Ganado Unified School District
(High School Earth Science)

PACING Guide SY 2018-2019

Timeline & Resources	AZ College and Career Readiness Standard	Essential Question (HESS Matrix)	Learning Goal	Vocabulary (Content/Academic)
Unit 1: **Five Weeks** **Resources:** Textbook Pearson Earth Science by Tarbuck and Lutgens, 2011., Power Point for Strands One and for Scientific Inquiry, Thermometers, Metric and Standard rulers, graduated cylinders and balance scales, Computers, and Various Geologic and Meteorological Data Collection Websites. Various Worksheets, Games, and Films.	2:2:1. Specify the requirements of a valid, scientific explanation (theory); 1:1:1. Evaluate scientific information for relevance to a given problem; 1:1:2. Develop questions from observations that transition into testable hypotheses; 1:1:3. Formulate a testable hypothesis; 1:1:4. Predict the outcome of an investigation based on prior evidence, probability, and/or modeling (not guessing or inferring)	How does creating a Hypothesis benefit my experiment? Why is a Hypothesis essential to future exploration of Space, the Oceans, and discovering the depths of the center of our planet? What does the Scientific Method have to do with my everyday life?	**Objectives:** Throughout the year the students will utilize the following understandings and skills they develop in this Unit. • Develop scientific dispositions and habits of mind. **1. Use Science Process and Thinking Skills** a. Observe objects, events and patterns, and record both qualitative and quantitative information. b. Use comparisons to help understand observations and phenomena. c. Evaluate, sort, and sequence data according to given criteria. d. Select and use appropriate technological instruments to collect and analyze data. e. Plan and conduct experiments in which students may: • List the steps in the scientific method. • Identify a problem. • Formulate research questions and explore past procedures and evidence. • predict results of investigations based upon prior data	Accept, Analyze, Assume, Behavior, Conclusion, Constant, Control, Curiosity, Data, Density, Dependent Variable, Develop, Error, Evidence, Experiment, Formulate, Frequency, Honesty, Hypothesis, Independent Variable, Information, Investigate, Knowledge, Mass, Measurement , Modify, Natural, Observe, Openness, Opinion, Patterns, Phenomena, Predict, Procedure, Qualitative, Quantitative, Range, Requirements, Scientific Law, Scientific Method, Skepticism, Skill, Solution, Systematic, Testing, Theory, Volume

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			• Demonstrate the ability to write a suitable hypothesis for an experiment. • Being given a lab experiment scenario, be able to describe a possible control for the experiment. • Distinguish between independent and dependent variables, and will identify each in an experiment, being able to describe the relationship between them. • Distinguish between the experimental group and the control group in an experiment. • List factors that must be kept constant in an experiment. • Collect data on the dependent variable. • Select the appropriate format of a graph, chart, diagram, etc. and use it to summarize the data obtained. • Distinguish between quantitative and qualitative types of data. • Look at a graph and form a conclusion based on the information in the graph. • Examine the information in a data table and identify the independent and dependent variables to assist in forming a conclusion. • Analyze data, check it for accuracy and construct reasonable conclusions. They will prepare written, video, Power Point, and oral reports of investigations. f. Distinguish between factual statements and inferences. g. Develop and use classification systems. h. Construct models, simulations and metaphors to describe and explain natural phenomena. i. Use mathematics as a precise method for showing relationships.	

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			j. Form alternative hypotheses to explain a problem. k. Examine how density expresses the relationship between mass and volume. **2. Develop Scientific Attitudes and Interests** a. Voluntarily read and study books and other materials about science. b. Raise questions about objects, events and processes that can be answered through scientific investigation. c. Maintain an open and questioning mind toward ideas and alternative points of view. d. Evaluate scientifically related claims against available evidence. e. Reject pseudoscience as a source of scientific knowledge. **3. Demonstrate Understanding of Science Concepts, Principles and Systems** a. Know and explain science information specified for the subject being studied. b. Distinguish between examples and non-examples of concepts that have been taught. c. Apply principles and concepts of science to explain various phenomena. d. Solve problems by applying science principles and procedures. e. How scientific knowledge is based on the assumption that natural laws operate today as they did in the past and they will continue to do so in the future. f. How Science assumes the universe is a vast single system in which basic laws are consistent. **4. Communicate Effectively Using Science Language, and Rational, Logical Reasoning**	

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			a. Provide relevant data to support their inferences and conclusions. b. Use precise scientific language in oral and written communication. c. Use proper English in oral and written reports. d. Use reference sources to obtain information and cite the sources.	
Unit 2: **Four Weeks** Textbook Pearson Earth Science by Tarbuck and Lutgens, 2011. Power Points for "Intro to Earth Science," "Phenomenon," "Natural Resources," "Recycling," "Introduction to Mapping," and "Geological Time Line," Computers, Various Geologic and Meteorological Data Collection Websites, Drafting Supplies, Protractors,	6:3:4. Interpret a geologic time scale; 6:3:5. Distinguish between relative and absolute geologic dating techniques; 6:3:8. Sequence major events in the Earth's evolution (e.g., mass extinctions, glacial episodes) using relative and absolute dating data; 6:1:4. Demonstrate how the hydrosphere links the biosphere, lithosphere, cryosphere, and atmosphere	How can Relative and Absolute Dating be beneficial to the Future since it relays the Past? What are the essential forces that drive our planet's systems that interact and what would happen, in turn, if each of them were to cease their function in their exchanges? What happens when the non-renewable resources run out? How might mapping/Cartography evolve in the future?	**Objectives:** **Intro to Earth/Space Science –. During this Unit students will be able to:** 1. Define Earth Science 2. Describe Earth's Four Major Spheres and how they interact 3. Differentiate among the three parts of the Geosphere 4. Describe Earth's two major sources of energy 5. Understand energy transformations on and within the Earth, and between the Earth and Sun 6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere, providing the foundation for living organisms 7. Distinguish between renewable and nonrenewable resources 8. Discover the importance of Cartography, and examine its use in Geography and Earth science. 9. Read, Compare, and Interpret a variety of maps including topographical, road, world maps, and globes	Archean, Archeologists, Ash, Ban, Biodegradable, Biodiversity, Cambrian, Cartography, Cenozoic, Chemical, Compost, Conservation, Contaminate, Contours, Cretaceous, Decomposition, Devonian, Diagram, Direction, Disposable, Diverse, Elevation, Environment, Eocene, Eon, Epoch, Equator, Era, Extinction, Fossils, Global, Habitat, Hadean, Hazardous Waste, Incinerator, Invertebrate, Jurassic, Key, Landfill, Landforms, Latitude, Legend, Litter, Longitude, Map scale, Mesozoic, Microorganisms, Micro-plastic, Miocene, Mississippian, Natural Resources, Oligocene, Ordovician, Organic, Paleocene, Paleozoic, Pangea, Pennsylvanian,

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Rulers, Compasses, Mapping Paper, Grids, Various Lab Equipment, Topographical Models. Various Worksheets, Games, and Films.			10. Locate points on Earth's surface by their Latitude and Longitude 11. Use knowledge to create different types of maps including the use of the 10 Types of Contouring. 12. Examine Earth's historical Timeline and ascertain how Science finds evidence to prove our knowledge	Period, Permian, Petroleum, Phanerozoic, Photosynthesis, Pleistocene, Pliocene, Pollution, Proterozoic, Quaternary, Raw Materials, Recycle, Reduce, Relation, Reuse, Rose Compass, Silurian, Species, Structures, Tertiary, Topography, Toxic, Trash, Triassic, Vertebrate
Unit 3 **Nine Weeks** **Resources:** Textbook Pearson Earth Science by Tarbuck and Lutgens, 2011. Power Point Presentations: Cosmology, Big Bang, Stars, Galaxies and Out Milky Way, The Sun, Our Solar System, Meteors Asteroids and Comets, The Moon, Eclipse, Observatories Space Travel	6:4:1. Describe the Big Bang Theory as an explanation for the origin of the universe; 6:3:1. Describe the scientific theory of the origin of the solar system (solar nebular hypothesis); 6:3:2. Describe the characteristics, location, and motions of the various kinds of objects in our solar system, including the Sun, planets, satellites, comets, meteors, and asteroids; 6:3:3. Explain the phases of the Moon, eclipses (lunar and solar), and the interaction of the Sun, Moon, and Earth (tidal effect); 6:4:2. Describe the fusion process that takes place in stars; 6:4:3. Analyze the evolution of various types of stars using the Hertzsprung-Russell (HR) diagram; 6:4:4. Compare the evolution (life cycles) of stars	What thoughts might early Astronomers have had regarding today's Space Exploration? How might each of the Early Astronomers envisioned Space? What may future Space Exploration bring to the Human Existance?	**Objectives:** **During this Unit, Students will be able to:** • Describe the big bang theory of universe formation and how it is supported by observations of distant galaxies receding from our own, first discovered by the Hubble Telescope. • Understand the nebular theory of solar system formation and the evidence supporting this theory, including cosmic background radiation, variance of elements, and redshift relation. • Identify the scientific evidence, such as radioactive decay, for the age of the solar system (4.6 billion years), including Earth. • Describe the solar system structure due to gravity, motion and temperature and relate the composition of objects in the solar system to their distance from the Sun. • Study the composition and age of meteorites and discover what part asteroids, meteors, and comets play in the Universe. • Decipher the results of the observations of newly forming stars, Investigate the life cycle of stars, the different types of stars, black holes,	Absolute Magnitude, Acceleration, Accretion Disk, Antimatter, Apex, Aphelion, Asteroid, Astrology, Atom, Aurora Borealis, Azimuth, Barred Spiral Galaxy, Big Bang, Binary Star System, Black Hole, Brown Dwarf, Celestial, Centripetal Force, Cluster, Coma, Comet, Conduction, Constellation, Convection, Coriolis Effect, Corona, Coronal Mass Ejection, Cosmic Background Radiation, Cosmic Ray, Cosmology, Crater, Crescent Phase, Dark Matter, Dark Nebula, Density, Differentiation, Diurnal, Doppler Effect, Dust Tail, Dwarf, Eclipse, Electromagnetic Wave,

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and Satellites. Star Locators, Telescope, Etc. Various Worksheets, Games, and Films.	of different masses (low and high mass); 6:4:5. Explain the formation of the light elements in stars and the heavier elements (what astronomers call “metals”) in supernova explosions; 6:4:6. Explain the evolution and life cycles of galaxies.		and be able to chart them based on the Hertzsprung-Russell (HR) diagram by the Electromagnetic Radiation in which atoms of each element emit and absorb characteristic frequencies of light. These characteristics allow identification of the presence of an element, even in microscopic quantities. • Explain how heavy elements found on Earth are formed in stars by nucleosynthesis, being produced when certain massive stars achieve a supernova stage and explode. • Analyze Earth as part of the solar system, which is part of the Milky Way galaxy. • Compare the size of the solar system to the Milky Way galaxy and compare the size and scale of objects within the solar system, itself. • Relate the composition of objects in the solar system to their distance from the Sun. • Explore evidence of nuclear fusion in the sun’s core that releases energy that eventually reaches Earth in the form of radiation, focusing on the energy transfer mechanisms and the difference of the masses and lifetimes of other stars, as well as the variation of radiation due to solar flares, the 11-year sunspot cycle, and non-cyclic variations over centuries. • Evaluate the conditions that currently support life on Earth and compare them to the conditions that exist on other planets and moons in the solar system including atmospheres, hydrospheres, geospheres, the amounts of incoming solar energy, and the habitable zones. • Examine the age of our Universe by looking at how spontaneous radioactive decay follows a characteristic exponential decay law. Nuclear lifetimes allow radiometric dating to be used to	Electron, Elliptical Galaxy, Event Horizon, Fireball, Fission, Focus, Force, Frequency, Fusion, Galaxy, Gamma Ray, Gas, Gas-Giant, Geocentric, Giant, Gibbous, Gravity, Greenhouse Effect, Half-life, Heliocentric, Heliopause, Heliosphere, Hertzsprung - Russell Diagram, Horizon, Hubble’s Law, Hyperbola, Inclination, Index of Refraction, Inertia, Inferior Planet, Infrared, Interstellar Matter, Ion, Irregular Galaxy, Kepler’s Laws of Planetary Motion, Kuiper Belt, Light Year, Luminosity, Lunar Eclipse, Magnitude, Main Sequence, Maria, Mass, Meteor, Meteor Shower, Meteorite, Meteoroid, Milky Way, Molecular Cloud, Neap Tide, Neutron, Neutron Star, Nodes, Nucleosynthesis, Nucleus, Oort Cloud, Orbit, Ozone, Parabola, Penumbra, Perihelion, Photon, Planet, Planetesimal, Plasma, Polarity, Pressure, Prominence, Proton, Protostar, Quarter Moon,

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			determine the ages of rocks and other materials. • Study how galaxies were formed, and what the different classifications of galaxies are, including our Milky Way. • Explain Empirical Evidence to identify patterns. • Understand that Energy cannot be created or destroyed only moved between one place and another place, between objects and/or fields, or between systems, and that in nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved. • Participate in learning about the past views of Cosmology in different cultures and societies. • Review past space explorations, what impacts space exploration has had, and what scientists are looking to discover in the future. • Test how cyclical changes in the shape of Earth's orbit around the sun, together with changes in the tilt of the planet's axis of rotation, both occurring over hundreds of thousands of years, are responsible for altering the intensity and distribution of sunlight falling on the earth. Connect how these phenomena cause a cycle of ice ages and other gradual climate changes in conjunction with plate tectonics. • Explore the Newtonian gravitational laws governing orbital motions, which apply to human-made satellites as well as planets and moons, and Kepler's law that describes common features of the motion of orbiting objects, including their elliptical paths around the sun.	Quasar, Radiant, Radio Galaxy, Radioactivity, Rays, Redshift, Reflection, Refraction, Regolith, Resolution, Rille, Solar Flare, Solar Nebula, Solar Wind, Solstice, Spacetime, Spectrograph, Spectrum, Spicule, Spiral Arm, Spiral Galaxy, Star, Stellar, Summer Solstice, Sunspot, Supergiant, Supernova, T-Tauri Star, Telescope, Terminal Velocity, Terrestrial Planet, Tides, Transverse Velocity, Ultraviolet, Umbra, Universe, Van Allen Belts, Velocity, Vernal Equinox, Waning Crescent, Wavelength, Waxing Crescent, White Dwarf, Zenith, Zodiac
Unit 4 Five Weeks	6:2:4. Demonstrate the relationship between the Earth's internal convective	What might Plate Tectonics evolve into in the future?	**Objectives:**	Advection, Aftershock, Alfred Wegener, Asthenosphere,

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			• Describe how earthquakes and volcanoes transfer energy from Earth's interior to the surface through seismic waves transferring mechanical energy, and flowing magma transfers heat and mechanical energy. • Demonstrate how Convection currents cause tectonic plates to move. • Model tectonic plate movement to compare the results convergent, divergent, and transform boundaries in mountain building, volcanoes, earthquakes, mid-ocean ridges, and oceanic trenches. • Compare P-Waves, S-Waves, and Love Waves, along with the epicenter and focus of an earthquake. Also Compare and contrast aftershocks and foreshocks and be able to read the measurements of a seismograph. Students will also be able to identify the major hazards associated with earthquakes. • Describe the composition of each layer of Earth • Explain how scientists have determined Earth's structure and composition • List the three main types of volcanos and distinguish how the different types of volcanic landforms form and describe the major intrusive igneous features, such as dikes, sills, laccoliths, and batholiths and their formation. • Define radioactivity and half-life and see how radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle, providing the primary source of the heat that drives mantle convection. • Make the connection of the different Earth Processes to see how energy drives the cycling of matter within and between systems and is responsible for Plate movement, for most continental and ocean-floor features, and for the distribution of most rocks and minerals within Earth's crust.	Wave, Radioactive Decay, Radioactive, Ridge-Push, Ridges, Rocks, Sea-Floor Spreading, Sedimentary, Seismic Waves, Seismograph, Sills, Slab-Pull, Subduction, Surface, S-Wave, Systems, Tectonic Plates, Tectonic Uplift, Thermal Convection, Transform boundaries, Trenches, Unstable Isotopes, Valley, Volcanic Ash, Volcanism, Volcano, Weathering

