**Science Pacing Guide**

**Time Frame: September – November Fourth Grade**

**Unit 1: Energy**

| **Science & Engineering Practices** | **Crosscutting Concepts** | **Literacy Standards** | **Mathematics Standards** |
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| **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) | **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)  Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS3-2)  **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) | **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) | **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) |

| **Next Generation Science Standards** | **Disciplinary Core Ideas** | **Essential Questions** | **Assessments** | **Vocabulary** | **Resources** |
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| Students who demonstrate understanding can:  **4-PS3-1** 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-PS3-2** 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-PS3-3** 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-PS3-4** 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 energy or use stored energy to cause motion or produce light or sound.*]  **4-ESS3-1** 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.]  **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. | **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 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)*  **ETS1.A: Defining and Delimiting 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. (3-5-ETS1-1) | What is energy and how does it affect speed of objects?  (**4-PS3-1)**  Energy can move around, but how does energy do this in all its forms?  (**4-PS3-2)**  Where does energy go after a collision of objects?  (**4-PS3-3)**  Can man test the conversion of energy? How?  (**4-PS3-4)**  Fuels and energy move our world, where do they come from and what are the Environmental consequences?  (**4-ESS3-1)**  How can society solve its energy problems?  (**3-5-ETS1-1)** | **Before:**  Pretest students for understanding. (Use a test to collect data for aid in differential instruction. The tests reflect standards.)  Think aloud (Get an idea of what students are thinking about subject). This is a form of brainstorming. There can be more than one think aloud to use with Standard.)  Discussion (Talk with student, have them make predictions on what they are about to learn. Good place to use essential questions.)  **During:**  Research reports (Break down standards; with the chunks of topics, give students topics to present to class. Use a rubric to organize the steps to reach a common goal.)  Example- students look up information to talk about what happens during a collision of two objects, Describe that energy and fuels are derive from natural resources and their use affect the environment.  Student observations (Set up several experiments that will show applications of energy transfer and the relationship between energy and speed. Students should ask questions and predict outcomes. Perform them in front of students. With the help of a rubric to guide what students should record, Students will write down or draw what they are seeing.)  **After:**  Project (Check what they learned by allowing them to create their own device that convert energy from one form to another, could fit in to engineering. This will be a simple creation that shows understanding of energy and devices. A rubric can be used here to help students reach the goal.)  Posttest (Give students a test that will test them for knowledge and help them get use to formal testing) | Conversion  Current  Electric current  Energy  Force  Fossil fuel  Fossils  Habitat  Heat  Kinetic energy  Light  Matter  Motion  Natural Resources  Nonrenewable energy  Pollution  Potential energy  Renewable energy  Sound  Speed | **Websites / Lessons / Games:**  Lessons and links on energy: <http://www.energyquest.ca.gov/teachers_resources/index.html>  Resources available on energy, asking what energy is: <http://www.tncurriculumcenter.org/resource/3828>  Government site about energy, videos and information:  <http://energy.gov/science-innovation/science-education>    Energy for kids information site:  <http://www.eia.gov/kids/energy.cfm?page=1>  Supplement site for energy, lessons, experiments, and so on:  <http://www.sciencekids.co.nz/sciencefacts/energy.html>  Interactive slide show, showing effect of size and weight on motion: <http://www.bbc.co.uk/schools/scienceclips/ages/10_11/forces_action.shtml>  Circuits and conductors interactive slip:  <http://www.bbc.co.uk/schools/scienceclips/ages/8_9/circuits_conductors.shtml> |

**Science Pacing Guide**

**Time Frame: December – January Fourth Grade**

**Unit 2: Waves**

| **Science & Engineering Practices** | **Crosscutting Concepts** | **Literacy Standards** | **Mathematics Standards** |
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| **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 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)   **Connections to Nature of Science**    **Scientific Knowledge is Based on Empirical Evidence**  Science findings are based on recognizing patterns. (4-PS4-1) | **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 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) | **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) | **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) |

| **Next Generation Science Standards** | **Disciplinary Core Ideas** | **Essential Questions** | **Assessments** | **Vocabulary** | **Resources** |
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| Students who demonstrate understanding can:  **4-PS4-1** 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-PS4-3** 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.]  **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. | **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 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)*  **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. (3-5-ETS1-3) | What do waves look like, how can we model waves?  (**4-PS4-1)**  Can I communicate with others using waves? How?  (**4-PS4-3)**  How can we improve on our ability to understand waves as we model them?  **(3-5-ETS1-3)** | **Before:**  Discussion (Talk to students, get feedback on what they are thinking about with the current topic)  Listing (List out preconceived ideas on topic)  Painting (Paint the structure of waves with students so that they can see the parts of a wave)  **During:**  Daily assignments (Give assignments to students that will check for understanding on a day to day basis)  Group Project (Get students to work together to develop a model of wave to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. Good for engineering applications)  **After:**  Report (Have students share on how they can use waves to communicate.)  Unit test | Amplitude  Communicate  Crest  Device  Digital information  Frequency  Median  Models  Patterns  Peak  Transmit  Trough  Variables  Wave length  Waves | Sound wave information, details:  <http://www.sciencekids.co.nz/sciencefacts/sound.html>  Site showing the different types of waves, <http://science.hq.nasa.gov/kids/imagers/ems/waves3.htmlspectrum>:  Activity for Morse code, for use of waves standard:  <http://www.education.com/activity/article/Morse_Code/>    One more resource site for Morse code:  <http://www.arrl.org/helping-kids-discover-morse-code>  Sounds wave experiment:  <http://www.ducksters.com/science/experiment_sound_waves.php> |

**Science Pacing Guide**

**Time Frame: January – March Fourth Grade**

**Unit 3: Processes that Shape the Earth**

| **Science & Engineering Practices** | **Crosscutting Concepts** | **Literacy Standards** | **Mathematics Standards** |
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| **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 well they meet the criteria and constraints of the design solution. (4-ESS3-2) | **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) | **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)* | **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) |

| **Next Generation Science Standards** | **Disciplinary Core Ideas** | **Essential Questions** | **Assessments** | **Vocabulary** | **Resources** |
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| Students who demonstrate understanding can:  **4-ESS1-1** Identify evidence from patterns in rock formations and fossils in rock layers for changes in a landscape over time 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-ESS2-1** 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-ESS2-2** 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 maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.]  **4-ESS3-2** 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.*]  **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. | **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**  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)*  **ETS1.B: Developing Possible Solutions**  Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2)  At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2)  Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5-ETS1-3) | Evidence of time in rocks is easily observed, Why?  (**4-ESS1-1)**  What causes the change in our landscape?  (**4-ESS2-1)**  How can man interpret the face of Earth?  (**4-ESS2-2)**  It is possible to prevent damage to human infrastructure with the greatest of nature’s wrath?  (**4-ESS3-2, 3-5-ETS1-2, 3-5-ETS1-3.)** | **Before:**  Brainstorming (patterns of the earth’s features for example mountains and the topography)  KWL (Rock formations, fossils and weathering.  **During:**  Think pair share (Identify changes in the landscape over time by observing rock formations and fossils in rock layers using specimen or pictures.  Lab Report (Record observations and measurement on the effect of weathering or rate of erosion by water, ice, wind, or vegetation.)  Concept maps (interpreting data from maps to describe patterns Earth’s features.)  **After:**  Project (Simulate an event that models, a solution to reduce the impact of natural Earth processes on humans. Good for engineering applications. Project will be graded based on a teacher created rubric using science and literacy standards.) | Canyon  Continental boundaries  Depositions  Earthquakes  Erosion  Eruptions  Floods  Fossils  Freezing  Landscape  Mountains  Oceans  Plate Tectonics  River  Rock layers  Sediments  Thawing  Topographic maps  Trenches  Tsunamis  Vegetation  Volcanoes  Wind | Space links: <http://www.fi.edu/learn/hotlists/space.php>  Plant identification and details:  <http://plants.usda.gov/java/>  More plant imagery, information, resources:  <http://library.thinkquest.org/6274/General%20Plant%20Information/Plant%20info.htm>  Informational site for paleontology:  <http://geology.er.usgs.gov/paleo/eduinfo.shtml>    Information site that can also simulate disasters and explain about how to prevent damage: <http://www.stopdisastersgame.org/en/information.html>  Links you to several informational sites on natural disasters:  <http://www.kidskonnect.com/subjectindex/15-educational/science/92-natural-disasters.html>  Game that helps teach you what to do during a disaster:  [Www.disaterhero.com](http://Www.disaterhero.com) |

**Science Pacing Guide**

**Time Frame: April – June Fourth Grade**

**Unit 4: Structure, Function, and Information Processing**

| **Science & Engineering Practices** | **Crosscutting Concepts** | **Literacy Standards** | **Mathematics Standards** |
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| **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) | 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) | **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) | **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) |

| **Next Generation Science Standards** | **Disciplinary Core Ideas** | **Essential Questions** | **Assessments** | **Vocabulary** | **Resources** |
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| Students who demonstrate understanding can:  **4-PS4-2** 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-LS1-1** 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-LS1-2** 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.*] | **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) | How can light and sounds be described by their properties?  (**4-PS4-2)**  How can we see and understand what we see?  (**4-PS4-2)**  Do plants and animals need all there parts (Arms, legs, stems, etc.) to survive?  (**4-LS1-1)**  All species take in energy in different ways, how can we prove this based on how organisms react to different reactants?  (**4-LS1-2)** | **Before:**  Questioning (How information is processed through our senses to identify student misconceptions.)  **During:**  Debates (Students will debate the functionality of internal and external structures that supports survival, growth, behavior and reproduction. Grading with a teacher made rubric that represents science standards, speaking and listing standards.)  Drawing (Students will draw a model on a poster showing how light reflects objects and enters the eye to allow the object to be seen. Drawing will be graded using a teacher creating rubric that reflects science standards.)  **After:**  Power point (Students will create a power point that with describe how an animal receives information through their senses, process the information in their brain and response to the information in different ways. Teacher created rubric that reflects science standards.) | Adapted  Behavior  Conditioning  Electromagnetic-Radiation  External  Function  Growth  Interactions  Internal  Light  Memories  Perceptions  Reactants  Receptors  Reflecting  Remote sensing  Reproduction  Senses  Survival  Visible light  Visible spectrum | Information on light with video: <http://studyjams.scholastic.com/studyjams/jams/science/energy-light-sound/light.htm>  Good site on plants, has information, games, quizzes and lessons: <http://www.sciencekids.co.nz/plants.html>  Website providing some information and work sheets on sense:  <http://www.schoolofdragons.com/resources/the-five-senses-word-list>  “How we see”, website, information and interactive activities:  [www.sciencekids.co.nz/gamesactivities/howwesee.html](http://www.sciencekids.co.nz/gamesactivities/howwesee.html)  Neuroscience for kids information, misc.:  <http://faculty.washington.edu/chudler/brainsize.html>  Plant biology and structure site with information: <http://www.biology4kids.com/files/vert_main.html>  On animal parts and information with visuals and tests: <http://www.mcwdn.org/Animals/AnimalFunctions.html> |