Earth and Space Science Curriculum - 6th grade

Unit	Standards	Unit Objectives	Big Ideas	Activities/Resources

1- Science Process Skills 	**Interdependence of Science, Engineering, and Technology**	Introduction to Science
		
		Get to know teacher & student
		
		Students will be able to = SWBAT
			Getting to Know You Classroom Procedures	• Getting to Know You Activity ✅
				  ○ Role & Share
				• Review Syllabus and Procedures ✅
				  ○ Back to School..
				  ○ Back to School.. stations
				• All about you...
				  ○ All about YOU

		Students will be able to identify the science lab equipment that we will be using during the year
		
		SWBAT perform lab activities and experiments knowing safe procedures in the lab
			Lab Safety
			Common Lab Equipment
				• Lab safety ✅
				  ○ LabSafetyFoldable-1 (2).pdf
				  ○ LabSafetyPresentation-1
				  ○ FREELaboratorySafetySort...
				• Lab equipment ✅
				  ○ Lab Equipment- 6th grade
				  ○ Lab Equipment notes
				  ■ QUIZ
				  6th grade QUIZ Lab ...
				–FIND/CREATE AN ACTIVITY TO "USE" EACH PIECE–
				
				6th grade Measurement A... look at this

				○ Check it out... ○ Lab Equipment Review Activity | Science Scavenger Hunt Game | SciQuest– on TPT ○ ●
		SWBAT do simple common conversations. Focus will be from base unit to milli and centi	Metric System Review	● PDF PowerPoint Presentation.pdf ○ Download update!!!! ● Metric system doodle notes
		SWBAT measure length, mass, and volume. SWBAT know the difference between mass & weight	Measuring in Science	● Measuring Length, Volume, Mass, and Weight Notes ○ Measurement notes ✅ ■ PDF MeasurementDoodle... ○ PDF 10 - Mass vs Weight Doodl... ○ ● Measuring Length 80s Party Activity ○ PDF MeasuringLengthActivity.pdf ● Graduated Cylinder Color Magic Measuring Lab ○ Look into this... ● Graduated Cylinder Rainbow Rack Challenge ○ PDF measuring_the_rainbow.pdf ● Measuring Mass ○ mass vs. weight mini-lab

				○ ○ Measurement Activity ■ Edit.. change to be just mass?
		SWBAT identify the different types of graphs, the parts of graphs and construct graphs when given the data.	Graphing in Science	● Dry Mix to remember variables C:\Users\AnnGraniczny\Downloads\ScienceVariablePosterDRYMIX-1.png ● ● Lucky Charms Cereal Data Analysis and Graphing Project ● Graphing notes.pdf ● GRAPH STATION INSTRUCTION... ○ GraphingStation KEY.pdf
			Claim Evidence Reasoning	CER- introduction— ???
		Students will be able to explain how various Earth scientists study different aspects of Earth systems. SWBAT to differentiate between observations and inferences and make detailed observations and evidence-based inferences.	Types of Earth Scientists Observations and Inferences	● Lesson 1: types of Earth Scientists; making observations vs. inferences ● Lesson 2: scientific modeling Introduction to Earth & Space Science Unit– – USE FOR THESE LESSONS

2 Intro to Earth Science- Earth's Spheres 	**MS-ESS2-1:** Develop a model to describe the cycling of Earth's material and the flow of energy that drives this process. **Interdependence of Science, Engineering, and Technology**	SWBAT describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. SWBAT identify the Earth's continents and oceans, hemispheres, and important lines. SWBAT make observations about regions of Earth's surface using Google Earth. SWBAT explain how satellites including the International Space Station are used to study Earth's systems. SWBAT learn the digital skills of working on Google Slides, Google Earth, Jamboard, Forms, Drawings, class galleries, and more!	Earth's Spheres	Earth's five spheres (biosphere, geosphere, hydrosphere, atmosphere, cryosphere) GG- Spheres 1 The-Four-Spheres-Worksheet-GG.pdf ○ 2 Copy of Spheres of Earth Lesson ○ Copy of Copy of KEY Spheres of Earth L... ○ 3- Earth's Systems - The Four Spheres Digi... ○ EarthsSpheresBiosphereHydrosphereAt... ■ Notes ● Earth Sphere Doodle No... ■ sphere doodle notes key pdf.png ○ 4 sphere ws 2.pdf use this before walkabout ○ 5- walkabout ■ sphere walkabout ws.pdf ■ walkabout cards.pdf ■ Earth Spheres Walkabout key.pdf ○ 6- code challenge ■ Sphere code challenge.pdf ○ 7- Review Spheres of Earth Lesson w/ cryo... ○ Copy of Copy of KEY Spheres of Earth L... ■ Includes videos & cryosphere ○ Earth's Spheres ws ● Sphere quiz '23 ○ Regular & modified

			➔ Studying Earth ➔ Earth's Magnetic Field ➔ Earth's Continents, Oceans, and Lines ➔ Google Earth	• Lesson 4: Tree Rings (studying Earth from the ground)-- **DO WITH CLIMATE CHANGE** • Lesson 5: Earth's magnetic field • **DO WITH EARTH'S ATMOSPHERE** • Lesson 6: Earth's continents, oceans, and invisible lines • DONE IN Social Studies • Lesson 7: using Google Earth • DONE IN Social Studies

			➔ Satellites
			➔ The ISS
				• Lesson 8: Satellites studying Earth from space)
				• DONE WITH SPACE EXPLORATION
				• Lesson 9: the International Space Station
				  • DONE WITH SPACE EXPLORATION
				• Design and Build a Satellite Project
				  • DONE WITH SPACE EXPLORATION

Unit	Standards	Unit Objectives	Big Ideas	Activities
3 **Geologic History** 	**MS-ESS1-4:** Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion year old history.	Students will be able to identify relationships among rock layers of differing locations and explain how geologists use rock layers and fossils to understand the relative age and geologic history of the Earth. SWBAT describe events that lead to mass extinctions and argue for why we are presently experiencing a 6th mass extinction. SWBAT describe how evidence is used to estimate the absolute age of the Earth. SWBAT research the life and geography during various time periods of Earth's 4.6-billion year old history.	→ Timelines → Sedimentary Rock Layers → Index Fossils	Ed puzzle.. Fossils, Relative Dating, Absolute Dating, Geologic Time – Ed puzzle Fossils, Relative Dating, Absolute Dating, Geologic Time Vocab for lesson 1- Geologic Time Geologic Time Scale notes.pdf GeologicalTimeline.pdf who done it geology.pdf Geologic History Unit – slide show with vocab & notes ● Lesson 1: Relative, Sequential, and Numerical Time ● Lesson 2: Sedimentary Rock Layers ● Lab: Clay Cupcakes ● Lesson 3: Correlation of Rock Strata
			→ Stratigraphy → Relative Dating → Index Fossils	● Lesson 3 continued: Correlation of Rock Strata ● Cornell Doodle Notes: Relative Age Dating of Rocks ● Lesson 4: Principles of Stratigraphy and Dating Rock Layers ● Fossils PPT and Notes ● Lesson 5: Index Fossils

			→ Mass Extinctions → The Age of the Earth	• Lesson 6: Mass Extinctions • Lesson 7: The Age of the Earth • Review and Assessment (Geologic History Clue Game)
			→ Geologic Time Scale	• Geologic Time Scale Amazing Race Project
Unit	Standards	Unit Objectives	Big Ideas	Activities
4 Earth's Interior and Plate Tectonics 	**MS-ESS2-3:** Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. **MS-ESS2-1:** Develop a model to describe the cycling of Earth's material and the flow of energy that drives this process.	Students will be able to differentiate Earth's layers by their composition and how they respond to stress. SWBAT explain how the property of density is responsible for both Earth's layers and the convection currents which occur in the Earth's mantle. SWBAT generate questions and create a question board about how and why Earth's continents have moved over time. SWBAT analyze maps of Earth's tectonic plates and their apparent motion to determine how their movement over geologic time shapes Earth's surface.	→ Continental Drift → Pangaea → Earth's Layers	Plate Tectonics and Earth's Interior Unit • Lesson 1: Alfred Wegener's discovery (unit phenomenon) • Lesson 2: Pangaea • Lesson 3: Earth's Interior
			→ Density and Earth's Interior → Tectonic Plates	• Lesson 4: Earth's Layers • Cornell Doodle Notes: Earth's Interior • Optional: Density "Deep Dive" (Fruits and Roots Activity and Density Mini-Labs) • Lesson 5: Density and Earth's Layers • Lesson 6: Moving Plates, Hot Spot Island Formation
			→ Convection in the Mantle → Tectonic Plate Boundaries	• Lesson 7: Convection in the Mantle • Lesson 8: Tectonic Plate Boundaries • Lesson 9: Seafloor Spreading

	MS-ESS2-2: Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.		➔ Seafloor Spreading	• Cornell Doodle Notes: Continental Drift and Seafloor Spreading
			➔ Plate Boundaries	• Lesson 10: Types of Plate Boundaries • Cornell Doodle Notes: Plate Tectonics • Review and Assessment
Unit	Standards	Unit Objectives	Big Ideas	Activities
5 Earthquakes and Volcanoes 	**MS-ESS2-2:** Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.	Students will be able to explain how earthquakes are detected and the scales used to measure them. SWBAT construct an argument using evidence for how earthquakes are caused by Earth's moving tectonic plates. SWBAT identify the parts of a volcano and differentiate between the three main types of volcanoes. SWBAT identify the Ring of Fire and its significance. SWBAT describe the events that produce tsunami. SWBAT research a major earthquake or volcanic eruption	➔ Earthquakes	Earthquakes and Volcanoes Unit • Lesson 1: Introduction to Earthquakes (how often they occur, vocabulary) • Lesson 2: Effects of Earthquakes and Fault Lines • Lesson 3: Locating Earthquakes (Triangulation) • Lesson 4: Measuring Earthquakes (Richter Scale and Modified Mercalli Intensity Scale)
			➔ Volcanoes	• Lesson 5: Introduction to Volcanoes (major events, vocabulary) • Lesson 6: Types of Volcanoes (shield, cinder cone, composite / stratovolcano) • Lesson 7: Tsunami and Mini-Project • Plotting Earthquakes and Volcanoes on an X-Y Grid

		and present the information in a class gallery.		
Unit	Standards	Unit Objectives	Big Ideas	Activities
6 **Rocks and Minerals** 	**MS-ESS2-1:** Develop a model to describe the cycling of Earth's material and the flow of energy that drives this process.	Students will be able to differentiate between rocks and minerals. SWBAT describe the characteristics that a substance must have in order to be classified as a mineral. SWBAT differentiate and organize the three main types of rocks based on their characteristics and explain the processes that form them and change them. SWBAT model the processes of the Earth that change rocks from one form to another over time.	➔ Minerals ➔ Defining Rocks	Rocks and Minerals Unit ● Lesson 1: Intro to Rocks and Minerals ● Lesson 2: What is a Mineral? ● Lesson 3: Mineral Properties
			➔ Types of Rocks	● ● RocksandTheRockCycleWebquestFillintheBlank... ● ● ● Lesson 4: What is a Rock? ● Cornell Doodle Notes: Types of Rocks ● Lesson 5: Igneous Rocks ● Lesson 6: Sedimentary and Metamorphic Rocks
			➔ The Rock Cycle	● Lesson 7: Types of Rocks Review ● Lesson 8: The Rock Cycle I ● Lesson 9: The Rock Cycle 2 ● Cornell Doodle Notes: The Rock Cycle ● Review and Assessment

Unit	Standards	Unit Objectives	Big Ideas	Activities
7 Earth's Freshwater and the Water Cycle 	**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. **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. **MS-ESS3-2:** Analyze and interpret data on natural hazards to forecast future	Students will be able to model the processes of evaporation and condensation at a particle level. SWBAT explain how satellites can collect data about the freshwater available at different places on Earth. SWBAT write a claim about the potential for water scarcity in specific places based on evidence from data. SWBAT explain the driving forces and processes by which Earth's water is continuously cycled through the atmosphere, on land, and in oceans. SWBAT design and build a water filtration system to purify dirty water. SWBAT model how freshwater is stored in aquifers and other reservoirs and naturally purified as part of the water cycle. SWBAT complete a graphic organizer to summarize a TED Talk about an aspect of water scarcity and present it to their peers.	→ Freshwater → Groundwater → Evaporation	Earth's Freshwater and the Water Cycle Unit ● Lesson 1: Water Footprint ● Lesson 2: Freshwater Distribution on Earth ● Lesson 3: Groundwater ● Lesson 4: Evaporation
			→ Condensation → The Water Cycle → Drought	● Lesson 5: Condensation and Clouds ● Lesson 6: The Water Cycle 1 ● Lesson 7: Satellite Monitoring and Drought
			→ Infiltration → The Water Cycle → Water Issues	● Lesson 8: Infiltration (Water Filter Lab Challenge) ● Lesson 9: The Water Cycle 2 ● Cornell Doodle Notes: The Water Cycle ● Lesson 10: Freshwater Scarcity and Issues ● Review and Assessment

	catastrophic events (in this case, drought) and inform the development of technologies to mitigate their effects.			
Unit	Standards	Unit Objectives	Big Ideas	Activities
8 Weather and the Atmosphere 	**MS-ESS2-5:** Collect data to provide evidence for how the motions and complex interactions of airmasses results in changes in weather conditions. **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.	Students will be able to describe how air pressure is affected by altitude and changing temperature of air in the atmosphere. SWBAT collect data from and model demonstrations that explain why the Earth has weather and how conditions of the atmosphere change with the unequal heating of the Earth. SWBAT take virtual measurements of temperature, humidity, wind speed and direction, and precipitation accumulation at various locations. SWBAT define weather fronts and the colliding air masses that produce them. SWBAT model the atmospheric conditions that produce hail storms and how hailstones are	→ What is Weather → Relative Humidity → Wind	Weather and the Atmosphere Unit ● Lesson 1: intro to weather, unit phenomenon (hailstorms) ● Lesson 2: hailstones, weather data analysis ● Lesson 3: relative humidity, wind, wind chill
			→ Weather Data → Unequal Heating → Layers of the Atmosphere	● Gizmo Virtual Lab: taking measurements of temperature, humidity, wind speed and direction, precipitation ● Cornell Doodle Notes: Weather Variables ● Lesson 4: unequal heating of Earth, layers of Earth's atmosphere ● Lesson 5: troposphere temperature, differences in surface temperature, cloud formation
			→ Atmospheric Pressure → Local Winds → Pressure Systems → Air Masses → Fronts	● Lesson 6: atmospheric air pressure, temperature and air pressure, local winds (sea breeze, land breeze) ● Lesson 7: high and low pressure systems, isobars, simple weather prediction ● Lesson 8: air masses and weather fronts ● Cornell Doodle Notes: Weather Systems

		formed within cumulonimbus clouds.	➔ Precipitation ➔ Storms	• Lesson 9: types of precipitation, conditions for storms • Lesson 10: cumulonimbus clouds, hailstone formation, conditions for hailstorms • Review and Assessment
Unit	Standards	Unit Objectives	Big Ideas	Activities
9 Climate Change 	**MS-ESS3:** Earth and Human Activity (Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.)	Students will be able to build on their prior knowledge about how and why Earth's climate is changing rapidly. SWBAT model how the Earth's atmosphere acts like a greenhouse and traps gases that warm the planet. SWBAT analyze evidence of global climate trends and changes. SWBAT use evidence to explain why human emission of the greenhouse gas carbon dioxide is causing Earth to warm abruptly relative to natural cycles of warming. SWBAT explain how the accumulation of carbon dioxide gas and other greenhouse gases in the atmosphere contribute to a changing climate. SWBAT explain how sea level will change as the planet warms.	➔ What is Climate Change ➔ The Greenhouse Effect ➔ Carbon Sources and Sinks	Climate Change Unit • Lesson 1: Images of Change, Ideas about Climate Change • Lesson 2: The Greenhouse Effect, Carbon Sources and Sinks • Lesson 3: Greenhouse Gas Molecules, Evidence of Climate Change
			➔ Carbon Dioxide ➔ Glaciers ➔ Sea Level Rise ➔ Carbon Footprint	• Lesson 4: Carbon Dioxide and the Keeling Curve • Lesson 5: Glaciers and Sea Level Rise • Lesson 6: Local Emissions and Your Carbon Footprint • Climate Change Blog Project

		SWBAT generate questions about the phenomena of global warming and climate change.		
Unit	Standards	Unit Objectives	Big Ideas	Activities
10 Earth in Space 	**MS-ESS1-1:** Develop and use a model of the Sun-Earth-Moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. **MS-ESS1-3:** Analyze and interpret data to determine scale properties of objects in the solar system.	SWBAT interpret evidence of Earth's rotation, revolution, and 23.5° tilt and model why the Earth has seasons. SWBAT explain with models that most objects in the solar system are in regular and predictable motion; these motions explain such cyclical phenomena as the day, the month, the year, the phases of the moon, eclipses of the sun and moon, and tides. SWBAT analyze and interpret data to determine scale properties of objects in the solar system.	→ Phenomena → Rotation vs. revolution → Evidence of Earth's motion → Earth's tilted axis → Reason for the seasons	Earth in Space Unit ● Lesson 1: Sun-Earth-Moon phenomena ● Lesson 2: Earth's rotation and revolution ● Cornell Doodle Notes: Earth's Motion ● Lesson 3: Reason for the Seasons ● Cornell Doodle Notes: Seasons on Earth
			→ Exploring the moon → The Moon's motion → Moon phases	● Lesson 4: Earth's Moon ● Lesson 5: Moon's Revolution ● Lesson 6: The Moon Phases ● Cornell Doodle Notes: Moon Phases
			→ Solar and lunar eclipses → Tides → The planets of our solar system	● Phases of Life Moon Phases Project ● Lesson 7: Eclipses ● Cornell Doodle Notes: Eclipses ● Lesson 8: Tides ● Tour of the Solar System Gallery Walk Activity

