Grade 8 curriculum roadmap
Physical Science

Module: STC: Matter and Its Interactions

Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
1: Pre-Assessment: Matter and Its Interactions	What do you know about matter?	Students perform short, simple investigations that evaluate their existing knowledge of one or more concepts related to matter and its interactions. Student Reading: What is Matter? Where Did Matter Come From?	discuss students current understanding of matter, describe the properties of matter, organize analyze and interpret data, read about measurement and states of matter	5	matter, dissolve, effervescent, element, filter, gas, insoluble, liquid, mixture, physical change, solid, soluble			Pre-assessment and self-assessment. Extension address myths and theories of matter creation and origin.	circuit of stations, reflections, self assessment	8 short investigations and self-assessment
2: The Nature of Matter	What can properties of matter help you determine?	Students investigate characteristics of matter. Students are introduced to physical and chemical properties and make simple observations of stubstances they will use later in the unit. Studets are introduced to the concelp that different substances react chemically in different ways	learn about chemical and physical properties that could be used to identify a substance, organize analyze and interpret data on characteristic properties of substances of known and unknown substances, identify substances in an unknown mixture, use experimental evidence to argue that a new substance forms and a chemical reaction occurs; read about atoms and molecules,variables and controls, acids and bases, alchemy into chemistry, malleability and flammability,	7	atom, chemical change, chemical property, mass, matter, molecule, particles, physical change, physical property, predict, volume, characteristic property, crystal, dissolve, solubility, controlled experiment, dependent variable, independent variable, modification, reactivity, variable, flammability, malleability	8.PS.5 8.PS.6	8.PS.5 Investigate the property of density and provide evidence that properties, such as density, do not change for a pure substance. 8.PS.6 Compare and contrast physical change vs. chemical change. Analyze the properties of substances before and after substances interact to determine if a chemical reaction has occurred.	Patterns, cause and effect, energy and matter. Use appropriate tools strategically. Historical perspective of alchemy, malleability, and flammability	planning and carrying out investigations, analyzing and interpreting data, make observations, analyze and interpret properties of mystery samples, determine if a chemical reaction takes place, compare and contrast known and unknown samples	investigations divided into four sections: 1 - properties of mystery samples, 2-observing physical properties, 3- reactivity of iron, 4 - using properties to identify an unknown

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3. Density Makes a Difference	How can density be used to identify a substance and predict how it will behave under different conditions?	Students will focus on one characteristic physical property of substances: density. Students will calculate density of of regular and irregular solids and liquids. Use density to identify liquids and design a density bottle.	describe how density can be used to identify substances; liquid density investigation; irregularly shaped object density; density columns; explain real-life phenomena; read density as a physical property, calculating density, Archimedes, panning for gold and applications in panda fertility,	8	density, mass, model, physical property, volume, characteristic property, modification, predict, diagram, particle, contraction, expansion	8.PS.5	8.PS.5 Investigate the property of density and provide evidence that properties, such as density, do not change for a pure substance.	patterns, cause and effect, scale, proportion, and quantity. Use mathematical tools appropriately, apply and extend previous understandings of arithmetic to algebraic expressions	developing and using models, analyzing and interpreting data, determine mass and volume, calculate density, displacement, floating and sinking, explain common events by applying density principles	dived into 5 investigation sections: 1 - measuring mass, volume and density of liquids, 2 - comparing densitites, 3 - measuring the density of irregular objects, 4 - building a density column, 5 - building a density bottle Detailed investigation of density as a physical property

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4: Just a Phase	How is energy related to physical changes in matter?	Students investigate phase changes and use models to articulate relationships and connections among particle otion, kinetic energy, temperature, and state of matter when thermal energy is added or removed from a system. Students answer questions related to conservation of matter.	Observe and use models to represent phase changes, observe and use models to represent diffusion, investigate mass of a closed system, use computer simulations to observe molecular-level models and compare data collected, discuss advantages and disadvantages of models used; Read about thermal energy, phase change, kinetic-molecular theory, temperature measurement scales, chocolate and crude oil applications	6	Boiling, condensation, evaporation, gas, liquid, phases of matter, solid, states of matter, temperature, heat, kinetic energy, particle, system, thermal energy, Celsius, dependent variable, freezing, freezing point, independent variable, mass, melting, melting point, phase change, sublimation	8.PS.2	8.PS.2 Illustrate with diagrams (drawings) how atoms are arranged in simple molecules. Distinguish between atoms, elements, molecules, and compounds.	Cause and effect, scale, proportion, and quantity, systems and system models, energy and matter	Developing and using models, investigating, analyzing and interpreting data, constructing explanation, obtaining, evaluating, and communicating information	Section divided into 3 investigations: 1 – heating ice water, 2 – investigating mass and melting, 3 – states of matter Introductory standard addressing phases and general atom/ molecule arrangement. Does not nearly address total standard.

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5: Building Blocks of Matter	How can you use a model to describe the composition of matter?	Students rotate through stations to collect information about 16 different element samples. Next, students combine elements and create models of simple molecules using plastic atoms and computer simulations.	Describe atomic composition of substances containing calcium; observe and classify elements according to their physical and chemical properties; use plastic models to describe the atomic composition of simple molecules; use computer representations to model the atomic composition of simple molecules; identify patterns in the molecules formed by elements in the same group, periodic table patterns; Read about atoms and molecules, making and	7	Atom, bond, compound, element, molecule, periodic table, chemical reaction, crystals, particle, periodic table, physical property	8.PS.2 8.PS.3 8.PS.4 8.PS.5	8.PS.2 Illustrate with diagrams (drawings) how atoms are arranged in simple molecules. Distinguish between atoms, elements, molecules, and compounds. 8.PS.3 Use basic information provided for an element (atomic mass, atomic number, symbol, and name) to determine its place on the Periodic Table. Use this information to find the number of protons, neutrons, and electrons in an atom. 8.PS.4 Identify organizational patterns (radius, atomic number, atomic mass, properties and radioactivity) on the Periodic Table. 8.PS.5 Investigate the property of density and provide evidence that	Patterns, scale, proportion, quantity, systems and system models, structure and function	developing and using models, analyzing and interpreting data, using mathematics and computational thinking	Section divided into 3 investigations; 1- examining and grouping elements, 2 – making molecular models, 3 – build a molecule Standard 8.PS.3 can be addressed by extending the “reflecting on what you’ve done” Little Boxes and Mendeleev readingswith additional information and practice determining the number of protons, neutrons, and electrons Standard 8.PS.5 - the concepts of physical and chemical properties is introduced in investigation 5.1 and can easily be expanded upon to address standard fully This would be an ideal location to add the content included in standards 8.PS.1 (Create models to represent the arrangement and charges of subatomic particles in an atom (protons, neutrons and electrons). Understand the significance that the currently 118 known chemical elements combine to form all the matter in the universe.)

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6: Pure Substances and Mixtures	How can mixtures be separated?	Students observe and describe samples of pure substances and mixtures. Students use chromatography to separate inks, and distill flavoring from a carbonated beverage. Students apply engineering skills to design a method for removing impurities from rock salt.	Use cards and computer simulation to model and describe elements, compounds, and mixtures and how behavior depends on atomic and molecular structure; Identify pure substances, mixtures, and heterogeneous substances; Conduct ink chromatography; Distill a flavored carbonated beverage; Develop a procedure for cleaning impurities from rock salt; Read about elements, compounds, and mixtures, methods	9	Heterogeneous, homogeneous, mixture, pure substance, separations, conductivity, model, solute, solution, solvent, component, compound, dissolves, chromatograph, reagent, distillation, mixture, condense, evaporate	8.PS.2	8.PS.2 Illustrate with diagrams (drawings) how atoms are arranged in simple molecules. Distinguish between atoms, elements, molecules, and compounds.	Patterns, scale, proportion, and quantity	Asking questions and defining problems, developing and using models, planning and carrying out investigations, engaging in argument from evidence, obtaining, evaluating, and communicating information	Section divided into 5 investigations: 1 – sugar and salt solutions, 2 – observing and identifying pure substances and mixtures, 3 – analyzing inks, 4 – separating mixtures by distillation, 5 – cleaning rock salt

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7: Reacting Chemicallly	How can the properties of matter be used to determine if a chemical reaction has occurred?	Students analyze and interpret data on the properties of substances before and after different chemical reactions. Students also use their data to support the claim that a new substance has been formed. Chemical reactions include: the electrolysis of water; formation of precipitates; and combination of sodium bicarbonate, calcium chloride, and phenol red.	Understand that chemical reactions change properties of substances and atomic composition; Diagram and identify products of the electrolysis of water; Plan and conduct an investigation in precipitate formation; Conduct investigations and determine if a chemical reaction has taken place; Relate how atomic –level structure affects physical changes and chemical reactions; Read about chemical reactions, electrolysis,	6	Atom, chemical bond, chemical change, chemical reaction, diagram, molecule, physical change, product, reactant, compound, conductivity, diagram, electrolysis, element, mixture, model, solution, substance, characteristic property, precipitate, solubility, contraction, expansion	8.PS.6	8.PS.6 Compare and contrast physical change vs. chemical change. Analyze the properties of substances before and after substances interact to determine if a chemical reaction has occurred.	Patterns, cause and effect, interdependence of science, engineering, and technology	Developing and using models, planning and carrying out investigations, analyzing and interpreting data, engaging in an argument from evidence, obtaining, evaluating, and communicating information	Section divided into 3 investigations; 1 – electrolysis of water, 2 – formation of a precipitate, 3 – reaction in a bag

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8: Releasing Energy	What is the relationship between changes in substances and changes in thermal energy?	Students investigate a physical change that releases energy (dissolving calcium chloride in water). Next, students use data from their investigation to design a device that provides hear on demand: an instant hot pack.	Describe system components that release or absorb thermal energy; Investigate how changing the mass of a component relates to changes in thermal energy; Apply engineering process skills; Track the transfer of energy; Real-world application of thermal energy transfer ; Read about chemical engineering, heat, snow melt chemistry, chemical reactions and MREs	5	Chemical change, constrains, criteria, kinetic energy, physical change, chemical energy, dependent variable, independent variable, model, diagram, prototype, energy transfer, dissolve, freezing, heat, melting, temperature, chemical reaction	8.PS.6 6-8. E.1 6-8.E.2 6-8.E.3 6-8.E.4	8.PS.6 Compare and contrast physical change vs. chemical change. Analyze the properties of substances before and after substances interact to determine if a chemical reaction has occurred. 6-8.E.1 Identify the criteria and constraints of a design 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. 6-8.E.2 Evaluate competing design solutions using a systematic process to identify how well they meet the criteria and constraints of the problem. 6-8.E.3 Analyze data	Patterns, cause and effect, scale, proportion, and quantity, systems and system models, energy and matter, STEM influence	Asking questions and defining problems, developing and using models, investigating, analyzing and interpreting data, using mathematical and computational thinking, constructing explanation and designing solutions	Section is divided into 2 investigations; 1 – measuring thermal energy release, 2 – solution for heat on demand Standard 8.PS.6 focus is on endothermic and exothermic reactions Investigation 8.2allows for a complete cycle of the engineering process

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9: Conservation of Matter	What happens to matter in a chemical reaction	Students will apply their understanding of the law of conservation of matter to create models that explain situation in which matter seems to appear or disappear. Chemical reactions include dissolving an effervescent tablet in water and burning steel wool.	Conduct an investigation to compare the mass of reactants and the mass of products; Construct a generalized law of conservation of mass; Make predictions and evaluate data to determine law of conservation of mass; Describe law of conservation of mass at the atomic and molecular level; Read about dissolving, law of conservation of mass development	4	Diagram, evaporate, mass, physical change, system, chemical reaction, Law, Law of conservation of matter, product, reactant, predict, experiment	8.PS.7	8.PS.7 Balance chemical equations to show how the total number of atoms for each element does not change in chemical reactions and as a result, mass is always conserved in a closed system. (Law of Conservation of Mass.)	Patterns, systems and system models, energy and matter	Developing and using models, investigating, analyzing and interpreting data, using mathematics and computational thinking, constructing explanation and designing solutions, engaging in argument from evidence	Section is divided into 2 investigations; 1 – matter does not disappear, 2 – matter does not appear Introduction and explanation of the Law of conservation of mass, but does not address or practice balancing chemical equations. This lesson/skills must be addressed to fully meet the criteria for the standard

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Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
10: Compounds from Natural Resources	How are synthetic compounds made and used?	Students read about and investigate natural resources that undergo chemical reactions to produce synthetic materials. Students plan and conduct an investigation to determine which solutions can be combined with sodium alginate to form a gelatinous product.	Synthesize alginate gel and observe and interpret the results of mixing sodium alginate with three salts; Identify patterns and relationships based on chemical reactions; Conduct and present research on synthesized compound; Explain benefits and detriments of synthetic compounds; Read about synthetic compounds, branches of chemistry, polymers, plastics, biodiesel, medicines, real world applications;	6	Biochemistry, materials science, organic chemistry, synthetic compound, monomer, polymer, organic polymer, petrochemical, petroleum	8.PS.6	8.PS.6 Compare and contrast physical change vs. chemical change. Analyze the properties of substances before and after substances interact to determine if a chemical reaction has occurred.	Patterns, structure and function, influence and interdependence of STEM	Developing and using models, investigating, analyzing and interpreting data, constructing explanation and designing solutions, basing scientific knowledge on empirical evidence	Section has only one investigation that is engaging, but not strongly connected to standard requirements except another example of a chemical reaction

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Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
11: Assessment: Matter and Its Interactions	How can we use our knowledge of matter and its interactions to solve problems?	This unit concludes with a two-part assessment. The first part is a performance assessment, in which students demonstrate their content knowledge and science and engineering skills to design a cold pack using one of the five chemical compounds. Students must set up their own experiments and justify their selection based on safety for humans, safety for the environment, and cost of material per gram. In the second part, students complete a written assessment covering the performance expectations, disciplinary core ideas, crosscutting concepts, and science and engineering practices covered in this unit.		5	All previously listed	6-8.E. 1-4 8.PS. 2-7	All engineering standards Physical standards 2-7. Will need to be amended to include additional concepts from standards 8.PS.1, 8.PS.5, 8.PS.7			

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Module: STC Understanding Weather and Climate

Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
Part 1: Storms and Weather Lesson 1	What do you already know about the earth's weather and climates, as well as the difference between weather and climate?	Initial assessment of student understanding of weather and its occurrences. Make concept maps.	Assess students' pre-existing ideas and questions about weather and climate	2	Climate, concept map, hurricane, tornado, weather, drought, flood, globe, map, atmospheric scientist, climatologist, meteorologist, oceanographer, satellite, sensor			Natural hazards, science careers in weather and climate	Create concept maps, images of the earth – using a globe and world map	No correlation
Part 1: Storms and Weather Lesson 2: Introducing Storms	How does air move in a tornado or hurricane?	Patterns in photos and satellite views. 2.1 Effects of pressure on a vortex in a bottle. Reading about thunderstorms, tornadoes, and hurricane and measurement scales.	Model the movement of air in a tornado or hurricane, define vortex; Read about weather alerts vs. warnings, vortices, thunderstorm, tornadoes, and hurricanes	2	Cloud, hurricane, satellite image, tornado, vortex, dust devil, Enhanced Fujita sale, precipitation, Saffir-Simpson scale, thunderstorm, typhoon, waterspout			Satellite images, natural hazards	Model a vortex	No correlation

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Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
Part 1: Storms and Weather Lesson 3: Heating Earth's Surfaces	What drives the weather? How do earth's surfaces receive and give off heat?	3.1 Collect data on heating and cooling of soil and water. Introduction to uneven heating and convection currents. Parts of earth's atmosphere. Readings introduce concept of the sun as the hear engine and generator of the earth's weather, and origins of National weather forecasting system. Begin to differentiate between weather and climate.	Investigate rates of heating and cooling soil and water; Describe the atmosphere and its layers; Explain what happens to energy from the sun when it reaches the earth. – conduction, convection, radiation; Read about weather vs. climate, source of earth's heat, atmosphere, weather forecasting history	2	Controlled experiment, cyclone, hurricane, thunderstorm, tornado, typhoon, axis, digital thermometer, graph, unit, variable, carbon dioxide, chlorofluorocarbon, climate, equinox, exosphere, greenhouse effect, mesosphere, meteorology, methane, nitrogen nitrous oxide, ozone, stratosphere, thermosphere, troposphere, ultraviolet ray, weather	8.ESS.2	8.ESS.2 Create a diagram or carry out a simulation to describe how water is cycled through the earth's crust, atmosphere and oceans. Explain how the water cycle is driven by energy from the sun and the force of gravity.	Conducting a controlled experiment	Observe, graph, analyze data, compare, explain, describe, devise a controlled experiment	Great opportunity to work on process skills (SEPS.)Examines sun's heat energy and effects on earth, doesn't specifically mention driving water cycle (8.ESS.2) This would be good to be included in discussion and final conclusions.

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Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
Part 1: Storms and Weather Lesson 4: Heat Transfer and the Movement of Air	What happens to air when it is heated or cooled by the surface beneath it? How does heat move between the earth's surface and the air above it?	4.1 Observe the behavior of air masses formed over warm and cool surfaces. 4.2 Uneven heating and how warm and cool air move.	Investigate the effect of surface temperature on the temperature of the air above the surface; Determine this basic conditions under which water moves through the air; Read about movement of warm and cold air masses, work of a weather forecaster	2	Temperature, controlled experiment, convection tube, digital thermometer, variable, condensation, evaporation, anemometer, barometer, Doppler radar, frequency, microwaves, Nowcasting, stable air mass, unstable air mass	8.ESS.2 processes	8.ESS.2 Create a diagram or carry out a simulation to describe how water is cycled through the earth's crust, atmosphere and oceans. Explain how the water cycle is driven by energy from the sun and the force of gravity.	Weather forecasting, compare and analyze data	Analyze data, observe air mass movement	Process skills utilized with investigation Investigates air mass movement and density due to heating and cooling. Does not address water movement directly, teacher must make connection
Part 1: Storms and Weather Lesson 5: Convection Currents in the Air	What happens when air masses of different temperature and humidity conditions meet?	5.1 Observe convection currents, colliding air masses, and apply to the formation of fronts that generate land and sea breezes, global winds, the jet stream, storms, and tornadoes described in readings.	Investigate what happens to two air masses when they meet, convection currents and weather fronts; Explain how wind forms; Read about weather fronts, tornadoes, land and sea breezes, monsoons, global winds, and the jet stream	2	Air mass, humidity, temperature, convection current, humidity, variable, weather front, cold front, Dixie Alley, easterlies, global winds, jet stream, land breeze, monsoon, occluded front, sea breeze, tornado alley, trade winds, warm front, water spout weather front, westerlies	8.ESS.2	8.ESS.2 Create a diagram or carry out a simulation to describe how water is cycled through the earth's crust, atmosphere and oceans. Explain how the water cycle is driven by energy from the sun and the force of gravity.	Natural hazards	Investigate, analyze observations, develop working definitions	Standard 8.ESS.2 concepts about weather and air movement are addressed, although nothing directly related to the water movement ideas is standard is directly addressed, teacher must make connection

