|  |
| --- |
| 8th Grade Science Curriculum Document Quarter \_1\_ |
| 8.PS2: Motion and Stability: Forces and Interactions |
| **Time Frame** | **Learning Outcomes/Activities** | **Online Resources** | **Crosscutting Concepts (CCC)****Science and Engineering Practices (SEP)** |
| 8.PS2.1 Design and conduct investigations depicting the relationship between magnetism and electricity in electromagnets, generators, and electric motors, emphasizing the factors that increase or diminish the electric current and the magnetic field strength.8.ETS1.1 Develop a model to generate data for ongoing testing and modification of an electromagnet, a generator, and a motor such that an optimal design can be achieved. |
| 3 weeksQuarter 1X% of TNReady | 1. Students will construct an explanation in order to show how electric currents create magnetic fields and magnetic fields can induce an electric current highlighting that energy stored in electric currents and magnetic fields can be transmitted between the two.2. Students will design a solution in order to show how an optimal design for an electromagnet can hold a specific number of paperclips (designated by teacher) highlighting the structure and function of the parts of the electromagnet. 3. Students will collect, analyze, and interpret data from an electric generator in order to show how the variables of the generator can change the amount of electricity generated highlighting the patterns that exist between the independent and dependent variables.4. Students will plan and carry out an investigation in order to show the variables that affect an electric motor highlighting that the system model illustrates the components working together in predictable ways. | [7-page article on electromagnets](https://science.howstuffworks.com/electromagnet.htm)[electromagnet simulation](http://static.lawrencehallofscience.org/kidsite/portfolio/virtual-electromagnet/)[electromagnetic Induction demonstration video](http://www.vega.org.uk/video/programme/224)[electromagnetic Induction simulation (generator)](https://nationalmaglab.org/education/magnet-academy/watch-play/interactive/electromagnetic-induction) [2-minute video for a simple electric motor](https://www.neok12.com/video/How-It-Works/zX5b4c696f007c5c7d525a6b.htm)[Multiple NGSS lesson plans](https://betterlesson.com/next_gen_science/browse/2201/ngss-ms-ps2-3-ask-questions-about-data-to-determine-the-factors-that-affect-the-strength-of-electric-and-magnetic-forces?from=domain_core_lesson_count) | **CROSSCUTTING CONCEPT:**Energy and MatterStructure and FunctionPatternsSystems and System Models**SCIENCE AND ENGINEERING PRINCIPLE:**Construct ExplanationsDesign SolutionsAnalyze and Interpret DataPlanning and Carrying Out Controlled Investigations |
| 8.PS2: Motion and Stability: Forces and Interactions |
| **Time Frame** | **Learning Outcomes/Activities** | **Online Resources** | **Crosscutting Concepts (CCC)****Science and Engineering Practices (SEP)** |
| 8.PS2.2 Conduct an investigation to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. |
| 1 week (Embedded)Quarter 1X% of TNReady | 1. Students will engage in argument in order to show evidence of non-contact forces in electromagnetism and Newton’s Laws from experiments and research highlighting that stability or change in those systems is dependent on the equilibrium of forces (contact and non-contact). | [NGSS lesson plan](https://betterlesson.com/next_gen_science/browse/2203/ngss-ms-ps2-5-conduct-an-investigation-and-evaluate-the-experimental-design-to-provide-evidence-that-fields-exist-between-object?from=domain_core_lesson_count)A google search of the topic will provide a number of videos and simple activities for students. However, most are oriented towards lower grade levels. There are numerous examples of contact and non-contact forces found in the activities in this unit, and these activities should be the main source of evidence. Some demonstrations or activities for learning outcome three include straw rockets and [electric trains.](https://www.youtube.com/watch?v=Y1MDOerruDU) | **CROSSCUTTING CONCEPT:**Stability and Change**SCIENCE AND ENGINEERING PRINCIPLE:**Engaging in Argument from Evidence |
| 8.PS2: Motion and Stability: Forces and Interactions |
| **Time Frame** | **Learning Outcomes/Activities** | **Online Resources** | **Crosscutting Concepts (CCC)****Science and Engineering Practices (SEP)** |
| 8.PS2.3 Create a demonstration of an object in motion and describe the position, force, and direction of the object. |
| 2 weeksQuarter 1X% of TNReady | 1. Students will ask questions that lead to testable predictions in order to show properties and forces of objects in various states of inertia and motion highlighting the cause and effect relationship of forces on the object’s inertia. 2. Students will obtain, evaluate, and communicate information through synthesis of scientific text in order to show the relationship of factors of an object’s motion highlighting the pattern of force inputs and motion.3. Students will analyze and interpret data by constructing graphs and charts (motion maps, line graphs, vector quantities) in order to show position vs time and velocity vs time for the various states of motion (no motion, constant speed, acceleration, and deceleration) highlighting the inclusion or exclusion of specific parts of the model.4. Use mathematics and computational thinking to create equations and predict outcomes in order to show the forces and resultant motion of an object highlighting the scale, proportion, and quantity of the various calculations. | [article, examples, videos, & interactives about graphing motion](http://www.physicsclassroom.com/Physics-Tutorial/1-D-Kinematics)[articles, examples, videos, & interactives about Newton’s Laws](http://www.physicsclassroom.com/Physics-Tutorial/Newton-s-Laws)[interactive motion map](https://www.motionmapmaker.com/)[multiple NGSS lesson plans](https://betterlesson.com/next_gen_science/browse/2200/ngss-ms-ps2-2-plan-an-investigation-to-provide-evidence-that-the-change-in-an-object-s-motion-depends-on-the-sum-of-the-forces-o?from=domain_core_lesson_count) | **CROSSCUTTING CONCEPT:**Cause and EffectPatternsScale, Proportion, and QuantitySystems and System Models**SCIENCE AND ENGINEERING PRINCIPLE:** Asking QuestionsObtaining, Evaluating, and Communicating InformationAnalyzing and Interpreting DataUse Mathematics and Computational Thinking |
| 8.PS2: Motion and Stability: Forces and Interactions |
| **Time Frame** | **Learning Outcomes/Activities** | **Online Resources** | **Crosscutting Concepts (CCC)****Science and Engineering Practices (SEP)** |
| 8.PS2.4 Plan and conduct an investigation to provide evidence that the change in an object’s motion depends on the sum of the forces on the object and the mass of the object. |
| 1 WeekQuarter 1X% of TNReady | 1. Students will analyze and interpret data from a recorded observation of a phenomenon in order to show all the forces (applied forces, gravity, and friction) acting on an object, using a free body diagram to highlight that patterns of force, mass, and acceleration are explicit in the data set. 2. Students will use mathematics and computational thinking incorporating online simulations compared to real world data in order to show the relationship of force, mass, and acceleration highlighting that mathematical models can be used to make predictions about force and acceleration on objects. 3. Students will plan and conduct an investigation given a claim in order to show the relationship of force, mass, and acceleration highlighting the cause and effect relationship of force and mass on acceleration supporting the mathematical model of F=MA.    | [site explain three laws with links and labs](http://teachertech.rice.edu/Participants/louviere/Newton/index.html)[free-body diagrams](http://www.physicsclassroom.com/class/newtlaws/Lesson-2/Drawing-Free-Body-Diagrams)[multiple NGSS lesson plans and experiments](https://betterlesson.com/next_gen_science/browse/2200/ngss-ms-ps2-2-plan-an-investigation-to-provide-evidence-that-the-change-in-an-object-s-motion-depends-on-the-sum-of-the-forces-o?from=domain_core_lesson_count)[online simulation](https://phet.colorado.edu/en/simulation/forces-and-motion-basics)[virtual lab](http://www.glencoe.com/sites/common_assets/science/virtual_labs/E25/E25.html) | **CROSSCUTTING CONCEPT:**PatternsSystems and System ModelsCause and Effect **SCIENCE AND ENGINEERING PRINCIPLE:** Analyzing and Interpreting DataUse Mathematics and Computational ThinkingPlanning and Carrying out Investigations |
| 8.PS2: Motion and Stability: Forces and Interactions |
| **Time Frame** | **Learning Outcomes/Activities** | **Online Resources** | **Crosscutting Concepts (CCC)****Science and Engineering Practices (SEP)** |
| 8.PS2.5 Evaluate and interpret that for every force exerted on an object there is an equal force exerted in the opposite direction. |
| 1 WeekQuarter 1X% of TNReady | 1. Students will engage in argument in order to show that for every force exerted on an object there is an equal and opposite force highlighting that energy in momentum is conserved. 2. Students will develop and use models in the form of free-body diagrams in order to show the sum of forces acting upon objects resulting in a change in momentum highlighting that the stability of an object is often the result of dynamic equilibrium and change can be cause by disequilibrium. | [site explain three laws with links and labs](http://teachertech.rice.edu/Participants/louviere/Newton/index.html)[multiple NGSS lesson plans and experiments](https://betterlesson.com/next_gen_science/browse/2199/ngss-ms-ps2-1-apply-newton-s-third-law-to-design-a-solution-to-a-problem-involving-the-motion-of-two-colliding-objects?from=domain_core_container) | **CROSSCUTTING CONCEPT:**Energy and MatterStability and Change**SCIENCE AND ENGINEERING PRINCIPLE:** Engaging in Argument from EvidenceDeveloping and Using Models |
| 8.PS4: Waves and Their Applications in Technologies for Information Transfer |
| **Time Frame** | **Learning Outcomes/Activities** | **Online Resources** | **Crosscutting Concepts (CCC)****Science and Engineering Practices (SEP)** |
| 8.PS4.1 Develop and use models to represent basic properties of waves including frequency, amplitude, wavelength and speed. |
| 1 WeekQuarter 1X% of TNReady | 1. Students will develop and use a conceptual model in order to show the parts of electromagnetic and mechanical waves highlighting the structure and function of the waves in modern technology.2. Students will use mathematical and computational thinking in order to show the relationship between frequency, wavelength, and speed of electromagnetic and mechanical waves in different media highlighting the cause and effect inverse or direct relationships between the properties of the wave. 3. Students will ask questions regarding wave models in order to show the relationship between amplitude and energy highlighting that the amount of energy is reflected in the waves magnitude. | [an introduction to waves with animations](http://www.bbc.co.uk/schools/gcsebitesize/science/edexcel_pre_2011/waves/anintroductiontowavesrev1.shtml)[multiple NGSS lesson plans and experiments](https://betterlesson.com/next_gen_science/browse/2211/ngss-ms-ps4-1-use-mathematical-representations-to-describe-a-simple-model-for-waves-that-includes-how-the-amplitude-of-a-wave-is?from=core_child_lesson_count)[virtual lab](https://phet.colorado.edu/sims/html/wave-on-a-string/latest/wave-on-a-string_en.html) | **CROSSCUTTING CONCEPT:**Structure and FunctionCause and EffectEnergy and Matter**SCIENCE AND ENGINEERING PRINCIPLE:** Developing and Using ModelsUsing Mathematical and Computational ThinkingAsking Questions |
| 8th Grade Science Curriculum Document Quarter \_2\_ |
| 8.PS4: Waves and Their Applications in Technologies for Information Transfer |
| **Time Frame** | **Learning Outcomes/Activities** | **Online Resources** | **Crosscutting Concepts (CCC)****Science and Engineering Practices (SEP)** |
| 8.PS4.2 Compare and contrast mechanical waves and electromagnetic waves based on refraction, reflection, transmission, and absorption and their behavior through a vacuum and/or various media. |
| 1 WeekQuarter 2X% of TNReady | 1. Identify examples of refraction, reflection, transmission, and absorption in mechanical and electromagnetic waves.2. Explain the key differences of mechanical waves and electromagnetic waves including the medium in which they are transmitted.3. Model examples of refraction, reflection, transmission, and absorption of mechanical and electromagnetic waves. | [virtual lab](https://www.curriculumpathways.com/portal/#/info/1329?id=1200)[a series of lessons, animations, and labs about wave interactions](http://www.physicsclassroom.com/class/waves/Lesson-3/Boundary-Behavior)[multiple NGSS lesson plans and experiments](https://betterlesson.com/next_gen_science/browse/2212/ngss-ms-ps4-2-develop-and-use-a-model-to-describe-that-waves-are-reflected-absorbed-or-transmitted-through-various-materials?from=core_child_lesson_count) | **CROSSCUTTING CONCEPT:****Energy and Matter** – Students track energy changes through transformations in a system.**SCIENCE AND ENGINEERING PRINCIPLE:** **Constructing Explanations and Designing Solutions** – Students form explanations using source (including student developed investigations) which show comprehension or parsimony, utilize quantitative and qualitative models to make predictions, and can support or cause revisions of a particular conclusion. |
| 8.PS4: Waves and Their Applications in Technologies for Information Transfer |
| **Time Frame** | **Learning Outcomes/Activities** | **Online Resources** | **Crosscutting Concepts (CCC)****Science and Engineering Practices (SEP)** |
| 8.PS4.3 Evaluate the role that waves play in different communication systems. |