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Unit 5 **Four Weeks** **Resources:** Textbook Pearson Earth Science by Tarbuck and Lutgens, 2011. Power Point Presentations: Caves, Deserts, Landforms, Rocks, Soil, Weathering and Erosion. Lab Equipment for Rock Identification. Rock Saw, Rock Cabbing Machine. Various Worksheets, Games, and Films.	6:1:2. Demonstrate how dynamic processes such as weathering, erosion, sedimentation, metamorphism, and Orogenesis relate to redistribution of materials within the Earth system; 6:1:3. Explain how the rock cycle is related to plate tectonics; 6:1:7. Explain how the geochemical processes are responsible for the concentration of economically valuable minerals and ores in Arizona and worldwide;	How are other Earth Systems important in the Rock Cycle? What other Sciences are important to the Rock Cycle and how are the different types of Rock affected? Which parts of Erosion and Deposition have had the most influence on the surface of the Earth? How had Deposition influenced Human behavior? How might the area you live in change in the next Era by Erosional and Depositional Changes that might occur? Why might those changes occur?	• Understanding the Recycling of the Materials of our Planet within the Rock Cycle, Earth Tectonic Forces that build our Earth Features, and the wearing down and movement of surface Materials through Weathering and Erosion. • Students will be able to: • Learn the classification process of minerals, rocks, and other Earth resources based on their properties and origins, including igneous rocks, sedimentary rocks, and metamorphic rocks. • Understand the formation of intrusive and extrusive rocks and be able to differentiate. • Focus on weathering, erosion, and deposition, along with the surface features formed by them. • Describe and demonstrate by modeling how landforms are created through geologic processes. • Understand and explore landform development • Practice mechanical investigations including stream transportation and deposition using a stream table, erosion using variations in soil moisture content, or frost wedging by the expansion of water as it freezes. • Determine the age of fossils and rocks using the Relative Age, and the Absolute Age in conjunction with the Geological Timeline, and discover how spontaneous radioactive decays follow a characteristic exponential decay law so Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials as well. • Visit how atoms of each element emit and absorb characteristic frequencies of light that allow identification of the presence of an element, even in microscopic quantities, through Electromagnetic Radiation.	Aa, Abrasion, Abyssal Plain, Algae, Alluvial Fan, Andesite, Angular, Anticline, Ash, Attrition, Basalt, Batholith, Beach, Bedding, Bed-load, Biological Weathering, Clay, Lava Bomb, Calcite, Calcium Carbonate, Cementation, Chalk, Chemical Weathering, Clay, Coal, Cementation, Color, Compaction, Deformation, Delta, Deposition, Desert, Dyke, Deposition, Earthquakes, Effusive eruption, Estuary, Erosion, Eruption, Evaporation, Exfoliation, Expansion, Explosive Eruption, Extrusive, Erosion, Faults, Feldspar, Fine-Grained, Folds, Foliated, Fossil, Fragmental, Freeze-Thaw, Fossil Fuel, Coarse-grained, Coccoliths, Columnar joints, Compaction, Compression, Conglomerate, Continental Shelf, Contraction, Contact Metamorphism, Crater, Creep, Cross-bedding, Crystal, Crystalline, Crystallization, Gabbro,

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			• Investigate chemical weathering and recrystallization by testing the solubility of different materials. • Give examples of include how photosynthetic life altered the atmosphere through the production of oxygen, which in turn increased weathering rates and allowed for the evolution of animal life. • Design, build, and test a model that investigates geological processes such as mudslides, earthquakes, flooding, and erosion, with the possible effects on human-engineered structures like dams, homes, bridges, roads. • Demonstrate how system interactions, such as the loss of ground vegetation, causes an increase in water runoff and soil erosion, and how dammed rivers increase groundwater recharge, decrease sediment transport, and increase coastal erosion. • Exhibit models to establish how the resulting land features of mountains, valleys, and plateaus, and the sea-floor features such as trenches, ridges, and seamounts, are a result of both constructive forces such as volcanism, tectonic uplift, and orogeny, and destructive mechanisms such as weathering, mass wasting, and coastal erosion.	Glacial Erosion, Gneiss, Granite, Groundwater, Gravity, Marble, Meander, Medium-Grained, Metamorphic Aureole, Metamorphic Rock, Metamorphism, Mica, Mineral, Moraine, Mudflow, Mudstone, Hoodoo, Shale, Sill, Slate, Soil creep, Solution, Strata, Strike-slip fault, Suspension, Syncline, Hydrolysis, Ice sheet, Igneous, Interlocking, Intrusion, Invertebrates, Lagoon, Lahar, Landslide, Landslip, Lava, Limestone, Longshore Drift, Lithification, Magma, Mass-Movement, Metamorphism, Normal Fault, Oolith, Oolitic Limestone, Oxidation, Pahoehoe, Pebbles, Petroleum, Physical Weathering, Pillow lava, Plankton, Playa, Plucking, Porous, Pumice, Pyroclastic, Pyroclastic Flow, Pressure, Quartz, Quartzite, Re-Crystallization, Reef, Regional Metamorphism, Reverse Fault, Rhyolite,