			➔ Scale of the solar system ➔ Other Objects in the Solar System	• Lesson 9: The Solar System • Lab: Scaled Solar System • Lesson 10: Scale of the Solar System • Comets, Asteroids, and Meteoroids Information Text Activity
			➔ Earth in Space Cumulative Project, Review, and Assessment	• Write a Children's Book Planet Research Project • Review and Assessment
Unit	Standards	Unit Objectives	Big Ideas	Activities
11 The Universe and Its Stars 	**MS-ESS1-2:** Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.	Students will explore how the technologies that NASA has developed for space exploration have led to important discoveries about the universe and advances in virtually every field of science as well as in products used in everyday life. SWBAT apply understanding about how light-years are used as a measure of distance for astronomical objects in space. SWBAT create a 2D model giving information about the distances and temperatures of stars in a constellation of their choosing. SWBAT apply their	➔ What is the Universe ➔ NASA ➔ Light-years ➔ Stars ➔ Constellations	The Universe and Its Stars Unit • Lesson 1: initial ideas and models of the universe • Lesson 2: NASA • History of Space Exploration Timeline Activity • Lesson 3: light years, exploring deep space, star types • Lesson 4: constellations
			➔ Mass & Weight ➔ Orbiting ➔ Habitable Zones of Stars ➔ Exoplanets	• Lesson 5: mass vs. weight, gravity • Cornell Doodle Notes: Gravity and Orbiting • Lesson 6: orbiting • Lesson 7: habitable ('Goldilocks') zones of stars, exoplanets

		understanding of gravity to explain why one's weight would change on different celestial objects. SWBAT model how the force of gravity changes with mass and distance and how this can be explained by the warping of spacetime. SWBAT model the forces that keep an object in orbit around another object. SWBAT analyze models of the habitable zones of stars and describe how stars are used to detect exoplanets in other solar systems. SWBAT describe the types of galaxies that exist in the universe and how astronomers count and learn about them. SWBAT describe the different life cycles of stars and the characteristics of black holes. SWBAT explain how space telescopes can see objects in the universe more clearly and process information about the universe in different wavelengths of the electromagnetic spectrum.	➔ Galaxies ➔ Black Holes ➔ EM Spectrum	• Lesson 8: types of galaxies • Lesson 9: black holes and the Event Horizon Telescope • Lesson 10: life cycle of stars, the electromagnetic spectrum
			➔ Space Telescopes	• Lesson 11: space telescopes • Lesson 12: The Hubble and James Webb Space Telescopes • Review and Assessment
Unit	Standards	Unit Objectives	Big Ideas	Activities

 **Plastic in the Oceans**	**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. **MS-ESS3-3:** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.	Students will develop and use models to show how ocean surface currents and winds move plastic waste around the planet and form gyres of plastic pollution in the world's oceans. SWBAT design a device for cleaning up plastic waste in the oceans. SWBAT develop a public service announcement about the accumulation of plastics in the Earth's oceans and the impact that this has on Earth's systems.	➔ Plastics ➔ Ocean Currents ➔ Plastic Pollution	Plastic in the Ocean Unit ● Lesson 1: Plastic Pollution ● Lesson 2: Ocean Currents ● Lesson 3: Nurdles and Gyres ● Lesson 4: Effects on Animals, Design a Clean Up Device ● Lesson 5: Public Service Announcement Project
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 **Energy and Natural**	**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	Students will be able to model and graph how human population has increased over the past 500+ years. SWBAT discuss environmental, economic, and social consequences for a human population of close to 8 billion.		

Resources	systems. **MS-PS1-3:** Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. **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. **MS-ESS3-5:** Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.	SWBAT differentiate between different types of kinetic and potential energy. SWBAT explain the difference between renewable, nonrenewable, and inexhaustible resources and model both an unsustainable and a sustainable consumption of resources in a population. SWBAT explain how human reliance on fossil fuels for energy has caused an accumulation of carbon dioxide in Earth's atmosphere and why this is changing global climate. SWBAT calculate the electrical energy consumption of household appliances. SWBAT model how greenhouse gasses warm Earth's atmosphere. SWBAT describe the advantages and disadvantages of the six major renewable energy sources (wind, solar, geothermal, hydroelectric, biofuels, and hydrogen fuel cells).		
Unit	Standards	Unit Objectives	Big Ideas	Activities
End of the Year				Earth and Space Science Careers Research and T-Shirt Design Project