East Penn School District

Curriculum and Instruction

Curriculum for: Science, Grade 8

Course(s): 8th Grade Science

Grades: 8th 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:

Developed by: M. Harned and H. Slatoff

ADOPTED: 2018

Enduring Understandings & Essential Questions	Knowledge	Skills	Standards
Enduring Understandings: ● Earth's place in the universe affects life on Earth. ● The tilt of the Earth and its axis as it rotates causes seasonal changes. Tides, solar eclipses, and lunar eclipses result from specific positions of the Earth, Sun and Moon. ● The planets in our Solar System have a predictable orbit around a central star. Each has their own specific size, distance, and attributes. ● Gravity is a force that has a direct relationship with mass within the Universe. This force is responsible for the creation of Stars, Planets, Solar Systems, and Galaxies while maintaining predictable patterns.	● Earth's place in the universe affects life on Earth. ● The tilt of the Earth and its axis as it rotates causes seasonal changes. Tides, solar eclipses, and lunar eclipses result from specific positions of the Earth, Sun and Moon. ● The planets in our Solar System have a predictable orbit around a central star. Each has their own specific size, distance, and attributes. ● Gravity is a force that has a direct relationship with mass within the Universe. This force is responsible for the creation of Stars, Planets, Solar Systems, and Galaxies while maintaining predictable patterns. ● All stars begin their life in a similar pattern.	● Students will define the qualities required for life to exist. ● Students will create/design a Sun, Earth, Moon model that explains eclipses, lunar phases, seasons, and rotation/revolution. ● Students will create a model to represent size, scale, distance, and properties of objects in our solar system. Models will include the individual attributes of the planets in the solar system including satellites, rings, atmosphere, temperature, composition, rotation and revolutions; distance from the sun is represented in kilometers and astronomical units (AU's). ● Students will explore the similarities and	NGSS Standards: ● MS-PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. [Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.] [Assessment Boundary: Assessment is limited to qualitative applications pertaining to light and mechanical waves.] ● MS-ESS1-1. Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. [Clarification Statement: Examples of models can be physical, graphical, or conceptual.] ● MS-ESS1-2 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. [Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as students' school or state).] [Assessment Boundary: Assessment does not include Kepler's Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth.]

● All stars begin their life in a similar pattern. Dependent upon its mass, a star will exhibit different characteristics and patterns that can shape our Universe. ● Scientists use and interpret evidence and data to apply scientific principles in designing a solution to problem. Essential Questions: ● How is the Universe organized? ● Why do the movement and relative position of the Sun - Earth - Moon System cause changes? ● What is the role of gravity in the solar system? ● Why do humans explore space?	Dependent upon its mass, a star will exhibit different characteristics and patterns that can shape our Universe. ● Scientists use and interpret evidence and data to apply scientific principles in designing a solution to problem.	differences between comets, asteroids, and meteors by designing an experiment to see the impact of cosmic collisions between these objects and solar system planets and satellites by determining the relationship between various-sized objects, impact speed and crater size. The students will then propose at least one way to prevent a near-Earth object from impacting Earth. ● Students will create a model that demonstrates gravity and its effect on our Solar System including the relationship between mass and weight and gravity. ● Students will view the life and death of different stars and determine the commonalities of the attributes of stars that have a similar life cycle. They will create	● MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system. [Clarification Statement: Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects. Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models.] [Assessment Boundary: Assessment does not include recalling facts about properties of the planets and other solar system bodies.] ● MS-PS2-4 Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. [Clarification Statement: Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system.] [Assessment Boundary: Assessment does not include Newton's Law of Gravitation or Kepler's Laws.] ● MS-PS2-5 Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. [Clarification Statement: Examples of this phenomenon could include the interactions of magnets, electrically-charged strips of tape, and electrically-charged pith balls. Examples of investigations could include first-hand experiences or simulations.] [Assessment Boundary: Assessment is

		a stellar life cycle flow chart. ● Students will create a model that discovers the relationship between temperatures and absolute brightness of stars. ● Students will evaluate relevant data of solar characteristics, distance, suitability for life, and available resources to determine future habitability of an exoplanet. After completing an evaluation of data and research, students will make argument about which exoplanet the first mission should be sent to and communicate their findings to their peers.	limited to electric and magnetic fields, and limited to qualitative evidence for the existence of fields.] ● MS-ETS1-1.Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
Enduring Understandings: ● The surface of Earth is largely covered with water, most of which is saltwater found in oceans. Only fresh-water is drinkable, and it is found on the land	● Water has unique properties: capillary action, surface tension, universal solvent, and specific heat. The chemical composition of water is H2O and it is a polar molecule. ● Clean water is essential for human survival.	● Students will define the properties of water in terms of the observed characteristics. ● Students will create a model of a water molecule which demonstrates the concept of polarity.	NGSS Standards: ● MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures. [Clarification Statement: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could