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				Rift Valley, Ripple Marks, Rock, Rock Fall, Rock Salt, Rounded, Saltation, Sand, Sandstone, Schist, Sea-stack, Sediment, Sedimentary Rock, Sediment, Streak, Tension, Texture, Thrust Fault, Traction, Transport, Turbidity, speed Transportation, Unconformity, Uplift, Vent, Vesicles, Viscosity, Volcano, Volcanic Ash, Wave-Cut Platform, Weathering
Unit 6 **Two Weeks** **Resources:** Textbook Pearson Earth Science by Tarbuck and Lutgens, 2011. Power Point Presentations: Hydrosphere, Oceans, Rivers and Streams, Groundwater. Maps and Charts, Survey Equipment, Various Worksheets,	6:1:4. Demonstrate how the hydrosphere links the biosphere, lithosphere, cryosphere, and atmosphere;	What could be done to restore water to the world's ancient aquifers? Is another Dust Bowl possible? Where? And Why? What does the future of fresh water for humans look like? How do you determine that? What can you do to keep water fresh for human use on this planet?	**Objectives:** **Students will understand the dynamics of the hydrosphere.** • Characterize how water has been recycled throughout time. • Identify oceans, lakes, running water, frozen water, ground water, and atmospheric moisture as the reservoirs of Earth's water cycle, and graph or chart the relative amounts of water in each. • Diagram how the processes of evaporation, condensation, precipitation, surface runoff, ground infiltration and transpiration contribute to the cycling of water through • Earth's reservoirs. • Model the natural purification of water as it moves through the water cycle. • Using data collected from local water systems, evaluate water quality and conclude how	Abiotic, Ablation, Absorb, Adhesion, Alluvial, Alluvium, Aquiclude, Aquifer, Aquifuge, Arroyo, Artesian Well, Atmospheric Moisture, Backflow, Bed, Biotic, Canal, Capillary, Channel, Cohesion, Condensation, Creek, Crest, Current, Dam, Delta, Depths, Dike, Dissolve, Drainage, Dry Wash, Ecosystem, El Niño, Estuary, Evaporation, Filter, Flash Flood, Floe, Flood, Flood Plain, Freeze, Freezing Point, Freshwater, Frozen water, Glacier, Ground Infiltration, Groundwater, Headwater, Hydrosphere,

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Games, and Films.			current pollution practices can make water unavailable for human and animal use or unsuitable for life. • Relay how research shows the oceans formed from outgassing by volcanoes and ice from comets. • Investigate how salinity, temperature, and pressure at different depths and locations in oceans and lakes affect saltwater ecosystems through experimentation. • Model energy flow in the physical dynamics of oceans such as wave action, deep-ocean tides circulation, surface currents, land and sea breezes, El Niño, and upwelling's. • Explore various fresh water systems, such as streams and drainage systems, groundwater, and caves. • Link water properties such as the capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks to its benefit or detriments to Earth's other systems.	Ice, Ice Jam, Impermeable, Impervious, Irrigation, Lake, Levee, Liquid, Meander, Natural Purification, Ocean, Ogee, Percolation, Perennial Stream, Permeable, Pool, Porosity, Precipitation, Pressure, Puddle, Rain Gage, Rainfall, Reservoir, River, Running water, Runoff, Salinity, Saltwater, Saturation, Spring, Stream, Surface Runoff, Surface Water, Tank, Tide, Transpiration, Transport, Turbidity, Upwelling, Viscosity, Wash, Water Quality, Water Table, Waterline, Watershed, Wave, Well, Wetland
Unit 7 **One Week** Textbook Pearson Earth Science by Tarbuck and Lutgens, 2011. Power Point Presentations: Glaciers and Ice Caps, Snowball Earth.	No AZ Standard HS-ESS3-5: (National Standard) Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth's systems. [Clarification Statement: Examples of evidence, for both data and climate model outputs, are for	Is Snowball Earth possible again? What will truly happen if all the Glaciers melt and is that possible? What might happen to the polar icecaps if the Earth's Magnetism were to reverse?	**Objectives:** **Earth's Cryosphere including Snowball Earth, Past Glaciation, Ice Caps, and Icebergs, and the influence on Weathering and Erosion.** **Students will be able to:** • Discuss the different erosional features formed by alpine glaciers.	Ablation, Ablation Moraine, Abrasion, Accumulation, Accumulation Area, Advance, Arête, Barren Zone, Bergschrund, Bergy Seltzer, Braided Stream, Calving, Calving Glacier, Chatter Marks, Cirque, Corrie, Crescentic Gouge, Crevasse, Debris Cone, Dendrochronology, Disarticulation, Distributary,

