East Penn School District

Curriculum and Instruction

Curriculum for: Science, Grade 6

Course(s): 6th Grade Science

Grades: 6th Grade

Department: Middle Level Science

Length of Period (average minutes): 41 min.

Periods per cycle: 6 periods

Length of Course (yrs): 1 year

Type of offering: required

Credit(s) awarded:

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ADOPTED: 2018

Enduring Understandings & Essential Questions	Knowledge	Skills	Standards
Enduring Understandings: ● Potential and kinetic energy determine the speed of an object. ● The motion of objects can be affected by many factors, including, speed, velocity, acceleration, inertia, mass and forces. ● Newton's Laws can be used to predict the motion of objects. Essential Questions: ● How do potential and kinetic energy relate to the motion of an object? ● How does time and distance affect speed? ● What changes in velocity cause acceleration? ● What factors cause an object to be in motion or be at rest?	● I can understand the difference between potential and kinetic energy and how they affect motion. ● I can explain how potential energy transfers into kinetic energy. ● I can explain how distance and time affect motion. (speed) ● I can explain the difference between speed, velocity, and acceleration. ● I can explain how changes in velocity affect acceleration. ● I can use acceleration to explain the motion of objects. ● I can explain how mass and force affect the motion of an object. ● I can describe motion in terms of an object's inertia. ● I can describe the motion based on the object's	● I can create a scenario in which I vary potential energy to create varying amounts of kinetic energy and identify the relationship in the transfer of energy. ● I can calculate speed using time and distance. ● I can calculate velocity. ● I can create and interpret real life scenarios dealing with speed and velocity. ● I can read, interpret, and apply data from a distance-time graph. ● I can use the formula to calculate acceleration. ● I can measure time and distance in order to calculate speed and visually represent with a graph. ● I can measure changes in velocity and describe those changes in terms of acceleration and visually represent with a graph. ● I can interpret a situation/scenario to	NGSS Standards: ● MS-PS2-1 Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.* [Clarification Statement: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.] [Assessment Boundary: Assessment is limited to vertical or horizontal interactions in one dimension.] ● MS-PS2-2 Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. [Clarification Statement: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units. [Assessment Boundary: Assessment is limited to forces and changes in motion in one-dimension in an inertial reference frame and to change in one variable at a time. Assessment does not include the use of trigonometry.] ● MS-PS3-1 Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. [Clarification Statement: Emphasis is on descriptive

● How does mass and force affect the motion of an object? ● How do magnetic forces affect motion?	mass and the size of the force applied. ● I can determine the action/reaction forces involved when a collision takes place. ● I can describe how motion changes when a magnetic force is applied.	determine which of Newton's Laws applies to it. ● I can design an investigation that compares unbalanced forces in a system that evaluates mass and changes in motion. ● I can design a solution to the problem involving the motion of two colliding objects. ● I can design a magnet car using three bar magnets and a toy car. ● I can describe the change in motion after altering the poles of a magnet. ● Students will be able to test different sized magnets and determine how they affect the speed of the car.	relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a wiffle ball versus a tennis ball.] ● MS-PS3-2 Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. [Clarification Statement: Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate's hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems.] [Assessment Boundary: Assessment is limited to two objects and electric, magnetic, and gravitational interactions.] ● MS-PS3-5 Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes,energy is transferred to or from the object. [Clarification Statement: Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.] [Assessment Boundary: Assessment does not include calculations of energy.]

			● MS-ETS 1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. ● MS-ETS 1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. ● MS-ETS 1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. ● MS-ETS 1-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
Enduring Understandings: ● The history of Earth can be understood through analyzing changes that have taken place over the past 4.6 billion years. ● Major and minor events change and shape the Earth's surface.	● I can explain Earth's history by looking at rock strata and fossils. ● I can describe how rocks can be given a relative age based on their relationship to other rocks. ● I can explain Earth's timeline. ● I can explain seafloor spreading causes plates to move. ● I can explain the theory of plate tectonics and use it to	● I can construct an explanation of rock strata by using index fossils and geological evidence, ● I can infer what fossils can tell you about Earth's past. ● I can analyze interpret data to prove plate movement. ● I can differentiate between the three types of plate boundaries. ● I can predict future plate movement based off of my knowledge of sea floor	NGSS Standards: ● MS-PS4-1 (Waves) Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. [Clarification Statement: Emphasis is on describing waves with both qualitative and quantitative thinking.] [Assessment Boundary: Assessment does not include electromagnetic waves and is limited to standard repeating waves.] ● MS-ESS1-4 Construct a scientific explanation based on evidence from rock strata for how the

● Resources are unevenly dispersed throughout the Earth. ● Data is used to predict future geological events and use technology to lessen their impact. Essential Questions: ● How do fossils and the patterns of layering of rock tell a story about Earth's past? ● How do plate movements shape the Earth's surface? ● How do volcanic eruptions and earthquakes shape the Earth's surface? ● What evidence is used to prove plate movement? ● How have geological factors contributed to the uneven distribution of natural resources? ● How can technology be used to lessen the impact of a potential geologic event?	describe changes on the Earth. ● I can explain continental drift theory and use it to describe changes on the Earth. ● I can describe how convection and plate tectonics drive continental drift. ● I can explain Wegner's contribution and apply his theory to explain movement. ● I can use fossil evidence to support continental drift theory. ● I can identify changes of the Earth through the use of model of Pangea. ● I can explain the layers of Earth and their relationship to plate movement. ● I can explain how plate movements result in plate-boundary interactions that produce volcanoes, earthquakes, and continental drift. ● I can describe how plate movements create volcanoes and earthquakes. ● I can indicate how plate movements shape the Earth's surface. ● I can discuss the impact of earthquakes and volcanoes on the Earth's surface.	spreading and the theory of continental drift. ● I can model continental drift that has occurred on Earth. ● I can create a model of plate-boundary interactions. ● I can model convection currents. ● I can analyze volcano and earthquake data for patterns and use those patterns for predictions. ● I can make predictions of future volcanoes and earthquakes based on plate movements and inform the development of technologies to mitigate their effects. ● I can analyze seismograph data to explain plate motion. ● I can simulate plate interactions to produce various landforms. ● I can research different impacts of earthquakes and volcanoes on Earth's surface and its inhabitants. ● I can compare and contrast natural resources to explain their distribution throughout the world. ● I can analyze the geological factors related to how/why natural resources are distributed throughout the world and construct a	geologic time scale is used to organize Earth's 4.6-billion-year-old history. [Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.] [Assessment Boundary: Assessment does not include recalling the names of specific periods or epochs and events within them.] ● MS-ESS2-2 Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. [Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.]

● How does the energy of a wave impact its amplitude, frequency, and length?	● I can identify new technology advances and explain how they can be used to keep people safe from geologic events. ● I can research natural resources and explain the geological factors that have contributed to their uneven distribution. ● I can explain the unequal distribution of natural resources and identify how they change due to human impact. ● I can identify the parts of a wave. ● I can recognize the relationship between the energy of a wave and its amplitude, frequency, and length. ● I can generalize my knowledge of waves to seismograms and tsunamis.	scientific explanation explaining those factors. ● I can create a model of natural resources distribution throughout the world. ● I can infer how humans cause the depletion of natural resources. ● I can compare and contrast different waves to determine frequency. ● I can use mathematical representations to describe a simple model for waves that include how the amplitude of a wave is related to the energy in a wave. ● I can create a model of a wave and identify the parts. ● I can analyze wave patterns to explain seismograph data. ● I can analyze data to make predictions about tsunamis.	● MS-ESS2-3 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. [Clarification Statement: Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches).] [Assessment Boundary: Paleomagnetic anomalies in oceanic and continental crust are not assessed.] ● MS-ESS3-1 Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. [Clarification Statement: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).] ● MS-ESS3-2 Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. [Clarification Statement: Emphasis is on how some natural hazards, such as volcanic

			eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).] ● MS-ETS 1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
Enduring Understandings: ● Populations in ecosystems are affected by biotic and abiotic factors. ● The biodiversity of an ecosystem plays a vital role in the sustainability of an ecosystem.	● I can identify and explain biotic and abiotic factors in an ecosystem. ● I can identify and explain an ecosystem service. ● I can identify aspects of a biome. ● I can identify an individual, population, community, or ecosystem. ● I can explain the relationships between	● I can make observations and inferences based on a scenario. ● I can make detailed observations of living organisms and the changes they undergo. ● I can analyze an ecosystem for its services and explain the importance of each service to humans.	NGSS Standards: ● MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]

Essential Questions: ● What does an organism need to survive? ● What is the relationship between individuals, populations, and communities in an ecosystem? ● What is needed to sustain a food chain? ● How does the cycling of matter and flow of energy affect a food chain? ● Why is biodiversity important in an ecosystem? ● What are the impacts of humans on the ecosystem?	individuals, populations, communities, and ecosystems. ● I can explain how biotic and abiotic factors affect an ecosystem. ● I can explain the difference between a food chain and a food web. ● I can identify producers, consumers, and decomposers in a food web. ● I can demonstrate understanding by showing how trophic levels affect each other. ● I can define a habitat and explain how it is different than an ecosystem. ● I can identify an aquatic and terrestrial ecosystem. ● I can identify a predator and prey in an ecosystem. ● I can explain the importance of the predator/prey relationship and the impact it has on an ecosystem. ● I can identify processes that require energy. ● I can explain the role of energy through a food chain.	● I can classify organisms as either an individual, population, community, or ecosystem. ● Within a biome, I can analyze the relationship between the organisms in their classifications. ● I can create a food chain and food web that show how energy is transferred. ● I can create and analyze a food web based on a given scenario. ● I can classify an organism as a predator or prey in a given specific scenario. ● I apply appropriate biotic and abiotic factors that are needed for an organism's survival within a specific habitat. ● I can categorize and explain the role of energy in daily activities. ● I can create a model that shows the flow of energy through the food chain/web. ● I can implement variables in an experiment and determine if that variable affected the outcome. ● I can analyze charts and diagrams to determine	● MS-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. [Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.] ● MS-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. [Clarification Statement: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.] [Assessment Boundary: Assessment does not include the use of chemical reactions to describe the processes.] ● MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.] ● MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.* [Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution

	● I can identify factors that make a food chain sustainable. ● I can identify and explain factors that impact food chains. ● I can explain a decomposer's role in the ecosystem. ● I can understand that energy decreases as trophic levels increase. ● I can identify and explain limiting factors in a habitat/ecosystem. ● I can identify and explain factors that determine population growth in a habitat. ● I can identify and explain the importance of a diverse ecosystem. ● I can identify and explain non-native impacts on an ecosystem. ● I can differentiate between native, introduced, and invasive species.	trends and patterns in data. ● I can analyze the diversity of an ecosystem and make predictions about its sustainability. ● I can determine how introduced species become invasive species and negatively impact the ecosystem.	constraints could include scientific, economic, and social considerations.] ● MS-ETS1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

Materials and Resources: