=56)  [Analyzing and Interpreting Data](http://www.nap.edu/openbook.php?record_id=13165&page=61) [Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.](http://www.nap.edu/openbook.php?record_id=13165&page=61)   * [Analyze and interpret data to determine similarities and differences in findings. (MS-ETS1-3)](http://www.nap.edu/openbook.php?record_id=13165&page=61)  [Engaging in Argument from Evidence](http://www.nap.edu/openbook.php?record_id=13165&page=71) [Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world.](http://www.nap.edu/openbook.php?record_id=13165&page=71)   * [Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-ETS1-2)](http://www.nap.edu/openbook.php?record_id=13165&page=71) | Disciplinary Core Ideas[ETS1.A: Defining and Delimiting Engineering Problems](http://www.nap.edu/openbook.php?record_id=13165&page=204)  * [The more precisely a design task’s criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1)](http://www.nap.edu/openbook.php?record_id=13165&page=204)  [ETS1.B: Developing Possible Solutions](http://www.nap.edu/openbook.php?record_id=13165&page=206)  * [A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4)](http://www.nap.edu/openbook.php?record_id=13165&page=206) * [There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3)](http://www.nap.edu/openbook.php?record_id=13165&page=206) * [Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3)](http://www.nap.edu/openbook.php?record_id=13165&page=206) * [Models of all kinds are important for testing solutions. (MS-ETS1-4)](http://www.nap.edu/openbook.php?record_id=13165&page=206)  [ETS1.C: Optimizing the Design Solution](http://www.nap.edu/openbook.php?record_id=13165&page=208)  * [Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3)](http://www.nap.edu/openbook.php?record_id=13165&page=208) * [The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MS-ETS1-4)](http://www.nap.edu/openbook.php?record_id=13165&page=208) | Crosscutting Concepts[Influence of Science, Engineering, and Technology on Society and the Natural World](http://www.nap.edu/openbook.php?record_id=13165&page=212)  * [All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1)](http://www.nap.edu/openbook.php?record_id=13165&page=96) * [The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-ETS1-1)](http://www.nap.edu/openbook.php?record_id=13165&page=96) |
| *Connections to MS-ETS1.A: Defining and Delimiting Engineering Problems include:*  **Physical Science:** [MS-PS3-3](http://www.nextgenscience.org/msps3-energy)  *Connections to MS-ETS1.B: Developing Possible Solutions Problems include:*  **Physical Science:** [MS-PS1-6](http://www.nextgenscience.org/msps1-matter-interactions), [MS-PS3-3](http://www.nextgenscience.org/msps3-energy), **Life Science:** [MS-LS2-5](http://www.nextgenscience.org/msls2-ecosystems-interactions-energy-dynamics)  *Connections to MS-ETS1.C: Optimizing the Design Solution include:*  **Physical Science:** [MS-PS1-6](http://www.nextgenscience.org/msps1-matter-interactions) | | |
| *Articulation of DCIs across grade-bands:*  [**3-5.ETS1.A**](http://www.nextgenscience.org/3-5ets1-engineering-design) (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3); [**3-5.ETS1.B**](http://www.nextgenscience.org/3-5ets1-engineering-design) (MS-ETS1-2),(MS-ETS1-3),(MS-ETS1-4); [**3-5.ETS1.C**](http://www.nextgenscience.org/3-5ets1-engineering-design) (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3),(MS-ETS1-4);[**HS.ETS1.A**](http://www.nextgenscience.org/hsets1-engineering-design) (MS-ETS1-1),(MS-ETS1-2); [**HS.ETS1.B**](http://www.nextgenscience.org/hsets1-engineering-design) (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3),(MS-ETS1-4); [**HS.ETS1.C**](http://www.nextgenscience.org/hsets1-engineering-design) (MS-ETS1-3),(MS-ETS1-4) | | |
| *Common Core State Standards Connections:*   |  |  | | --- | --- | | *ELA/Literacy -* |  | | [**RST.6-8.1**](http://www.corestandards.org/ELA-Literacy/RST/6-8) | [Cite specific textual evidence to support analysis of science and technical texts.](http://www.corestandards.org/ELA-Literacy/RST/6-8) (MS-ETS1-1),*(MS-ETS1-2),(MS-ETS1-3)* | | [**RST.6-8.7**](http://www.corestandards.org/ELA-Literacy/RST/6-8) | [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).](http://www.corestandards.org/ELA-Literacy/RST/6-8) *(MS-ETS1-3)* | | [**RST.6-8.9**](http://www.corestandards.org/ELA-Literacy/RST/6-8) | [Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.](http://www.corestandards.org/ELA-Literacy/RST/6-8)(MS-ETS1-2),(MS-ETS1-3) | | [**WHST.6-8.7**](http://www.corestandards.org/ELA-Literacy/WHST/6-8) | [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.](http://www.corestandards.org/ELA-Literacy/WHST/6-8) (MS-ETS1-2) | | [**WHST.6-8.8**](http://www.corestandards.org/ELA-Literacy/WHST/6-8) | [Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.](http://www.corestandards.org/ELA-Literacy/WHST/6-8) (MS-ETS1-1) | | [**WHST.6-8.9**](http://www.corestandards.org/ELA-Literacy/WHST/6-8) | [Draw