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Part 1: Storms and Weather Lesson 6: Temperature, Pressure, and Cloud Formation	How does water evaporate and condense as clouds? How does air pressure affects cloud formation?	6.1 Observing evaporation and condensation 6.2 Effect of air pressure on condensation and evaporation by changing the pressure on moisture laden air – formation of clouds. Movement of air masses with different properties. Collect local weather data and look for patterns. Reading about hurricane formation and the water cycle and air pressure	Collect and analyze weather information including maps and data; Model and describe how water evaporates and condenses and how clouds form; Complete and present a project on weather observations and predictions; Read about the process of cloud formation, air pressure	4	Cloud, high-pressure system, low-pressure system, condensation, evaporation, water cycle, water vapor, air pressure, cloud formation, barometric pressure, cirrus cloud, cumulonimbus cloud, cumulus cloud, peak wind speed, relative humidity, stratus cloud, total precipitation, cold front, warm front, axis, graph, peak wind speed, total precipitation, barometer, bar, hurricane, millibar, tropical water	8.ESS.2	8.ESS.2 Create a diagram or carry out a simulation to describe how water is cycled through the earth's crust, atmosphere and oceans. Explain how the water cycle is driven by energy from the sun and the force of gravity.	Natural hazards STEM application and influence	Model, analyze data	

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Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
Part 1: Storms and Weather Lesson 7: Hurricanes: Destructive Storms	How do hurricanes form, behave and impact the earth?	Investigation of hurricanes	Investigate and model the factors that affect the height of a storm surge; Learn about the behavior and effects of hurricanes; Read about hurricane formation, historical hurricanes, and Hurricane Katrina's impact	4	Hurricane eye, hurricane wall, landfall, storm surge, barometric pressure, latitude, levee, longitude, tropical depression, tropical storm, wind speed, disaster plan, flood			Natural hazards	Investigate and model	Does not directly correlate

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Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
Part 2: The Ocean's Impact on Weather Lesson 8: Earth: An Ocean Planet	What lies within the ocean's depths and what is its contribution to earth's weather and climate?	Role of the ocean and its impact on weather and climate. 8.1 Draw ocean contour maps. 8.2 Make ocean "floors" and investigate Read about historical ocean exploration.	Locate various zones of the ocean and the features of each; Read and draw contour maps; Develop a bathymetric map; Read about current and early oceanography	4	Abyssopelagic zone, bathymetric map, bathypelagic zone, contour line, contour map, elevation, Epipelagic zone, Hadal zone, Mesopelagic zone, pelagic, surface, topographic map, sounding, canyon, continental rise, continental shelf, continental slope, guyot, seamount, trough, ridge, HMS Challenger, latitude, longitude, robot, submersible, sonar			STEM application, sounding, and various maps	Construct, analyze, map	No correlation except connection to the water cycle content in standard 8.ESS.2

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Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
Part 2: The Ocean's Impact on Weather Lesson 9: Ocean Currents	What are the effects of temperature, salinity, and wind on ocean currents? How do these currents affect the climate worldwide?	9.1 and 9.2 Investigate convection currents due to temperature and salinity, test that sea ice formation leaves behind very salty water. 9.3 Investigating surface currents Apply learning to Gulf Stream, Kuroshio Current and El Nino upwelling.	Investigate the effect of water temperature and salinity on density and on the movement of water; Verify that ice formation in salt water increases the salinity of the remaining liquid water; Investigate the effect of wind on surface currents; Locate and analyze major ocean currents and their effects on global climate; Read about ocean currents, movement of hot and cold parts of the ocean, El Nino, early efforts to map the ocean currents.	4	Equator, polar region, convection current, ocean current, density, salinity, surface current, circumpolar, El Nino, La Nina, ocean conveyor belt, trade winds	8.ESS.2	8.ESS.2 Create a diagram or carry out a simulation to describe how water is cycled through the earth's crust, atmosphere and oceans. Explain how the water cycle is driven by energy from the sun and the force of gravity.	Impact of natural phenomena	Investigate, analyze, verify, quantitative vs. qualitative observations.	Standard 8.ESS.2 in relationship to ocean currents

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Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
Part 3: Climate and Climate Changes Lesson 10: Exploration Activity	How has the climate changed over time? What might come with climate change in the future?	Long term research project – analyze a graphed set of climate change-related data and present analysis.	Analyze a graph of data related to climate change; Conduct research on the graph's data and subject; Create an oral presentation; read about satellites making coordinated measurements of environmental factors	6	Accurate, consensus, definition, gradient, dependent variable, direct relationship, independent variable, indirect relationship, rubric, visual aid, clarity, aerosol	Need to see more details and date of data used. 8.ESS.1	8.ESS.1 Research global temperatures over the past century. Compare and contrast data in relation to the theory of climate change.	Politics and environmental action, mathematical and graphing skills	Analyze and interpret graphs, research and present findings	

