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Ocean County Science Curriculum

Content Area: Science	Grade Level: 4
Marking Period 1	Energy
Marking Period 2	Waves
Marking Period 3	Structure, Function, and Information Processing
Marking Period 4	Earth's Systems: Processes that Shape the Earth

2015 Ocean County Science Curriculum

Grade 4

Unit: Energy

What is energy, how does it move, how is it utilized and how does it change form?

How does speed impact energy? What happens when objects collide? What are non-renewable vs. renewable sources of energy?

Students participate in lessons, discussions and experiments in order to learn what energy is and how it is related to motion. They will discover how energy is transferred and how energy can be used to solve a problem? Students are able to use evidence to construct an explanation of the relationship between the speed of an object and the energy of that object. Students are expected to develop an understanding that energy can be transferred from place to place by sound, light, heat, and electric currents or from object to object through collisions. They apply their understanding of energy to design, test, and refine a device that converts energy from one form to another.

The crosscutting concepts of patterns; cause and effect; energy and matter; systems and system models; interdependence of science, engineering, and technology; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the fourth grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

The Grades 3-5 Storyline provides a summary of the understandings that students developed by the end of 5th grade.

#	STUDENT LEARNING OBJECTIVES (SLOs)	Corresponding PEs and DCIs
1	**Use evidence to construct an explanation relating the speed of an object to the energy of that object.** [*Assessment Boundary: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy.*	**4-PS3-1**
2	**Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.** [*Assessment Boundary: Assessment does not include quantitative measurements of energy.*]	**4-PS3-2**
3	**Ask questions and predict outcomes about the changes in energy that occur when objects collide.** [Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.] [*Assessment Boundary: Assessment does not include quantitative measurements of energy.*]	**4-PS3-3**
4	**Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.*** [Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.] [*Assessment Boundary: Devices should be limited to those that convert motion energy to electric*	**4-PS3-4**

	energy or use stored energy to cause motion or produce light or sound.]	
5	**Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.** [Clarification Statement: Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; non-renewable energy resources are fossil fuels and fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels.]	**4-ESS3-1**

The SLOs were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Asking Questions and Defining Problems

Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.

- Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. (4-PS3-3)

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (4-PS3-2)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Use evidence (e.g., measurements, observations, patterns) to construct an explanation. (4-PS3-1)
- Apply scientific ideas to solve design problems. (4-PS3-4)

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluate the merit and accuracy of ideas and methods.

- Obtain and combine information from books and other reliable media to explain phenomena. (4-ESS3-1)

Disciplinary Core Ideas

PS3.A: Definitions of Energy

- The faster a given object is moving, the more energy it possesses. (4-PS3-1)
- Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2),(4-PS3-3)

PS3.B: Conservation of Energy and Energy Transfer

- Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3-2), (4-PS3-3)
- Light also transfers energy from place to place. (4-PS3-2)
- Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (4-PS3-2),(4-PS3-4)

PS3.C: Relationship Between Energy and Forces

- When objects collide, the contact forces transfer energy so as to change the objects' motions. (4-PS3- 3)

PS3.D: Energy in Chemical Processes and Everyday Life

- The expression "produce energy" typically refers to the conversion of stored energy into a desired

Crosscutting Concepts

Energy and Matter

- Energy can be transferred in various ways and between objects. (4-PS3-1),(4-PS3-2),(4-PS3-3),(4-PS3-4)

Cause and Effect

- Cause and effect relationships are routinely identified and used to explain change. (4-ESS3-1)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

- Knowledge of relevant scientific concepts and research findings is important in engineering. (4-ESS3-1)

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

- Over time, people's needs and wants change, as do their demands for new and improved technologies. (4-ESS3-1)
- Engineers improve existing technologies or develop new ones. (4-PS3-4)

Connections to Nature of Science

Science is a Human Endeavor

- Most scientists and engineers work in teams. (4-PS3-4)
- Science affects everyday life. (4-PS3-4)

21st Century themes and skills ***(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	form for practical use. (4-PS3-4) **ESS3.A: Natural Resources** ● Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (4-ESS3-1) **ETS1.A: Defining Engineering Problems** ● Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.*(secondary to 4-PS3-4)*	