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Various Worksheets, Games, and Films.	climate changes (such as precipitation and temperature) and their associated impacts (such as on sea level, glacial ice volumes, or atmosphere and ocean composition).]		• Describe the processes by which glaciers change the underlying rocks. • Discuss the sorting and types of particles deposited by glaciers as they advance and recede. • Describe the landforms created by glacial deposits. • Diagram glacier anatomy, movement, deposits, landforms, and climate • Understand effects of growth and retreat of Glaciers and Ice Caps.	Downwasting, Drift, Drumlin, Erratic, Esker, Eustacy, Firn, Fjord, Foliation, Fountain, Freeze-Thaw Weathering, Glacial Furrow, Glacial Groove, Glacial Lake, Glacial Stream, Glacial Trough, Glacier, Glacier Cave, Glacier Flow, Glacier Ice, Glacier Table, Ground Moraine, Hanging Glacier, Hanging Valley, Holocene, Horn, Ice Cap, Ice Field, Ice Rafting, Ice Sheet, Ice Shelf, Iceberg, Ice-Cored Moraine, Ice-Dammed Lake, Icefall, Ice-Marginal Lake, Isostasy, Jökulhlaup, Kame, Kettle, Lateral Moraine, Little Ice Age, Mass Balance, Medial Moraine, Moraine, Moulin, Neve, Nunatak, Ogive, Outwash Plain, Piedmont Glacier, Pit Pond, Plucking, Polar Glacier, Push Moraine, Recessional Moraine, Reconstituted Glacier, Remnant, Retreat, Roche Moutonnee, Rock Flour, Rock Glacier, Rockslide, Sérac, Snowbridge, Stagnation, Striations, Suncups, Surge, Tarn, Temperate Glacier,

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				Terminal Moraine, Terminus, Tidewater Glacier, Till, Trimline, Truncated Spur, U-Shaped Valley, Valley Glacier, Varve,
Unit 8 **Six Weeks** **Resources:** Textbook Pearson Earth Science by Tarbuck and Lutgens, 2011. Power Point Presentations: Atmospheric Phenomenon, Catastrophes, Earth's Atmosphere, Weather, Climate. Different Lab Equipment including Barometers, Thermometers, Refrigeration, etc. Various Worksheets, Games, and Films.	6:2:9 Explain the effect of heat transfer on climate and weather; 6:2:10. Demonstrate the effect of the Earth's rotation (i.e., Coriolis Effect) on the movement of water and air; 6:2:11. Describe the origin, life cycle, and behavior of weather systems (i.e., air mass, front, high and low systems, pressure gradients); 6:2:12. Describe the conditions that cause severe weather (e.g., hurricanes, tornadoes, thunderstorms); 6:2:14. Analyze how weather is influenced by both natural and artificial Earth features (e.g., mountain ranges, bodies of water, cities, air pollution); 6:2:15. List the factors that determine climate (e.g., altitude, latitude, water bodies, precipitation, prevailing winds, topography); 6:2:16. Explain the causes and/or effects of climate changes over long periods of time (e.g., glaciation, desertification, solar activity, greenhouse effect).	How does human interaction with the planet affect Weather? Climate? How did early explorers probably predict Weather when they were traveling? What would happen to the trade winds in a Magnetic Reversal? Will humans be able to control catastrophic weather events in the future? How?	**Objectives:** Earth's Atmosphere, Climate, and Weather Students will be able to: • Understand the atmospheric processes that support life and cause weather and climate. • Relate how energy from the Sun drives atmospheric processes and how atmospheric currents transport matter and transfer energy. • Compare and contrast the amount of energy coming from the Sun that is reflected, absorbed or scattered by the atmosphere, oceans, and land masses. • Construct a model that demonstrates how the greenhouse effect contributes to atmospheric energy. • Conduct an investigation on how the tilt of Earth's axis causes variations in the intensity and duration of sunlight striking Earth. • Explain how uneven heating of Earth's atmosphere at the equator and Polar Regions combined with the Coriolis Effect create an atmospheric circulation system including,	Above Average, Absorption, Acid Rain, Adiabatic process, Aeolian, Air current, Air density, Air mass, Altocumulus, Altostratus, Anemometer, Anomaly, Anticyclone, Atmosphere, Atmospheric radiation, Autumn, Barometer, Barometric Pressure, Below Average, Blizzard, Ceiling, Charged Particles, Cirrocumulus, Cirrostratus, Cirrus, Clear, Climate Change, Climate, Climatology, Cloud, Cold Front, Cold Front, Condensation, Convection, Coriolis Effect, Cumulonimbus, Cumulus, Cyclone, Depression, Dew Point, Dew, Dewpoint, Doppler, Downburst, Drift, Drizzle, Drought, El Niño, Evapotranspiration, Fair, Flash Flood, Flood, Flurry, Fog, Forecast, Freezing, Front, Frost,