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Part 3: Climate and Climate Changes Lesson 11: Earth's Climate Zones	What are our current climate zones? How are these climate zones changing and why?	Review factors affecting the climate and investigate climate classification. Koppen's five main climate zones, 11.1 federal climate projections for the next century, and generate policy. 11.2 Use fossil evidence to study Cenozoic Era climate.	Study federal climate change projections for a region of the USA; Develop climate change related policy suggestions; Examine natural climate zones and factors that influence climate; Investigate the use of plant fossil data as an indicator of past climate; Read about Koppen classification system for world climates, fossil data indicating past climate, natural and man-made causes of climate change	4	Altitude, climate zone, Koppen classification system, latitude, climate projection, emission, greenhouse gas, Big Horn Basin, Cenozoic era, fossil, jagged-edge leaf, smooth-edge leaf, amplified, anthropogenic cause, foraminifera, natural cause, orbital pattern, solar output	8.ESS.1, 8.ESS.3	8.ESS.1 Research global temperatures over the past century. Compare and contrast data in relation to the theory of climate change. 8.ESS.3 Research how human consumption of finite natural resources (i.e. coal, oil, natural gas, and clean water) and human activities have had an impact on the environment (i.e. causes of air, water, soil, light, and noise pollution).	Political policy, human impact, fossil data interpretation	Develop climate change related policy recommendations, natural and mon made causes of climate change	Additional activities could be included at this point to explore standard 8.ESS.3 more thoroughly

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Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
Part 3: Climate and Climate Changes Lesson 12: Climate and Energy Use	How might global warming affect our future? How can we reduce or mitigate the impact of global warming?	12.1 Make a predictive model of their own (ice melt) and by investigating the burning of fossil fuels on the earth system. Analyze home energy use. 12.2 Discuss ways to reduce Carbon Footprint. Review before final assessment Readings on global warming and alternative fuels	Estimate the course of an event based on similar data; Evaluate home energy use and consider ways to reduce; Read about computer climate models, a climate forecaster for NOAA, scientific evidence for global warming, alternatives to fossil fuels	4	Consensus, greenhouse gas, Intergovernmental Panel on Climate Change, axis, graph, modeling, carbon footprint, emission, Environmental Protection Agency, fossil fuel, adaptation, anthropogenic, biofuel, geothermal energy, hydrogen fuel cell, mitigation, nuclear power, photovoltaic cell, radiative forcing, solar power	8.ESS.1, 8.ESS.3	8.ESS.1 Research global temperatures over the past century. Compare and contrast data in relation to the theory of climate change. 8.ESS.3 Research how human consumption of finite natural resources (i.e. coal, oil, natural gas, and clean water) and human activities have had an impact on the environment (i.e. causes of air, water, soil, light, and noise pollution).	Political policy making, risks and benefits of energy sources, computer models	Estimate future events based on data, evaluate and analyze home energy use	

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Module: STC Understanding Weather and Climate

Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
Part 3: Climate and Climate Changes Lesson 13: Understanding Weather and Climate Assessment		Final performance-based summative assessment	Part A: performance based assessment – observe a demonstration of a convection current and answer questions about it Part B: written assessment	4	All unit terms	8.ESS.1, 8.ESS.2, 8.ESS.3	8.ESS.1 Research global temperatures over the past century. Compare and contrast data in relation to the theory of climate change. 8.ESS.2 Create a diagram or carry out a simulation to describe how water is cycled through the earth's crust, atmosphere and oceans. Explain how the water cycle is driven by energy from the sun and the force of gravity. 8.ESS.3 Research how human consumption of finite natural resources (i.e. coal, oil, natural gas, and clean water) and human activities have had an impact on the environment (i.e. causes of air, water, soil, light, and noise pollution).			