| .5 WeekQuarter 2X% of TNReady | 1. Describe the use of mechanical waves in communication.2. Describe the use of electromagnetic waves in communication, including the frequencies and reason of the wavelength used for the various communication systems.    | [multiple NGSS lesson plans and experiments](https://betterlesson.com/next_gen_science/browse/2213/ngss-ms-ps4-3-integrate-qualitative-scientific-and-technical-information-to-support-the-claim-that-digitized-signals-sent-as-wav?from=core_child_lesson_count)[article about radio waves in communication](https://www.livescience.com/50399-radio-waves.html)[article comparing digital and analogue signals](https://revisionworld.com/gcse-revision/physics/electromagnetic-radiation/wave-communication) | **CROSSCUTTING CONCEPT:****Structure and Function** – Students design systems, selecting materials for their relevant properties.**SCIENCE AND ENGINEERING PRINCIPLE:** **Obtaining, Evaluating, and Communicating Information** - Students can evaluate text, media, and visual displays of information with the intent of clarifying claims, and reconciling explanations. Students can communicate scientific information on writing utilizing embedded tables, charts, figures, and graphs. |
| 8.ESS2: Earth’s Systems |
| **Time Frame** | **Learning Outcomes/Activities** | **Online Resources** | **Crosscutting Concepts (CCC)****Science and Engineering Practices (SEP)** |
| 8.ESS2.2 Evaluate data collected from a seismograph to create a model of Earth’s structure. |
| .5 WeekQuarter 2X% of TNReady | 1. Recognize that the Earth has 4 distinct layers.2. Explain how evidence from seismographs supports the theory that Earth has 4 layers.  | [article about Earth’s layers](http://solarviews.com/eng/earthint.htm)[multiple NGSS lesson plans and experiments](https://betterlesson.com/next_gen_science/browse/2248/ngss-ms-ess2-2-construct-an-explanation-based-on-evidence-for-how-geoscience-processes-have-changed-earth-s-surface-at-varying-t?from=domain_core) | **CROSSCUTTING CONCEPT:****Patterns** - Students recognize, classify, and record patterns in data, graphs, and charts.**SCIENCE AND ENGINEERING PRINCIPLE:** **Developing and Using Models** - Students create models which are responsive and incorporate features that are not visible in the natural world, but have implications on the behavior of the modeled systems and can identify limitations of their models. |
| 8.ESS2: Earth’s Systems |
| **Time Frame** | **Learning Outcomes/Activities** | **Online Resources** | **Crosscutting Concepts (CCC)****Science and Engineering Practices (SEP)** |
| 8.ESS2.3 Describe the relationship between the processes and forces that create igneous, sedimentary, and metamorphic rocks. |
| 1 WeekQuarter 2X% of TNReady | 1. Explain the processes involved in the formation of igneous, sedimentary, and metamorphic rocks. 2. Replicate the processes in an experiment to provide evidence that the rock cycle is not a progression of rock types. 3. Represent the rock cycle in a diagram.   | [interactive about rock cycle](http://www.learner.org/interactives/rockcycle/index.html)[geology.com – tons of stuff](https://geology.com/rocks/)[short article about rock types](http://www.geography4kids.com/files/earth_rocktypes.html)[rock cycle lab with crayons](http://mommaowlslab.blogspot.com/2012/01/science-thursday-crayon-rocks.html)[NGSS lesson plan](https://betterlesson.com/lesson/635343/rock-cycle) | **CROSSCUTTING CONCEPT:****Scale, Proportion, and Quantity** - Students recognize that phenomena are not necessarily observable at all scales. **SCIENCE AND ENGINEERING PRINCIPLE:** **Asking Questions (for science) and Defining Problems (for engineering)** - Questions originate based on experience as well as need to clarify and test other explanations or determine explicit relationships between variables.  |
| 8.ESS2: Earth’s Systems |
| **Time Frame** | **Learning Outcomes/Activities** | **Online Resources** | **Crosscutting Concepts (CCC)****Science and Engineering Practices (SEP)** |
| 8.ESS2.4 Gather and evaluate evidence that energy form the earth’s interior drives convection cycles within the asthenosphere which create change in the lithosphere including plate movements, plate boundaries, and sea-floor spreading. |
| 1 WeekQuarter 2X% of TNReady | 1. Identify the source of heat within earth’s core. 2. Describe the effects of earth’s inner heat on the mantle (asthenosphere).3. Explain plate movement, plate boundaries, and sea floor spreading as a result of convection in earth’s mantle.   | [multiple articles about Earth’s structure](https://www.livescience.com/topics/earth-s-interior)[article and links about Earth’s structure](http://www.geography4kids.com/files/earth_intro.html)[multiple NGSS lesson plans and experiments](https://betterlesson.com/next_gen_science/browse/2248/ngss-ms-ess2-2-construct-an-explanation-based-on-evidence-for-how-geoscience-processes-have-changed-earth-s-surface-at-varying-t?from=domain_core) | **CROSSCUTTING CONCEPT:****Cause and Effect** - Students begin to connect their explanations for cause and effect relationships to specific scientific theory. **SCIENCE AND ENGINEERING PRINCIPLE:** **Developing and Using Models** - Students create models which are responsive and incorporate features that are not visible in the natural world, but have implications on the behavior of the modeled systems and can identify limitations of their models. |
| 8.ESS2: Earth’s Systems |
| **Time Frame** | **Learning Outcomes/Activities** | **Online Resources** | **Crosscutting Concepts (CCC)****Science and Engineering Practices (SEP)** |
| 8.ESS2.5 Construct a scientific explanation using data that explains the gradual processes of plate tectonics accounting for A) the distribution of fossils on different continents, B) the occurrence of earthquakes, and C) continental and ocean floor features (including mountains, volcanoes, faults, and trenches). |
| 1 WeekQuarter 2X% of TNReady | 1. Conduct experiments to illustrate the results of plate tectonics. 2. Using evidence from the experiments, explain the types of plate boundaries that result in earthquakes, mountains, volcanoes, faults, and trenches.   | [graham cracker lab](https://www.playdoughtoplato.com/graham-cracker-plate-tectonics/)[Interactive site about plate tectonics](http://www.learner.org/interactives/dynamicearth/index.html)[multiple NGSS lesson plans and experiments](https://betterlesson.com/next_gen_science/browse/2249/ngss-ms-ess2-3-analyze-and-interpret-data-on-the-distribution-of-fossils-and-rocks-continental-shapes-and-seafloor-structures-to?from=domain_core_container) | **CROSSCUTTING CONCEPT:****Scale, Proportion, and Quantity** - Students recognize that phenomena are not necessarily observable at all scales. **SCIENCE AND ENGINEERING PRINCIPLE:** **Constructing Explanations Designing Solutions** - Students form explanations using source (including student developed investigations) which show comprehension of parsimony, utilize quantitative and qualitative models to make predictions, can support or cause revisions of a particular conclusion.  |

|  |
| --- |
| 8.ESS3: Earth and Human Activity |
| **Time Frame** | **Learning Outcomes/Activities** | **Online Resources** | **Crosscutting Concepts (CCC)****Science and Engineering Practices (SEP)** |
| 8.ESS3.1 Interpret data to explain that Earth’s mineral, fossil fuel, and groundwater resources are unevenly distributed as a result of tectonic processes.  |
| 1 WeekQuarter 2X% of TNReady | 1. Identify and map locations in North America of freshwater aquifers, fossil fuel (oil and coal) deposits, and mineral resources (such as gold, copper, iron, etc).2. Describe the rock layers in which water and fossil fuels are found. 3. Explain how plate tectonics cause the uneven distribution of natural resources using the map and rock layers information from previous activities.   | [oil formation and distribution](http://energy4me.org/all-about-energy/what-is-energy/energy-sources/petroleum/)[locating oil](https://science.howstuffworks.com/environmental/energy/oil-drilling1.htm)[orographic lift caused by mountain ranges](https://www.pbslearningmedia.org/resource/buac17-68-sci-ess-mtnweather/mountain-weather-orographic-lift/#.W0UBtoYh00p)[multiple NGSS lesson plans and experiments](https://betterlesson.com/next_gen_science/browse/2254/ngss-ms-ess3-1-construct-a-scientific-explanation-based-on-evidence-for-how-the-uneven-distributions-of-earth-s-mineral-energy-a?from=domain_core_container) | **CROSSCUTTING CONCEPT:****Cause and Effect** - Students infer and identify cause and effect relationships from patterns. **SCIENCE AND ENGINEERING PRINCIPLE:** **Obtaining, Evaluating, and Communicating Information** - Students can evaluate text, media, and visual displays of information with the intent of clarifying claims, and reconciling explanations. Students can communicate scientific information on writing utilizing embedded tables, charts, figures, and graphs. |

|  |
| --- |
| 8.ESS3: Earth and Human Activity  |
| **Time Frame** | **Learning Outcomes/Activities** | **Online Resources** | **Crosscutting Concepts (CCC)****Science and Engineering Practices (SEP)** |
| 8.ESS3.2 Collect data, map, and describe patterns in the locations of volcanoes and earthquakes related to tectonic plate boundaries, interactions, and hotspots.  |
| 1 WeekQuarter 2X% of TNReady | 1. Identify and map locations of volcanoes, earthquakes, and hot spots. 2. Describe in detail the type of plate composition and interactions that results in volcanoes, earthquakes, and hotspots. 3. Conduct research and explain the engineering practices used in locations of tectonic activity in comparison to relatively stable locations.   | [multiple labs about plate tectonics](http://newyorkscienceteacher.com/sci/files/topic-media.php?media=Lab&subject=earth+science&subtopic=Earthquakes,+Volcanoes+and+Plate+Tectonics)[multiple videos about earthquakes and volcanoes](https://www.iris.edu/hq/inclass/search#type=1)[multiple NGSS lesson plans and experiments](https://betterlesson.com/next_gen_science/browse/2248/ngss-ms-ess2-2-construct-an-explanation-based-on-evidence-for-how-geoscience-processes-have-changed-earth-s-surface-at-varying-t?from=domain_core) | **CROSSCUTTING CONCEPT:****Patterns** - Students recognize, classify, and record patterns in data, graphs, and charts.**SCIENCE AND ENGINEERING PRINCIPLE:** **Analyzing and Interpreting Data** - Students should create and analyze graphical presentations of data to identify linear and non-linear relationships, consider statistical features within data and evaluate multiple sets of a data for a single phenomenon.  |

|  |
| --- |
| 8.ESS2: Earth’s Systems |
| **Time Frame** | **Learning Outcomes/Activities** | **Online Resources** | **Crosscutting Concepts (CCC)****Science and Engineering Practices (SEP)** |
| 8.ESS2.1 Analyze and interpret data to support the assertion that rapid or gradual geographic changes lead to drastic population changes and extinction events. |
| 1 WeekQuarter 2X% of TNReady | 1. Compare gradual changes (ice ages, warming periods, and tectonic movements) in organisms over time to changes caused by catastrophic extinction level events. 2. Research the major extinction events of earth’s history.3. Differentiate between uniformitarianism, gradualism, and catastrophism and how each is used in scientific explanations of earths biological history.   | [article about mass extinction events](https://www.worldatlas.com/articles/the-timeline-of-the-mass-extinction-events-on-earth.html)[article about uniformitarianism, gradualism, and catastrophism](https://evolution.berkeley.edu/evolibrary/article/history_12) | **CROSSCUTTING CONCEPT:****Scale, Proportion, and Quantity** - Students recognize that phenomena are not necessarily observable at all scales. **SCIENCE AND ENGINEERING PRINCIPLE:** **Engaging in Argument from Evidence** - Students critique and consider the degree to which competing arguments are supported by evidence.  |
| 8th Grade Science Curriculum Document Quarter \_3\_ |
| 8.LS4: Biological Change: Unity and Diversity |
| **Time Frame** | **Learning Outcomes/Activities** | **Online Resources** | **Crosscutting Concepts (CCC)****Science and Engineering Practices (SEP)** |
| 8.LS4.1 Analyze and interpret data for the patterns of fossil record that document the existence, diversity, extinction, and change in life forms throughout Earth’s history. |
| 2 WeeksQuarter 3X% of TNReady | 1. Describe the process of fossilization, including factors that increase the likelihood of fossilization. 2. Distinguish among and describe fossils, trace fossils, and index fossils. 3. Determine relative ages of fossils. 4. Trace the ancestry of a modern-day organism comparing changes in structural features of the organism. 5. Review the fossil record of a specific region to determine environmental changes that have occurred in that region. 6. Research and engage in argument whether fossil evidence supports change in organisms and environments throughout the Earth’s history.   | [Site with info and links all about fossils](http://idahoptv.org/sciencetrek/topics/fossils/facts.cfm)[videos and lesson about fossils and modern ancestry](https://www.pbslearningmedia.org/resource/nvev-sci-fossils/fossils-rocking-the-earth/#.W0UGbIYh00o)[multiple NGSS lesson plans and experiments](https://betterlesson.com/next_gen_science/browse/2234/ngss-ms-ls4-1-analyze-and-interpret-data-for-patterns-in-the-fossil-record-that-document-the-existence-diversity-extinction-and?from=domain_core_lesson_count) | **CROSSCUTTING CONCEPT:****Scale, Proportion, and Quantity** - Students recognize that phenomena are not necessarily observable at all scales. **SCIENCE AND ENGINEERING PRINCIPLE:** **Analyzing and Interpreting Data** - Students form explanations using source (including student developed investigations) which show comprehension of parsimony, utilize quantitative and qualitative models to make predictions, and can support or cause revisions of a particular conclusion.  |

|  |
| --- |
| 8.LS4: Biological Change: Unity and Diversity |
| **Time Frame** | **Learning Outcomes/Activities** | **Online Resources** | **Crosscutting Concepts (CCC)****Science and Engineering Practices (SEP)** |
| 8.LS4.2 Construct an explanation addressing the similarities and differences of the anatomical structures and genetic information between extinct and extant organisms using evidence of common ancestry and patterns between taxa. |
| 1 WeekQuarter 3X% of TNReady | 1. Compare structural elements of organisms to determine their relatedness. 2. Compare embryonic features of mammals to determine relatedness to other kingdoms.3. Construct and interpret cladograms or phylogenetic trees to determine common ancestry of modern day organisms. 4. Construct an explanation with evidence of the common ancestries of modern organisms, including reasons for biodiversity.   | [how-to create phylogenetic trees (Khan Academy) with additional links](https://www.khanacademy.org/science/high-school-biology/hs-evolution/hs-phylogeny/a/phylogenetic-trees)[multiple NGSS lesson plans and experiments](https://betterlesson.com/next_gen_science/browse/2235/ngss-ms-ls4-2-apply-scientific-ideas-to-construct-an-explanation-for-the-anatomical-similarities-and-differences-among-modern-or?from=domain_core_lesson_count)[more multiple NGSS lesson plans and labs](https://betterlesson.com/search?keyword=Cladogram&from=autocomplete_option) | **CROSSCUTTING CONCEPT:****Patterns** - Students recognize, classify, and record patterns in data, graphs, and charts.**SCIENCE AND ENGINEERING PRINCIPLE:** **Constructing Explanations and Designing Solutions** - Students form explanations using source (including student developed investigations) which show comprehension of parsimony, utilize quantitative and qualitative models to make predictions, and can support or cause revisions of a particular conclusion.  |

|  |
| --- |
| 8.LS4: Biological Change: Unity and Diversity |
| **Time Frame** | **Learning Outcomes/Activities** | **Online Resources** | **Crosscutting Concepts (CCC)****Science and Engineering Practices (SEP)** |
| 8.LS4.3 Analyze evidence from geology, paleontology, and comparative anatomy to support that specific phenotypes within a population can increase the probability of survival of species that lead to adaptation. 8.LS4.4 Develop a scientific explanation of how natural selection plays a role in determining the survival of a species in a changing environment. |
| 2 WeeksQuarter 3X% of TNReady | 1. Describe how favorable characteristics increase the likelihood of survival of organisms. 2. Explain how favorable phenotypes are more likely to be passed from parent to offspring than unfavorable phenotypes. 3. Describe the theory of natural selection using evidence from previous activities. 4. Discuss how changes in environment lead to phenotype changes in organisms. 5. Research anatomical similarities and differences in finches and unique species of the Galapagos Islands. 6. Engage in argument whether natural selection leads to the evolution of species.  | [how adaptations evolve (includes local organisms)](http://www.nhptv.org/natureworks/nwep1.htm)[Khan Academy about natural selection and change with links](https://www.khanacademy.org/science/biology/her/evolution-and-natural-selection/a/lines-of-evidence-for-evolution)[multiple NGSS lesson plans and experiments](https://betterlesson.com/next_gen_science/browse/2237/ngss-ms-ls4-4-construct-an-explanation-based-on-evidence-that-describes-how-genetic-variations-of-traits-in-a-population-increas?from=domain_core_lesson_count)[more multiple NGSS lesson plans](https://betterlesson.com/search?keyword=natural%20selection&from=autocomplete_submit) | **CROSSCUTTING CONCEPT:****Cause and Effect** - Students begin to connect their explanations for cause and effect relationships to specific scientific theory. **SCIENCE AND ENGINEERING PRINCIPLE:** **Analyzing and Interpreting Data** - Students form explanations using source (including student developed investigations) which show comprehension of parsimony, utilize quantitative and qualitative models to make predictions, and can support or cause revisions of a particular conclusion.**Engaging in Argument from Evidence** - Students critique and consider the degree to which competing arguments are supported by evidence.  |

|  |
| --- |
| 8.LS4: Biological Change: Unity and Diversity |
| **Time Frame** | **Learning Outcomes/Activities** | **Online Resources** | **Crosscutting Concepts (CCC)****Science and Engineering Practices (SEP)** |
| 8.LS4.5 Obtain, evaluate, and communicate information about the technologies that have changed the way humans use artificial selection to influence the inheritance of desired traits in other organisms.  |
| 1 WeekQuarter 3X% of TNReady | 1. Research how scientists modify the traits of organisms (plants or animals) to produce offspring with more favorable characteristics. 2. Research an organism (plant or animal) that has been genetically modified to meet human needs or wants, including the process used to modify the organism.  \*Engage in argument over ethical creation and use of bio-engineered organisms.  | [multiple videos about artificial selection](https://www.hhmi.org/biointeractive/natural-and-artificial-selection)[multiple NGSS lesson plans and experiments](https://betterlesson.com/next_gen_science/browse/2238/ngss-ms-ls4-5-gather-and-synthesize-information-about-the-technologies-that-have-changed-the-way-humans-influence-the-inheritanc?from=domain_core_lesson_count) | **CROSSCUTTING CONCEPT:****Cause and Effect** - Students infer and identify cause and effect relationships from patterns. **SCIENCE AND ENGINEERING PRINCIPLE:** **Constructing Explanations and Designing Solutions** - Students form explanations using source (including student developed investigations) which show comprehension of parsimony, utilize quantitative and qualitative models to make predictions, and can support or cause revisions of a particular conclusion.  |

|  |
| --- |
| 8.ESS1: Earth’s Place in the Universe |
| **Time Frame** | **Learning Outcomes/Activities** | **Online Resources** | **Crosscutting Concepts (CCC)****Science and Engineering Practices (SEP)** |
| 8.ESS1.1 Research, analyze, and communicate that the universe began with a period of rapid expansion using evidence from the motion of galaxies and composition of stars. 8.ETS1.2 Research and communicate information to describe how data from technologies (telescopes, spectroscopes, satellites, and space probes) provide information about objects in the solar system and universe. |
| 3 WeeksQuarter 3X% of TNReady | 1. Research the relationship between energy and mass and the conversion between them.2. Describe the types of energy released by stars and where the energy comes from.3. Identify the composition of a star based on the color of the light released from that star.4. Create a demonstration of doppler shift and apply that demonstration to the movement of stars.5. Research evidence of the expansion of the universe including doppler shift.6. Create a presentation about the various technologies used to gather information about the universe. Include what data they gathered that support theories about planets or expansion of the universe.  | [article about big bang theory and other theories](https://science.howstuffworks.com/dictionary/astronomy-terms/universe-begin.htm)[another article](https://www.livescience.com/1774-greatest-mysteries-universe.html)[yet another article](https://www.space.com/13347-big-bang-origins-universe-birth.html)[NGSS lesson about expansion of the universe](https://betterlesson.com/lesson/641870/the-big-bang)[composition of stars with additional links](http://www.scholastic.com/browse/subarticle.jsp?id=2498)[article about stars with additional links](https://www.universetoday.com/130870/stars-different-colors/) | **CROSSCUTTING CONCEPT:****Energy and Matter** - Students track energy changes through transformations in a system. **SCIENCE AND ENGINEERING PRINCIPLE:** **Asking Questions (for science) and Defining Problems (for engineering)** - Questions originate based on experience as well as need to clarify and test other explanations or determine explicit relationships between variables. |

|  |
| --- |
| 8. ESS1: Earth’s Place in the Universe |
| **Time Frame** | **Learning Outcomes/Activities** | **Online Resources** | **Crosscutting Concepts (CCC)****Science and Engineering Practices (SEP)** |
| 8.ESS1.2 Explain the role of gravity in the formation of our sun and planets. Extend this explanation to address gravity’s effect on the motion of celestial objects in our solar system and Earth’s ocean tides.  |
| 1 WeekQuarter 3X% of TNReady | 1. Outline the process of planet formation and the forces involved.2. Create a model of the solar system including the forces of momentum and gravity.3. Discuss the reasons for tides and the alignment of the sun, Earth, and moon during spring and neap tides.  | [multiple NGSS lesson plans and experiments](https://betterlesson.com/next_gen_science/browse/2243/ngss-ms-ess1-2-develop-and-use-a-model-to-describe-the-role-of-gravity-in-the-motions-within-galaxies-and-the-solar-system?from=domain_core)[noaa.gov – info about tides with multiple links and videos](http://www.noaa.gov/resource-collections/tides)[NASA site with info and videos about planet formation](http://hubblesite.org/hubble_discoveries/discovering_planets_beyond/how-do-planets-form) | **CROSSCUTTING CONCEPT:****Scale, Proportion, and Quantity** -Students develop models to investigate scales that are beyond normal experiences. **SCIENCE AND ENGINEERING PRINCIPLE:** **Obtaining, Evaluating, and Communicating Information** - Students can evaluate text, media, and visual displays of information with the intent of clarifying claims, and reconciling explanations. Students can communicate scientific information on writing utilizing embedded tables, charts, figures, and graphs. |