evidence from informational texts to support analysis, reflection, and research.](http://www.corestandards.org/ELA-Literacy/WHST/6-8) *(MS-ETS1-2)* | | [**SL.8.5**](http://www.corestandards.org/ELA-Literacy/SL/8) | [Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.](http://www.corestandards.org/ELA-Literacy/SL/8) *(MS-ETS1-4)* | | *Mathematics -* |  | | [**MP.2**](http://www.corestandards.org/Math/Practice/MP2) | [Reason abstractly and quantitatively.](http://www.corestandards.org/Math/Practice/MP2) *(MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3),(MS-ETS1-4)* | | [**7.EE.3**](http://www.corestandards.org/Math/Content/7/EE) | [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.](http://www.corestandards.org/Math/Content/7/EE) *(MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3)* | | [**7.SP**](http://www.corestandards.org/Math/Content/7/SP) | [Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.](http://www.corestandards.org/Math/Content/7/SP) *(MS-ETS1-4)* | | | |
| **Digital information and technology integration:** Indicate any special considerations as well as materials, resources (online, print, video, audio) or equipment.   * [*http://www.ciese.org/materials/k12/*](http://www.ciese.org/materials/k12/) *These compelling lessons and projects promote problem-based learning, collaboration, higher order thinking skills, and critical analysis through the integration of science, technology, engineering, mathematics and other core subjects.* * [*https://www.teachengineering.org/*](https://www.teachengineering.org/) *TeachEngineering curriculum provides innovative resources and ideas for teachers using NGSS.* * [*http://tryengineering.org/lesson-plans*](http://tryengineering.org/lesson-plans) *TryEngineering offers a variety of lesson plans that align with education standards to allow teachers and students to apply engineering principles in the classroom.* * [*https://www.nsf.gov/news/classroom/engineering.jsp*](https://www.nsf.gov/news/classroom/engineering.jsp) *NSDL is the National Science Foundation's online library of resources for science, technology, engineering, and mathematics education.* * [*http://pbskids.org/designsquad/parentseducators/index.html*](http://pbskids.org/designsquad/parentseducators/index.html) *The goal of Design Squad is to give kids a stronger understanding of the design process, and the connection between engineering and the things we all use in everyday life. The DESIGN SQUAD NATION website equips kids with science and math skills, inspires them, and lays the foundation they need to participate in engineering activities later in life.* * [*http://teachers.egfi-k12.org/category/lessons/grades-6-8-lessons/*](http://teachers.egfi-k12.org/category/lessons/grades-6-8-lessons/) *eGFI is proudly brought to you by the* [*American Society for Engineering Education*](http://asee.org/) *(*[*ASEE*](http://asee.org/)*). We are committed to promoting and enhancing efforts to improve K-12 STEM and engineering education.* * [*http://stem-works.com/*](http://stem-works.com/) *a resource for teachers, mentors, parents, STEM professionals, volunteers, and everyone passionate about getting children eager to learn about science, technology, engineering, and math.* * [*http://www.sciencebuddies.org/science-fair-projects/teacher\_resources.shtml#scienceactivities*](http://www.sciencebuddies.org/science-fair-projects/teacher_resources.shtml#scienceactivities) *Each activity comes with student instructions, and a facilitator guide with just enough information to help anyone lead a good discussion on the science behind the activity.* * [*https://vimeo.com/43038579*](https://vimeo.com/43038579) *The invisible bicycle helmet video clip (Girls in Engineering)* * [*http://stemcollaborative.org/additionalResources.html*](http://stemcollaborative.org/additionalResources.html) *a wealth of worthy STEM resources readily available on the web* | | |

\* The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

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\*Taken directly from: <http://www.nextgenscience.org/msets1-engineering-design>.