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			• Hadley cells, trade winds, and prevailing westerlies, that moves heat energy around • Earth. • Explain how the presence of ozone in the stratosphere is beneficial to life, while ozone in the troposphere is considered an air pollutant. • Describe elements of weather and the factors that cause them to vary from day to day. • Identify the elements of weather and the instruments used to measure them such as temperature with a thermometer, precipitation with a rain gauge or Doppler radar, humidity with a hygrometer, air pressure with a barometer, wind with an anemometer, and cloud coverage by satellite imaging. • Describe conditions that give rise to severe weather phenomena such as Squall Lines, thunderstorms, tornados, hurricanes, and El Niño or La Niña. • Explain a difference between a low pressure system and a high pressure system, including the weather associated with them. • Diagram and describe cold, warm, occluded, and stationary boundaries, (weather fronts,) between air masses. • Design and conduct a weather investigation, use an appropriate display of the data, and interpret the observations and data. • Explain differences between weather and climate and the methods used to	Frostbite, Funnel Cloud, Gale, Global Warming, Greenhouse Effect, Gust, Haboob, Hail, Haze, Heat Index, Heat Wave, High Pressure, Humidity, Hurricane, Indian Summer, Ion, Isobar, Jet Stream, La Niña, Lake Effect, Land Fall, Lightning, Low Pressure, Maritime, Mesosphere, Meteorology, Nor' Easter, Occluded Front, Overcast, Paroemieology, Precipitation, Pressure, Prevailing Wind, Radar, Rain Shadow, Rain, Ridge, Sea Surface Temperature, Shower, Sleet, Snow, Southern Oscillation, Spring, Squall, Stationary Front, Storm, Stratosphere, Stratus, Subtropical, Summer, Surf, Surge, Temperature, Thermosphere, Thunder, Thunderstorm, Tornado, Trade Winds, Tropical Air Mass, Tropical Cyclone, Tropical, Tropopause, Troposphere, Trough, Tsunami, Turbulence, Unstable, Vertical Wind Shear, Visibility, Warm Front, Warning, Watch, Water Spout, Wavelength, Weather,

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			investigate such as ice core sampling, tree rings, historical temperature measurements, changes in the extent of alpine glaciers, and changes in the extent of Arctic sea ice. • Explain how Earth's climate has changed over time and describe the natural causes for these changes, including the Milankovitch cycles, solar fluctuations, plate tectonics. • Explain seasonal changes. • Describe how latitude affects climate. • Describe how elevation and mountain ranges affect climate. • Describe how large bodies of water affect climate. • Describe how vegetation affects climate. • Describe natural processes that can cause changes in climate. • Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. • Know the foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space. Gradual atmospheric changes are due to plants and other organisms that capture carbon dioxide and release oxygen.	Westerlies, Wind Chill, Wind Shear, Wind, Winter


THINKING
COMMUNICATION
RESPECT &
REVERENCE
CAREER
SELF & SOCIAL
AWARENESS