Engineering Design Next Generation Standards	
NGSS	**Description**
3-5-ETS1-1	**Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.**

3-5-ETS1-2	**Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.**
3-5-ETS1-3	**Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.**

Connections to other DCIs in fourth grade: **N/A**

Articulation of DCIs across grade-levels:

K.PS2.B (4-PS3-3); K.ETS1.A (4-PS3-4); 2.ETS1.B (4-PS3-4); 3.PS2.A (4 -PS3-3); 5.PS3.D (4-PS3-4); 5.LS1.C (4-PS3-4); 5.ESS3.C (4-ESS3-1); MS.PS2.A (4-PS3-3); MS.PS3.A (4-PS3-1),(4-PS3-2),(4-PS3-3),(4-PS3-4); MS.PS3.B (4-PS3-2),(4-PS3-3),(4-PS3-4); MS.PS3.C (4-PS3-3); MS.PS3.D (4-ESS3-1); MS.PS4.B (4-PS3-2); MS.ESS2.A (4-ESS3-1); MS.ESS3.A (4-ESS3-1); MS.ESS3.C (4-ESS3-1); MS.ESS3.D (4-ESS3-1); MS.ETS1.B (4-PS3-4); MS.ETS1.C (4-PS3-4)

Interdisciplinary Connections:

ELA/Literacy -

RI.4.1	***Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-PS3-1)***
RI.4.3	***Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. (4-PS3-1)***
RI.4.9	***Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-PS3-1)***
W.4.2	***Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (4-PS3-1)***
W.4.7	***Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4- PS3-2),(4-PS3-3),(4-PS3-4),(4-ESS3-1)***
W.4.8	***Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-PS3-1),(4-PS3-2),(4-PS3-3),(4-PS3-4),(4-ESS3-1)***
W.4.9	***Draw evidence from literary or informational texts to support analysis, reflection, and research. (4-PS3-1),(4-ESS3-1)***

Mathematics -

MP.2	***Reason abstractly and quantitatively. (4-ESS3-1)***
MP.4	***Model with mathematics. (4-ESS3-1)***
4.OA.A.1	***Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations. (4-ESS3-1)***
4.OA.A.3	***Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. (4-PS3-4)***

Grade Level: 4	**Title of Unit: Energy**

Stage 1 - Desired Results

Understandings:	**Essential Questions:**
Students will understand that… 1. Energy and fuels humans use are derived from natural sources and their use affects the environment. Some resources are renewable, others are not. 2. Moving objects contain energy. The faster the object moves, the more energy it has. Energy can be moved from place to place by moving objects, or through sound, light, or electrical currents. Energy can be converted from one form to another.	1. How does the energy of an object determine the speed of the object? 2. How is energy transferred from place to place by sound, light, heat, and electric currents? 3. What changes in energy occur when objects collide? 4. How can energy be converted from one form to another? 5. How are energy and fuels derived from natural resources, and how does their use impact the environment?
Knowledge: *Students will know…* ● Energy can be transferred in various ways and between objects. ● The faster a given object is moving, the more energy it possesses. ● Energy is present whenever there are moving objects, sound, light, or heat. ● Energy can be converted. ● Renewable energy sources can be found through wind energy, sunlight, and water. ● Nonrenewable energy sources like fossil fuels are limited in supply.	**Skills:** *Students will be able to…* ● Prove that the faster an object is moving, the more energy it has. ● Describe the changes of energy when two objects collide and accurately predict this occurrence when modeled. ● Use evidence to construct an explanation of the relationship between the speed of an object and the energy of that object. ● Identify different types of renewable energy. ● Describe the process of creating energy through circuits. ● Show how the environment is affected by using renewable energy. ● Work collaboratively in finding other ways for renewable energy.

Stage 2- Assessment Evidence

Performance Tasks and other evidence:

Successful teaching and learning requires more than a summative assessment at the end of the year. Educators need a new system of assessments to evaluate how well our students are learning and understanding the NGSS supported science curriculum. There are many classroom evaluations beyond traditional standardized testing that can determine whether students are successfully learning. Students can demonstrate competency with tasks like:

- developing and refining models;
- generating, discussing and analyzing data;
- constructing spoken and written scientific explanations;

- engaging in evidence-based argumentation; and
- reflecting on their own understanding.
- Summative Assessments
  - RST- Research Simulation Task
  - Associated Unit tests, quizzes
  - Labs and engineering based projects
  - Build a circuit that converts energy from one form to another
- Formative Assessments
  - Graphic Organizers & Guided Note Taking
  - Directed Reading
  - Cooperative Group Learning
  - Homework
  - Journal Entries
  - Participate in a Lab to determine Potential vs. Kinetic Energy of Objects
  - Make predictions about the changes in energy that occur when objects collide
  - Take notes while watching a video about the transfer of energy http://www.physics4kids.com/files/thermo_transfer.html
  - Compare and contrast renewable energy resources vs. non-renewable energy resources

Stage 3 – Learning Plan

Digital information and technology integration: Indicate any special considerations as well as materials, resources (online, print, video, audio) or equipment.

- http://astro.unl.edu/ (simulation)
- http://astro.unl.edu/naap/lps/animations/lps.html (moon phase simulation)
- https://docs.google.com/a/trschools.com/file/d/0BwGPbgTNlAinVUl4c1FFMTh1cGs/edit (Toilet Paper Solar System)
- http://www.bbc.co.uk/bitesize/ks3/science/energy_electricity_forces/forces/activity/ (forces)
- http://pbs.panda-prod.cdn.s3.amazonaws.com/media/assets/wgbh/ess05/ess05_int_seasonsgame/index.html (seasons)
- http://www.sciencecourseware.org/eec/GlobalWarming/Tutorials/Seasons/ (seasons)
- http://astro.unl.edu/interactives/
- http://spaceplace.nasa.gov/science-fair/en/ (science method fair ideas)
- https://phet.colorado.edu/sims/lunar-lander/lunar-lander_en.html (lunar landing interactive activity)
- http://www-tc.pbskids.org/designsquad/pdf/parentseducators/DSN_NASA_MissionSolarSystem_SoftLanding.pdf (Lunar landing stem activity)
- http://highered.mheducation.com/olcweb/cgi/pluginpop.cgi?it=swf::800::600::/sites/dl/free/0072482621/78778/Eclipses_Nav.swf::Eclipse%20Interactive (Eclipse Interactive)
- https://www.brainpop.com/games/flytomars/
- http://www.stem4students.net/
- http://betterlesson.com/

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**

2015 Ocean County Science Curriculum
Grade 4 **Unit: Waves**

What is the function of a wave?

How does a wave move objects and how can it send information?

The performance expectations in fourth grade help students formulate answers to questions such as: "What are waves and what are some things they can do? Students are able to use a model of waves to describe patterns of waves in terms of amplitude and wavelength, and that waves can cause objects to move. Students will participate in a variety of activities in order to deepen their understanding that patterns can encode, send, receive and decode information.

The crosscutting concepts of patterns; cause and effect; energy and matter; systems and system models; interdependence of science, engineering, and technology; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the fourth grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

The Grades 3-5 Storyline provides a summary of the understandings that students developed by the end of 5th grade.

#	STUDENT LEARNING OBJECTIVES (SLOs)	Corresponding PEs and DCIs
1	**Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.** [Clarification Statement: Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves.] [*Assessment Boundary: Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength.*]	**4-PS4-1**
2	**Generate and compare multiple solutions that use patterns to transfer information.*** [Clarification Statement: Examples of solutions could include drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, and using Morse code to send text.]	**4-PS4-3**

The SLOs were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Develop a model using an analogy, example, or abstract representation to	**PS4.A: Wave Properties** • Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in	**Patterns** • Similarities and differences in patterns can be used to sort, classify, and analyze simple rates of change for natural phenomena. (4-PS4-1) • Similarities and differences in patterns can be used to sort and

describe a scientific principle. (4-PS4-1)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-PS4-3)

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Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- Science findings are based on recognizing patterns. (4-PS4-1)

21st Century themes and skills ***(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

place; there is no net motion in the direction of the wave except when the water meets a beach. *(Note: This grade band endpoint was moved from K–2.)* (4-PS4-1)

- Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). (4-PS4-1)

PS4.C: Information Technologies and Instrumentation

- Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa. (4-PS4-3)

ETS1.C: Optimizing The Design Solution

- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. *(secondary to 4-PS4-3)*

classify designed products. (4-PS4-3)

- -

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

- Knowledge of relevant scientific concepts and research findings is important in engineering. (4-PS4-3)

Engineering Design Next Generation Standards

NGSS	Description
3-5-ETS1-1	**Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.**
3-5-ETS1-2	**Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.**
3-5-ETS1-3	**Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.**

Connections to other DCIs in fourth grade:

4.PS3.A (4-PS4-1); 4.PS3.B (4-PS4-1); 4.ETS1.A (4-PS4-3)

Articulation of DCIs across grade-levels:

K.ETS1.A (4-PS4-3); **1.PS4.C** (4-PS4-3); **2.ETS1.B** (4-PS4-3); **2.ETS1.C** (4-PS4-3); **3.PS2.A** (4-PS4-3); **MS.PS4.A** (4-PS4-1); **MS.PS4.C** (4-PS4-3); **MS.ETS1.B** (4-PS4-3)

Interdisciplinary Connections:

ELA/Literacy -

RI.4.1 ***Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (4-PS4-3)***

RI.4.9 ***Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-PS4-3)***

SL.4.5 ***Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-PS4-1)***

Mathematics -

MP.4 ***Model with mathematics. (4-PS4-1)***

4.G.A.1 ***Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. (4-PS4-1)***

Grade Level: 4	Title of Unit: Waves

Stage 1 - Desired Results

Understandings: *Students will understand that…* 1. Waves are regular patterns of motion, which can be made in water by disturbing the surface. Waves of the same type can differ in amplitude and wavelength. Waves can make objects move. 2. Patterns can encode, send, receive and decode information.	**Essential Questions:** 1. How do waves cause objects to move? 2. What are some patterns you can utilize to transfer information?
Knowledge: *Students will know…* ● Waves are regular patterns of motion. ● Waves can cause objects to move. ● Digitized information can be transmitted over long distances without significant degradation.	**Skills:** *Students will be able to…* ● Use model of waves to describe patterns of waves in terms of amplitude and wavelength. ● Show how waves move and cause objects to shift. ● Demonstrate the transfer of information using technological resources.

Stage 2- Assessment Evidence

Performance Tasks and other evidence:

Successful teaching and learning requires more than a summative assessment at the end of the year. Educators need a new system of assessments to evaluate how well our students are learning and understanding the NGSS supported science curriculum. There are many classroom evaluations beyond traditional standardized testing that can determine whether students are successfully learning. Students can demonstrate competency with tasks like:

- developing and refining models;
- generating, discussing and analyzing data;
- constructing spoken and written scientific explanations;
- engaging in evidence-based argumentation; and
- reflecting on their own understanding.

- Summative Assessments
  - RST- Research Simulation Task
  - Associated Unit tests, quizzes
  - Labs and engineering based projects
  - Create diagrams or physical models to demonstrate how waves cause objects to move
- Formative Assessments
  - Graphic Organizers & Guided Note Taking
  - Directed Reading
  - Cooperative Group Learning

- Homework
- Journal Entries
- Visit the website http://morsecode.scphillips.com/translator.html to learn more about Morse Code as a pattern to transmit information
- Research communication through drumming https://en.wikipedia.org/wiki/Drums_in_communication and discuss
- Use https://en.wikipedia.org/wiki/Binary_number to learn how the 0s and 1s in binary code transmit information

Stage 3 – Learning Plan

Digital information and technology integration: Indicate any special considerations as well as materials, resources (online, print, video, audio) or equipment.

- http://betterlesson.com/
- http://www.mccracken.kyschools.us/Downloads/4%20NGSS%20UNIT%20Energy%20Waves.pdf (entire NGSS unit)
- http://www.stem4students.net/
- https://sites.google.com/a/msad60.org/k-5_science/fourth-grade/waes
- http://phet.colorado.edu/
- http://betterlesson.com/lesson/630476/waves-performance-assessment-part-1
- http://betterlesson.com/lesson/632519/waves-performance-assessment-part-2
- https://sites.google.com/a/msad60.org/k-5_science/fourth-grade/encrusted-paper-plates
- http://www.nasa.gov/sites/default/files/goodvibrations.pdf
- https://www.ccmr.cornell.edu/sites/default/files/Waves%20(3-5).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**

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**

2015 Ocean County Science Curriculum

Grade 4

Unit: Structure, Functioning, and Information Processing

How do organisms take in information and use specialized structures for thriving and surviving?

What is the function of specialized structures? How does the reflection of light aid in sight?

The performance expectations in fourth grade help students formulate answers to questions such as: How do internal and external structures support the survival, growth, behavior, and reproduction of plants and animals? Fourth graders are expected to develop an understanding that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. By developing a model, they describe that an object can be seen when light reflected from its surface enters the eye.

The crosscutting concepts of patterns; cause and effect; energy and matter; systems and system models; interdependence of science, engineering, and technology; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the fourth grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

The Grades 3-5 Storyline provides a summary of the understandings that students developed by the end of 5th grade.

#	STUDENT LEARNING OBJECTIVES (SLOs)	Corresponding PEs and DCIs
1	**Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.**[*Assessment Boundary: Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works.*]	**4-PS4-2**
2	**Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.** [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.] [*Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.*]	**4-LS1-1**
3	**Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.** [Clarification Statement: Emphasis is on systems of information transfer.] [*Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.*]	**4-LS1-2**

The SLOs were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

- Develop a model to describe phenomena. (4-PS4-2)
- Use a model to test interactions concerning the functioning of a natural system. (4-LS1-2)

Engaging in Argument from Evidence

Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).

- Construct an argument with evidence, data, and/or a model. (4-LS1-1)

21st Century themes and skills ***(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

PS4.B: Electromagnetic Radiation

- An object can be seen when light reflected from its surface enters the eyes. (4-PS4-2)

LS1.A: Structure and Function

- Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1)

LS1.D: Information Processing

- Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. (4-LS1-2)

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships are routinely identified. (4-PS4-2)

Systems and System Models

- A system can be described in terms of its components and their interactions. (4-LS1-1),(4-LS1-2)

Engineering Design Next Generation Standards	
NGSS	**Description**
3-5-ETS1-1	**Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.**
3-5-ETS1-2	**Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.**
3-5-ETS1-3	**Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.**

Connections to other DCIs in fourth grade: **N/A**

Articulation of DCIs across grade-levels:

1.PS4.B (4-PS4-2); **1.LS1.A** (4-LS1-1); **1.LS1.D** (4-LS1-1); **3.LS3.B** (4-LS1-1); **MS.PS4.B** (4-PS4-2); **MS.LS1.A** (4-LS1-1),(4-LS1-2); **MS.LS1.D** (4-PS4-2),(4-LS1-2)

Interdisciplinary Connections:

ELA/Literacy -

W.4.1	***Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (4-LS1-1)***
SL.4.5	***Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-PS4-2),(4-LS1-2)***

Mathematics -

MP.4	***Model with mathematics. (4-PS4-2)***
4.G.A.1	***Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. (4-PS4-2)***
4.G.A.3	***Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. (4-LS1-1)***

Grade Level: 4	**Title of Unit: Structure, Function, and Information Processing**
Stage 1 - Desired Results	

Understandings:	**Essential Questions:**
Students will understand that… 1. Organisms have both internal and external macroscopic structures that allow for growth, survival, behavior, and reproduction. 2. Different sense receptors are specialized for particular kinds of information; Animals use their perceptions and memories to guide their actions. 3. Objects can be seen only when light reflected from their surface enters our eyes.	1. How does light reflecting from objects and entering the eye allow objects to be seen? 2. How do the internal and external structures of plants and animals support survival, growth, behavior, and reproduction? 3. How do animals receive different types of information through their senses and respond accordingly?
Knowledge: *Students will know…* ● Plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. ● Specific examples of structures of plants that aid in survival include roots, stems, leaves, thorns and seed pods. ● Specific examples of structures that aid in animal survival include, but are not limited to: the ability to camouflage, the ability to run fast, the ability to go long periods of time without food and water for specific animals, and the ability to hunt in groups. ● Light reflects from objects then hits the eye in order for the objects to be seen. ● Animals brains process information in different ways allowing them to interact differently. ● The steps involved in the brain processing light.	**Skills:** *Students will be able to…* ● Describe the process of light reflection. ● Prove how the eye can see things differently in lighted situations. ● Prove that certain animals will react differently to stimuli through information processing. ● Demonstrate why camouflage is effective. ● Grow plants to learn how specific structures aid in survival. ● Debate the effectiveness of specific adaptations.

Stage 2- Assessment Evidence

Performance Tasks and other evidence:

Successful teaching and learning requires more than a summative assessment at the end of the year. Educators need a new system of assessments to evaluate how well our students are learning and understanding the NGSS supported science curriculum. There are many classroom

evaluations beyond traditional standardized testing that can determine whether students are successfully learning. Students can demonstrate competency with tasks like:

- developing and refining models;
- generating, discussing and analyzing data;
- constructing spoken and written scientific explanations;
- engaging in evidence-based argumentation; and
- reflecting on their own understanding.

- Summative Assessments
  - RST- Research Simulation Task
  - Associated Unit tests, quizzes
  - labs and engineering based projects
  - Using clay, lights and mirrors, design a model of how the eye uses light to see--visit these pages for more information http://www.livescience.com/3919-human-eye-works.html https://faculty.washington.edu/chudler/chvision.html
  - Complete the lessons and assessments on animal body parts http://www.educationinnature.com/~/media/Corporate/EIN/Files/LessonPlans/CamouflageCountershadingAdaptationsLessonPlan.ashx?force=1
  - View Youtube videos of animals behaviors that help them grow and survive https://www.youtube.com/watch?v=EyyDq19Mi3A https://www.youtube.com/watch?v=8Zo_sopbYiI https://www.youtube.com/watch?v=fRX2JtKFUzk --choose one and present the information in Keynote or PowerPoint https://sites.google.com/a/msad60.org/k-5_science/fourth-grade/input-output
- Formative Assessments
  - Graphic Organizers & Guided Note Taking
  - Directed Reading
  - Cooperative Group Learning
  - Homework
  - Journal Entries
  - Conduct experiments using plants in order to learn the importance of their structures http://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1039&context=nrmsp http://www.glencoe.com/sites/common_assets/science/virtual_labs/LS12/LS12.html

Stage 3 – Learning Plan

Digital information and technology integration: Indicate any special considerations as well as materials, resources (online, print, video, audio) or equipment.

- http://www.crscience.org/lessonplans/5_FeelDeadBrains_CSSA_1112.pdf (minus the preserved brains most likely)
- http://www.stem4students.net/
- https://schoolweb.dysart.org/iPlan/CurriculumMap.aspx?u=4818
- https://sites.google.com/a/msad60.org/k-5_science/fourth-grade/amazing-eyes
- http://www.wccusd.net/cms/lib03/CA01001466/Centricity/domain/1040/stem-west%20grant/LightAndReflectivityActivities080614.pdf
- https://sites.google.com/a/msad60.org/k-5_science/fourth-grade/Stayin-Alive

- http://www.stem4students.net/fourth-grade---life-science.html
- http://www.stem4students.net/
- https://schoolweb.dysart.org/iPlan/CurriculumMap.aspx?u=4815
- http://betterlesson.com/
- http://www.birdsleuth.org/webinar-series/birdtalk/
- http://www.explorelearning.com/index.cfm?method=cResource.dspStandardCorrelation&id=1889

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**
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- **Learn different material (such as continuing to work on multiplication while classmates move on to fractions)**
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2015 Ocean County Science Curriculum

Grade 4

Unit: Earth's Systems: Processes that Shape the Earth

How can Earth's physical features be examined to learn about the past?

What physical features on Earth can be used to order events that occurred? How do water, ice, wind, organisms and gravity change the shape of the land?

The performance expectations in fourth grade help students formulate answers to questions such as: How can water, ice, wind and vegetation change the land and what patterns of Earth's features can be determined with the use of maps? Students are expected to develop an understanding of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. They apply their knowledge of natural Earth processes to generate and compare multiple solutions to reduce the impacts of such processes on humans. In order to describe patterns of Earth's features, students analyze and interpret data from maps.

The crosscutting concepts of patterns; cause and effect; energy and matter; systems and system models; interdependence of science, engineering, and technology; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the fourth grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

The Grades 3-5 Storyline provides a summary of the understandings that students developed by the end of 5th grade.

#	STUDENT LEARNING OBJECTIVES (SLOs)	Corresponding PEs and DCIs
1	**Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.** [Clarification Statement: Examples of evidence from patterns could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.] [*Assessment Boundary: Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time.*]	**4-ESS1-1**
2	**Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.** [Clarification Statement: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.] [*Assessment Boundary: Assessment is limited to a single form of weathering or erosion.*]	**4-ESS2-1**
3	**Analyze and interpret data from maps to describe patterns of Earth's features.** [Clarification Statement: Maps can include topographic maps of Earth's land and ocean floor, as well as	**4-ESS2-2**

	maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.]	
4	**Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.*** [Clarification Statement: Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.] [*Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.*]	**4-ESS3-2**

The SLOs were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1)

Analyzing and Interpreting Data

Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.

- Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2-2)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Identify the evidence that supports particular points in an explanation. (4-ESS1-1)
- Generate and compare multiple solutions to a problem based on how

Disciplinary Core Ideas

ESS1.C: The History of Planet Earth

- Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1)

ESS2.A: Earth Materials and Systems

- Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)

ESS2.B: Plate Tectonics and Large-Scale System Interactions

- The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. (4-ESS2-2)

ESS2.E: Biogeology

Crosscutting Concepts

Patterns

- Patterns can be used as evidence to support an explanation. (4-ESS1-1),(4-ESS2-2)

Cause and Effect

- Cause and effect relationships are routinely identified, tested, and used to explain change. (4- ESS2-1),(4-ESS3-2)

Connections to Engineering, Technology, and Applications of Science

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

- Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. (4-ESS3-2)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes consistent patterns in natural systems. (4-ESS1-1)

well they meet the criteria and constraints of the design solution. (4-ESS3-2) ***21st Century themes and skills*** ***(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	• Living things affect the physical characteristics of their regions. (4-ESS2-1) **ESS3.B: Natural Hazards** • A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2) *(Note: This Disciplinary Core Idea can also be found in 3.WC.)* **ETS1.B: Designing Solutions to Engineering Problems** • Testing a solution involves investigating how well it performs under a range of likely conditions.*(secondary to 4-ESS3-2)*	

Engineering Design Next Generation Standards	
NGSS	**Description**
3-5-ETS1-1	**Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.**
3-5-ETS1-2	**Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.**

3-5-ETS1-3	**Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.**

Connections to other DCIs in fourth grade:

4.EST1.C (4-ESS3-2)

Articulation of DCIs across grade-levels:

K.ETS1.A (4-ESS3-2); **2.ESS1.C** (4-ESS1-1),(4-ESS2-1); **2.ESS2.A** (4-ESS2-1); **2.ESS2.B** (4- ESS2-2); **2.ESS2.C** (4-ESS2-2); **2.ETS1.B** (4-ESS3-2); **2.ETS1.C** (4-ESS3-2); **3.LS4.A** (4-ESS1-1); **5.ESS2.A** (4-ESS2-1); **5.ESS2.C** (4-ESS2-2); **MS.LS4.A** (4-ESS1-1); **MS.ESS1.C** (4-ESS1-1),(4-ESS2-2); **MS.ESS2.A** (4-ESS1-1),(4-ESS2-2),(4-ESS3-2); **MS.ESS2.B** (4-ESS1-1),(4-ESS2-2); **MS.ESS3.B** (4-ESS3-2); **MS.ETS1.B** (4-ESS3-2)

Interdisciplinary Connections:

ELA/Literacy -

RI.4.1	***Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-ESS3-2)***
RI.4.7	***Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. (4-ESS2-2)***
RI.4.9	***Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-ESS3-2)***
W.4.7	***Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. (4-ESS1-1),(4-ESS2-2)***
W.4.8	***Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-ESS1-1),(4-ESS2-1)***
W.4.9	***Draw evidence from literary or informational texts to support analysis, reflection, and research. (4-ESS1-1)***

Mathematics -

MP.2	***Reason abstractly and quantitatively. (4-ESS1-1),(4-ESS2-1),(4- ESS3-2)***
MP.4	***Model with mathematics. (4-ESS1-1),(4-ESS2-1)(4-ESS3-2)***
MP.5	***Use appropriate tools strategically. (4-ESS2-1)***
4.MD.A.1	***Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. (4-ESS1-1),(4-ESS2-1)***
4.MD.A.2	***Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. (4-ESS2-1),(4-ESS2-2)***
4.OA.A.1	***Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations. (4-ESS3-2)***

<table>
<tr><td>Grade Level: 4</td><td>Title of Unit: Earth’s Systems: Processes that Shape the Earth</td></tr>
<tr><td colspan="2">Stage 1 - Desired Results</td></tr>
<tr><td>Understandings:

Students will understand that…
1. Certain features on Earth can be used to order events that have occurred in a landscape.
2. Water, ice, wind, organisms and gravity break rocks, soils, and sediments into smaller pieces and move them around.
3. Earth’s physical features occur in patterns, as do earthquakes and volcanoes. Maps can be used to locate features and determine patterns in those events.
4. A variety of hazards result from natural processes; humans cannot eliminate hazards but can reduce their impacts.</td><td>Essential Questions:

1. How do patterns in rock formations and fossils support the idea that a landscape changes over time?
2. What is the cause of weathering and erosion?
3. How can you use maps to describe the patterns of Earth’s features?
4. How can engineers design solutions to reduce the impacts of Earth’s processes, such as volcanic activity, earthquakes, and flooding?</td></tr>
<tr><td>Knowledge:

Students will know…

● Moving water, wind, and ice continually shape the Earth’s surface by eroding rock and soil in some areas and depositing them in other areas.
● Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans
● Living things affect the physical characteristics of their regions.
● A large amount of hazards are a result of natural processes and can only be reduced by humans, not eliminated.</td><td>Skills:

Students will be able to…

● Complete a model using water, sand, and rock to demonstrate erosion.
● Identify rock layers and see how the coloring and texture is affected by the environment.
● Describe how fossils in rock layers can demonstrate a change in the landscape over time.
● Use maps in order to show patterns of Earth’s features.
● Use appropriate instruments to demonstrate how to measure an earthquake’s strength.
● Explain to classmates the changes weathering can have on a landscape over time.
● Describe how humans and other living things can change and affect the physical features of the area.
● Show how humans can reduce the impact of natural hazards using a model and explanation.</td></tr>
<tr><td colspan="2">Stage 2- Assessment Evidence</td></tr>
<tr><td colspan="2">Performance Tasks and other evidence:</td></tr>
</table>

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- developing and refining models;
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- engaging in evidence-based argumentation; and
- reflecting on their own understanding.

- Summative Assessments
  - RST- Research Simulation Task
  - Associated Unit tests, quizzes
  - Labs and engineering based projects
  - Visit the website http://www.eie.org/engineering-adventures/curriculum-units/shake-things to learn additional information about earthquakes and follow the design process to create an earthquake resistant building
  - Participate in a Lab about The effects of Weathering and Erosion chrome-extension://bpmcpldpdmajfigpchkicefoigmkfalc/views/app.html
- Formative Assessments
  - Graphic Organizers & Guided Note Taking
  - Directed Reading
  - Cooperative Group Learning
  - Homework
  - Journal Entries
  - Explain changes in a landscape over time
  - utilize a topographic map to discuss land formations
  - visit Google Earth to have real time 3D images

Stage 3 – Learning Plan

Digital information and technology integration: Indicate any special considerations as well as materials, resources (online, print, video, audio) or equipment.

- http://www.ucmp.berkeley.edu/geology/tectonics.html (plate tectonics)
- http://earthquake.usgs.gov/learn/kids/ (earthquakes)
- https://www.nature.nps.gov/geology/nationalfossilday/activities.cfm (fossils)
- chrome-extension://bpmcpldpdmajfigpchkicefoigmkfalc/views/app.html (weathering and erosion)
- http://www.stem4students.net/
- http://betterlesson.com/

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**