(surface water), beneath the ground (groundwater), and frozen in glaciers. ● Clean water is an invaluable resource in limited supply. ● Water can be purified using various physical, biological, and chemical processes. ● Water moving across the Earth's surface is affected by the shape and slope of the land and the properties of the surface materials it encounters. ● The Earth's surface is shaped by weathering and erosion geoscience processes including movement of water, wind, and ice. ● Water continuously circulates throughout the Earth and its atmosphere. The Earth's water enters the atmosphere through evaporation from bodies of water and from ground surfaces.	○ Water can be purified using various physical, biological, and chemical processes. ○ Methods of distillation. ● Humans have the power to conserve this resource. ● Water cycles through the earth's atmosphere through phase changes powered by the sun and flows to the lowest point of the topography collecting in surface water and trickles through the Earth collecting in groundwater. ● The movement of water in the atmosphere and across the surface of the Earth causes weathering and erosion thus shaping the Earth. ● That water is a finite resource on Earth and that water moves through the Earth	● Students will design a desalination process to create potable water. ● Students will design a water distillation system and communicate their findings about water purity. ● Students will describe the distribution of Earth's water and causes for that distribution. ● Students will collect and analyze personal water use data to compare it to peers, national, and international per capita usage. ● Students will examine the impact of human water consumption and propose ways to mitigate human impact. ● Students will identify types of water pollution and design a method to purify polluted water. ● Students will model the phase change of water including representation of the	include drawings, 3D ball and stick structures, or computer representations showing different molecules with different types of atoms.] [Assessment Boundary: Assessment does not include valence electrons and bonding energy, discussing the ionic nature of subunits of complex structures, or a complete description of all individual atoms in a complex molecule or extended structure is not required.] ● MS-PS3-4 Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. [Clarification Statement: Examples of experiments could include comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.] [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.] ● 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-ESS2-1. Develop a model to describe the cycling of Earth's materials and the flow of energy that

Essential Questions: ● How does the sun cycle water through Earth's systems? ● How do weathering and erosion processes create and shape the surface of the Earth? ● How do human activities impact the quality of Earth's water resources?	being naturally cleaned and reused again and again.	energy before and after the transfer in the form of temperature changes or motion of object. ● Students will model the cycling of water through the Earth and its atmosphere. ● Students will compare and contrast the major agents of erosion and deposition of sediments: running water, moving ice, wave action, wind and mass movement due to erosion. ● Students will trace water through the hydrological cycle to include locations in the Earth and the atmosphere and the human impacts encountered along the way.	drives this process. [Clarification Statement: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.] [Assessment Boundary: Assessment does not include the identification and naming of minerals.] ● 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.] ● MS-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. [Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.] [Assessment Boundary: A quantitative understanding of the latent heats of vaporization and fusion is 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-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*[Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).] ● MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. [Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in

			human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.]
Enduring Understandings: ● Weather is defined as the exact conditions of a set place and time. ● Weather conditions can vary between cities due to their location on Earth in relation large bodies of water, elevation, and unequal heating by the Sun. ● Earth is surrounded by layers of gases (atmosphere) that influence the environment and support life. ● Different surfaces on Earth absorb and release solar energy at different rates. ● Climate is average weather conditions in a place over time. Climate can change due to natural and human impacts. ● Destructive weather occurs when there is unequal heating,	● Weather is defined as the exact conditions of a set place and time. Conditions can vary between cities due to their location on Earth in relation large bodies of water, elevation, and unequal heating by the Sun. ● Earth is surrounded by layers of gases (atmosphere) that influence the environment and support life. Different surfaces on Earth absorb and release solar energy at different rates. ● There are six main components, or parts, of weather. They are temperature, atmospheric pressure, wind, humidity, precipitation, and cloudiness. Together, these components describe the weather at any given time.	● Students will Adopt a United States City and get to know this city through research of location, land features, historical weather events, and personality. They will present their finding through a City Travel Fair. Students will learn to read the weather report for their adopted cities. ● Students will construct a model that demonstrates a relationship between a method of Earth's heat transfer and weather which incorporates understanding of density and temperature. ● Students will build a weather data collection tools" barometer, rain gauge, wind vane, and thermometer, for a schoolyard weather station. Though the	NGSS Standard: ● MS-ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. [Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).] [Assessment Boundary: Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations.] ● MS-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents.

pressure, and temperature interacting over a particular location. ● Current conditions and climate trends are analysed to predict future weather. These predictions utilize tech to prevent loss and destruction to mitigate catastrophic weather events. Essential Questions: ● How do water and solar energy interact to influence weather? ● How does the uneven heating of Earth's surface and the Earth's rotation cause oceanic and atmospheric circulation? ● How does the global climate change over time?	● Bodies of air with similar temperature, pressure, and humidity form air masses.The types of air masses are determined by their location in terms of land, water, and relationship to the equators and poles. When unlike air masses meet, fronts form. ● Destructive weather occurs when there is unequal heating, pressure, and temperature interacting over a particular location. ● Climate is average weather conditions in a place over time. Climate can change due to natural and human impacts. ● Weather has impact on the daily life of all individuals. ● Meteorologists interpret current conditions and climate trends to predict future weather. They also utilize tech to prevent loss and	reading of weather instruments and observation of current conditions, students will learn the main components of weather and how they are used to predict upcoming weather. ● Students will analyze weather maps to determine the effects of air masses and ocean currents in the creation of fronts and the weather resulting from these phenomenon. ● Students will analyze weather maps to determine the effects of air masses and ocean currents in the creation of fronts and the weather resulting from these phenomenon. ● Student will analyze maps of a variety of cities experiencing storm conditions; analyze data to identify the storm affecting the city and match forecasts with given map conditions.	Examples of models can be diagrams, maps and globes, or digital representations.] [Assessment Boundary: Assessment does not include the dynamics of the Coriolis effect.] ● 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-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.* [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development,

	destruction to mitigate catastrophic weather events. ● Weather is an unpredictable "pattern" that has complex interaction between humans and the environment.	● Students will develop models to collect evidence supporting the claim of global climate change and create a solution to mitigate human impact. ● Students will investigate jobs in weather or affected by weather by reaching out to a professional in their chosen field and create a career trading card of the profession of their choice. ● Students will use real-time weather data including temperature, relative humidity, humidity, wind speed/direction, dew point, air masses, fronts, air pressure, precipitation, jet stream, cloud cover, and maps to produce a weather report for a given city.	agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).] ● MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. [Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.] ● MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. [Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.]

Materials and Resources: