Gather Reason Communicate

MS GRC Lessons- Earth and Space Science

CSSS Guidance Document "Investigation Beyond the Classroom"

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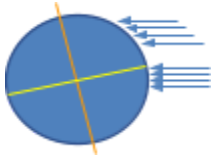
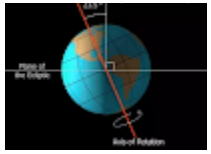
Earth and Space Science Standard	Link to Lesson	State	Lesson Topic	Phenomenon	GRC / 5E	Notes
Astronomy						
MS-ESS1-1 *Model of the Earth-Sun-Moon system to describe the cyclic patterns of lunar phases, eclipses of the sun, the moon, and seasons.*	No Shadow	HI	Seasonal Changes in Sunlight Intensity 	***Phenomenon:*** *Twice a year in Hawaii, there is no shadow at noon.*	**GRC** **PIP**	This investigation is focused on the seasonal differences in sunlight. Features an Investigation *Includes formative assessment*
MS-ESS1-1 *Model of the Earth-Sun-Moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and the moon, and seasons.*	A Time of Every Season	OK	Seasonal Changes 	***Phenomenon:*** *In December, it was dark when we came home from basketball practice at 5:30 pm, but in May, we played baseball,l and it was light until 8:30 pm.*	**GRC** **PIP**	This investigation is focused on seasons and how the length of the day affects seasonal changes. *Includes formative assessment*
MS-ESS1-1 *Model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, the sun and moon eclipses, and seasons.*	Is It Morning Yet? Need New Reading	OK	Cause of Seasons 	***Phenomenon:*** *Snow melts on the south slope of a hill before it melts on flat areas near the hill.*	**GRC** **PIP**	This is a good investigation for students to understand how the angle of incidence of sunlight affects the seasons. *Includes formative assessment*

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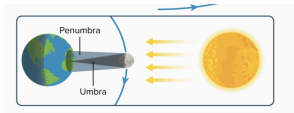
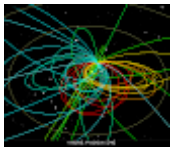
MS-ESS1-1 *Model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, the sun and moon eclipses, and seasons.*	*Mahina Moon*	HI	Patterns of lunar phases 	***Phenomenon:*** *The moon has a different shape each day and appears in a new position in the sky from one day to another*	**GRC**	Models patterns of changes in the Earth, moon, and sun systems that result in phases of the moon. *Includes formative assessment.* **Hawaii Culture and Place**
MS-ESS1-1 *Model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, the sun and moon eclipses, and seasons.*	*Total Eclipse of the Sun*	AZ	Eclipse 	***Phenomenon:*** *On April 8, 2024, at 11:20 am, most of Arizona went dark.*	GRC PIP	Use models and simulation to learn about the causes of an eclipse. *Includes formative assessment.*
MS-ESS1-2 *Gravity and Motion of Planets*	Stable Orbits	UT	Inertia, Gravity, and Orbit 	***Phenomenon:*** *The planets in our solar system have been in stable orbit for billions of years.*	GRC PIP	Use models to discuss the forces affecting the stable orbits of planets. *Includes formative assessment.*
MS-ESS1-2 *Gravity and Motion of Planets*	Planet's Ballet	HI	Simulation to explore the Motion of Planets 	***Phenomenon:*** *Earth travels around the Sun in an elliptical orbit, and the Moon travels around Earth in an elliptical orbit.*	GRC PIP	This investigation uses the PhET simulation to develop a relationship between the speed and gravity of an orbiting object. *Includes formative assessment*
MS-ESS1-2 *Gravity and Motion of*	Why Orbit?	HI	Inertia and Gravity	***Phenomenon:*** *If a tetherball's rope breaks, the*	GRC	This investigation starts with a simple hands-on task.

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Planets	*Needs Reading*			*ball flies off in a straight line.*	PIP	*Includes formative assessment*
MS-ESS1-3 *Scale of Objects in the Solar System*	Solar Scale	UT SLSD	The Scale of Distance in the Solar System	***Phenomenon:*** *Humans walked on the moon but not on Mars.*	GRC PIP	*The investigation focuses on the scale of distances in the solar system.* *Includes formative assessment*
MS-ESS1-3 *Scale of Objects in the Solar System*	Planetary Size	AZ	The Size of Planets	***Phenomenon****: The moon appears much larger in the night sky than Saturn, Mars, or the other planets.*	GRC PIP	*The investigation focuses on the relative size of the planets* *Includes formative assessment*
MS-ESS1-4 *Rock strata and geologic time scale*	Oklahoma's Geologic Time Scale	OK	Rock Strata and Time Scale	***Phenomenon****: The Arbuckle Mountains were once islands.*	GRC PIP	*This investigation can be done in other states by using a local geologic feature.* *Includes formative assessment*
MS-ESS1-4 *Rock strata and geologic time scale*	Rock Strata in Minnesota	MN	Time Scale of Earth 	***Phenomenon:*** *Fossils can be found in the rock cliffs along the Mississippi River in St. Paul, Minnesota.*	GRC PIP	*Students build a scaled time. It is specific to Minnesota but can be adapted.* *Includes formative assessment*
Summative Assessment Tasks **New 2024**	**1. MS-ESS1-1 Holiday in Argentina** 2. **MS-ESS1-2 The Milky Way**			3. **MS-ESS1-3 Voyager** **4. MS-ESS1-4 Wasatch Mountains Unconformity**		

These summative assessment tasks are new. We would appreciate your feedback on the items and the grading rubric. Please send your suggestions and sample student responses to brettdmoulding@gmeil.com. Thank you, Brett

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Geoscience Processes						
MS-ESS2-1 *Cycling of Earth's materials and flow of energy driving the process*	Arches National Park and Scale	UT	Geoscience Processes 	*A set of Analogous Phenomena leading to the large arches in rock formations can be seen in Arches National Park.*	**5E GRC**	*This is a sequence of investigations that also aligned to **MS-ESS2-2*** *This lesson has been used in teacher workshops and MS classrooms*
MS-ESS2-1 *Cycling of Earth's materials and flow of energy that is driving the process*				***Phenomenon:** The Hawaiian islands are part of a long chain of undersea mounds that extend under the Pacific to the northwest*		
MS-ESS2-2 *Geoscience processes have changed Earth's surface at varying time and spatial scales*	Igneous Butte	UT	Cycling of Earth materials 	***Phenomenon:** Near St. George, Utah, the tops of the buttes are covered with lava flow, but the valleys and ravines are covered with sand and sandstone.*	GRC PIP	*This investigation focuses on the cycling of sedimentary and igneous rock and how the rate of weathering differs. Also aligned to **MS-ESS2-2*** *Includes formative assessment*
MS-ESS2-2 *Geoscience processes have changed Earth's surface at varying time and spatial scales*	Shore Thing!	HI	Weathering and Erosion 	***Phenomenon:** Throughout the Hawaiian Islands, there are many different beach landscapes*	GRC	*This investigation has students investigate and model the formation of sandy beaches in Hawaii over time.* *Includes formative assessment*
MS-ESS2-2 *Geoscience processes have changed Earth's surface at varying time and spatial scales*	Do You Feel the Earth Moving?	UT	Uplift of Mountains 	***Phenomenon:** Maps show patterns of where mountains are found on Earth.*	GRC	Uplift and patterns in where mountains are uplifted. *Includes formative assessment*

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MS-ESS2-2 *Geoscience processes have changed Earth's surface at varying times and spatial scales*	Who Moved Niagara Falls	NY	The Scale of Change on Earth 	***Phenomenon:*** *Niagara Falls is located in a different place than it was the first time I saw it.*	**GRC** PIP	This investigation uses a local phenomenon to investigate geoscience processes. *Includes formative assessment*
MS-ESS2-2 *Geoscience processes have changed Earth's surface at varying time and spatial scales*	Devil's Slide	UT	Slow Geoscience Processes 	***Phenomenon****: Devil's Slide is an unusual geologic rock formation in Weber Canyon in Utah that has two parallel rock slabs protruding to form a slide.*	**GRC** Elaborate Apply Evaluate	This investigation provides a unique local landform. The same lessons can be used for local landforms near you. *Includes formative assessment*
MS-ESS2-2 *Geoscience processes have changed Earth's surface at varying time and spatial scales*	Pathways of Change	PA	Weathering of Sidewalks 	***Phenomenon****: The old sidewalks seem to be more worn out than the new sidewalks*	GRC Engage Explore Explain	This investigation is very useful for starting a unit on geoscience processes. *Includes formative assessment*
MS-ESS2-2 *Geoscience processes have changed Earth's surface at varying time and spatial scales*	Land of 10,000 Lakes	MN	Glaciation 	***Phenomenon:*** *Minnesota has thousands of lakes.*	GRC PIP	This investigation focuses on glaciation and timescale. *Includes formative assessment*
MS-ESS2-2 *Geoscience processes have changed Earth's surface at varying time and spatial scales*	Uniformitarianism Under Your Toes	AZ	Geological Column	***Phenomenon:*** *Only some of the layers in the Grand Canyon have fossils.*	GRC PIP	This investigation focuses on the idea of uniformitarianism. *Includes formative assessment*

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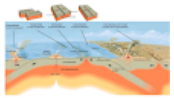
MS-ESS2-2 *Geoscience processes have changed Earth's surface at varying times and spatial scales*	Off Boundary	AZ	Plate Tectonics	***Phenomenon:*** *The Phoenix area has a lot of volcanic rock but no cone-shaped volcanoes.*	GRC PIP	This investigation can be adapted to focus on geological formations in other states and regions. *Includes formative assessment*
MS-ESS2-3 *Evidence for Plate Tectonics*	What to See on the Seafloor	HI	Evidence of Plate Motion 	***Phenomenon:*** *The Hawaiian Islands are not all the same age.*	GRC Engage Explore Explain	This investigation engages students in one line of evidence for the theory of plate tectonics. *Includes formative assessment*
MS-ESS2-3 *Evidence for Plate Tectonics*	Iceland has Geothermal Energy	NY	Evidence of Plate Motion 	***Phenomenon:*** *People in Iceland get most of their energy from geothermal energy sources.*	**GRC**	This lesson engages students in using multiple lines of evidence to support the theory of plate tectonics. May wish to bundle with MS-ESS3-1. *Includes formative assessment*
MS-ESS2-4 *Cycling of water through Earth's systems is driven by energy from the sun and the force of gravity.*	What's in the Water	PA MCIU	Watershed	*Phenomenon: One location of the school grounds is wetter than the other areas.*	GRC PIP	The investigation is focused on the watershed and water cycle. Includes formative assessment *Includes formative assessment*
MS-ESS2-4 *Cycling of water through Earth's systems is driven by energy from the sun and the force of gravity.*	From Polluted to Pure	PA MCIU	Watershed Cleaning of Water	*Phenomenon: Water is clearer after it passes through the grassy playground area.*	GRC PIP	The investigation explores soil and surface to explore pollution in watershed runoff. *Includes formative assessment*
MS-ESS2-4 *Cycling of water through Earth's systems is driven by energy from the sun*	Water Cycle *Needs Teachers to*		Water Cycle	*Phenomenon: Water in a closed plastic bag changes*	GRC PIP	This investigation is focused on the water cycle. *Includes formative assessment*

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and the force of gravity.	*Finish and Use Lesson*			*but does not go anywhere.*		
MS-ESS2-4 *Cycling of water through Earth's systems is driven by energy from the sun and the force of gravity*	Great Lakes Snow Analysis	NY	Water Cycle 	***Phenomenon:*** *Some areas of the Great Lakes receive more snow than others.*	**GRC**	This investigation provides an opportunity to Bundled MS ESS2-4 and 2-5. *Includes formative assessment*
MS-ESS2-4 *Cycling of water through Earth's systems is driven by energy from the sun and the force of gravity*	Sun energy moves the Water Cycle!	UT NY	Water Cycle 	***Phenomenon****- After a rainstorm, water on the pavement in sunny areas evaporates faster than in shady areas.*	**5E GRC**	This investigation has been used by many teachers in the classroom. *Includes formative assessment*
MS-ESS2-5 *Motions and complex interactions of air masses result in changes in weather conditions,*	Canyon Winds	UT	Weather 	***Phenomenon:*** *Most mornings, there is a gentle breeze in the mouth of the canyon, but on some days, the wind blows much harder, sometimes above 60 mph.*	GRC	This investigation is a good way to look at local winds. *Includes formative assessment*
MS-ESS2-5 *Motions and complex interactions of air masses result in changes in weather conditions.*	Winds of Change Need a reading	MN	Air Masses 	***Phenomenon****: The wind often changes direction when the weather changes.*	GRC PIP	This investigation helps students develop an understanding of weather maps. *Includes formative assessment*
MS-ESS2-5 *Motions and complex interactions of air masses result in changes in weather conditions.*						

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MS-ESS2-6 *Unequal heating and rotation of the Earth cause atmospheric and oceanic circulation patterns that determine regional climates.*	Climate and A Tale of Two Cities Useable Under Construction		Climate Variables	***Phenomenon:*** *The climate in two nearby cities can be very different.*	GRC PIP	This investigation has some very good readings to help learn about variables affecting climate. *Includes formative assessment*
MS-ESS2-6 *Unequal heating and rotation of the Earth cause atmospheric and oceanic circulation patterns that determine regional climates.*	Location, Location, Location!	UT	Climate 	***Phenomenon:*** *Salt Lake City, Utah, and Naples, Italy are located on the same latitude in the Northern Hemisphere, but the average July temperature in Salt Lake City is 90°F and in Naples 77° F.*	GRC	This investigation can be adapted to the location and climate where you live. *Includes formative assessment*
MS-ESS2-6 *Unequal heating and rotation of the Earth cause atmospheric and oceanic circulation patterns that determine regional climates.*	Local Rain	HI	**Weather & Climate** 	***Phenomenon:*** *In Hawai'i, annual rainfall varies from one area of an island to another.*	**GRC** **PIP**	The lesson uses data analysis and a very useful website simulator. You can adapt to your local rain patterns caused by topography. *Includes formative assessment*
MS-ESS2-6 *Unequal heating and rotation of the Earth cause atmospheric and oceanic circulation patterns that determine regional climates.*	Why So Dry?	UT SLSD	**Weather and Climate** 	***Phenomenon:*** *The Atacama Desert is the driest desert in the world.*	**GRC** Engage Explore Explain	This lesson follows the local rain lesson Under Construction Needs Assessment
Summative Assessment Tasks	1. MS-ESS2-1 Grand Canyon to Baha 2. MS-ESS2-2 Bryce Canyon 3. MS-ESS2-3 Ring of Fire			4. MS-ESS2-4 Water Cycle 5. MS-ESS2-5 Weather Map Simulation 6. MS-ESS2-6 California Climates		

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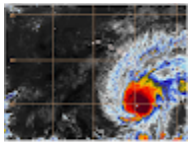
Earth Resources						
MS-ESS3-1 Distributions of Earth's mineral, energy, and groundwater resources	The Copper Conundrum	UT	**Distribution of Earth Resources** 	***Phenomenon:*** *Bingham Canyon is only one of a few places worldwide where large amounts of copper are mined.*	**GRC** Engage Explore Explore Explain	This investigation uses resources from online and embedded text to engage students. *Includes formative assessment*
MS-ESS3-2 Forecasting Natural Disasters	Specific Pacific Predictions	HI	 Hurricanes	***Phenomenon****: Hurricanes arrive early in the school year.*	GRC	This lesson provides a chance for students to look at NOAA data to find patterns in the motion of hurricanes. *Includes formative assessment*
MS-ESS3-2 Forecasting Natural Disasters	Monsoon	AZ	Monsoons	***Phenomenon:*** *Weather patterns change across the Southwest each summer.*	GRC PIP	This investigation uses a pHet simulation and good data sources. *Includes formative assessment*
MS-ESS3-2 Forecasting Natural Disasters	Tsunami Prediction	HI	Tsunami	***Phenomenon****: An earthquake occurred on January 23, and Hawaii has a tsunami warning/watch.*		

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MS-ESS3-2 Forecasting Natural Disasters	Avalanche	UT	Avalanches	*Phenomenon: Little Cottonwood in Utah has a lot of avalanches.*	GRC PIP	The investigation is specific to mountainous states. It could be applied to Mud Slides, too *Includes formative assessment*
MS-ESS3-3 Minimizing Human Impact on the Environment	Sustainable Beef	NE Farm Bureau		***Phenomenon:*** *Feedlots can support 50 steers on one acre, but pasture can only support one steer per acre.*	GRC PIP	This investigation includes engineering components. *Includes formative assessment*
MS-ESS3-3 Minimizing Human Impact on the Environment	Light of My Life	HI UT	Conserving Electric Energy 	***Phenomenon:*** *Not all lights use the same amount of electricity.* ***Engineering Challenge:*** *Develop a plan to reduce school energy consumption.*	GRC	This investigation provides a structure for an energy audit. Science and Engineering. *Includes formative assessment*
MS-ESS3-3 Minimizing Human Impact on the Environment	Flooding	PA	Human Effect on Flooding	*Phenomenon: After heavy rains, our town is flooded.*	GRC PIP	Investigation is specific to Quakertown but can be used for any river with resources. *Includes formative assessment*
MS-ESS3-4 Impact on Earth's systems of increases in human population and per-capita consumption of natural resources	Do You Want Fries with That? Links Go to Same Lesson Plan Oui, Oui, Wee, All the Way Home check	HI HI	Human population and per-capita consumption of natural resources	***Phenomenon****: The average American eats 12,129 hamburgers in a lifetime.* ***Phenomenon****: France and the USA are industrialized nations, but France uses "cleaner" natural resources than the USA.*	**5E GRC**	This investigation has two complete lessons. *Includes formative assessment*

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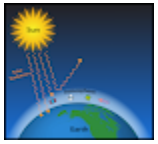
MS-ESS3-5 Factors affecting global temperatures over the past century	The Cycle of Manmade Disasters	HI	Biodiversity and ecosystem changes, and minimizing the human impact on the environment	***Phenomenon:*** *Satellite pictures reveal that 90% of the Aral Sea dried up, forming a new desert between Uzbekistan and Kazakhstan in Asia.*	**5E GRC**	This lesson uses a set of 25 man-made disasters to engage students in the elaborate phase of 5E with phenomena. *Includes formative assessment*
MS-ESS3-5 *Climate Change*	Venus Heat Trap	OK UT	Greenhouse Effect 	***Phenomenon:*** *The average global temperature on Earth has increased by 0.85 degrees Celsius over the past 100 years.*	**5E GRC** **PIP**	*This is a sequence of investigations that also aligns with **MS-ESS2-4 and MS-ESS3-5.*** *Includes a formative assessment*
Summative Assessment Tasks	1. MS-ESS3-1 Rare as Gold 2. MS-ESS3-2 Wasatch Mountains 3. MS-ESS3-3 Plastics in the Ocean			4. MS-ESS3-4 Forest Habitat 5. MS-ESS3-5 Human Population and Climate Change		

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Utah SEEd Standards Crosswalk to NGSS

Utah GRADE 6 CROSSWALK

Utah SEEd	NGSS	Core Idea
6.1.1	MS-ESS1-1	Cyclic patterns of moon phases, eclipses, and seasons
6.1.2	MS-ESS1-2	Role of gravity in orbital motions of objects in the solar system
6.1.3	MS-ESS1-3	Scale and properties of objects in the solar system
6.2.1	MS-PS1-1	Molecules are made of atoms
6.2.2	MS-PS1-4	States of matter (solid, liquid, gas) and phase changes
6.2.3	MS-PS3-4	The total energy of a system depends on the type and amount of matter
6.2.4	MS-PS3-3 MS-ETS1-4	Heat transfer (conductors and insulators)
6.3.1	MS-ESS2-4	The water cycle is driven by energy from the Sun
6.3.2	MS-ESS2-5	Interactions between air masses cause changes in weather
6.3.3	MS-ESS2-6	Patterns of atmospheric and oceanic circulation determine regional climates
6.3.4	MS-ESS3-5	Earth's greenhouse effect enables life to exist on Earth
6.4.1	MS-LS2-1	Effects of resource availability on populations
6.4.2	MS-LS2-2	Patterns of interactions across multiple ecosystems
6.4.3	MS-LS2-3	Matter cycles and energy flows in ecosystems (food webs)
6.4.4	MS-LS2-4	Changes to an ecosystem affect the stability of populations
6.4.5	MS-LS2-5 MS-ETS1-2	Preserving ecosystem services and biodiversity

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Utah GRADE 7 CROSSWALK

7.1.1	MS-PS2-2	Forces can change motion (Newton's First & Second Laws)
7.1.2	MS-PS2-1	Collisions (Newton's Third Law)
7.1.3	MS-PS2-5	Force fields exist between objectsthat are not in contact
7.1.4	MS-PS2-3	Factors that affect the strength of electric and magnetic forces
7.1.5	MS-PS2-4	Gravity depends on the masses of interacting objects
7.2.1	MS-ESS2-1	Energy drives the cycling of Earth's materials (rock cycle)
7.2.2	MS-ESS2-2	Earth's surface is constantly changing
7.2.3	MS-ESS3-2 MS-ETS1-1 MS-ETS1-2	Technologies mitigate the effects of natural hazards
7.2.4	HS-ESS2-3	Earth's interior includes the crust, mantle, and core
7.2.5	MS-ESS2-3	Earth's plates can move great distances, collide, spread apart
7.2.6	MS-ESS1-4	Rock strata and the fossil record tell a story of Earth's history
7.3.1	MS-LS1-1	Structure of living things (single-celled, multicellular organisms)
7.3.2	MS-LS1-2	The cell as a system (cell function)
7.3.3	MS-LS1-3	Body systems are specialized for particular body functions
7.4.1	MS-LS3-2	Effect of sexual and asexual reproduction on genetic variation
7.4.2	MS-LS1-4	Adaptations increase the probability of successful reproduction

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7.4.3	MS-LS3-1	Genetic mutations can change traits
7.4.4	MS-LS4-5 MS-ETS1-3	Genetic engineering technologies change the inheritance of traits in organisms (artificial selection, gene therapy)
7.5.1	MS-LS4-4 MS-LS4-6	Genetic variations in a population can affect some individual's probability of surviving and reproducing in a certain environment and lead to changes in populations over time (natural selection)
7.5.2	MS-LS4-1	The fossil record documents the history of life forms on Earth
7.5.3	MS-LS4-2	Anatomical similarities among modern organisms are evidence of common ancestry
7.5.4	MS-LS4-3	Embryological Development as Evidence for Common Ancestry

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Minnesota GRADE 6 Earth Science		
MN BENCHMARK	**NGSS**	**Minnesota Benchmarks Core Idea**
6E.1.1.1.1	MS-ESS1-1	Models can be used to describe the Earth-sun-moon system and to describe lunar phases, eclipses, and seasons.
6E.1.1.1.2	MS-ESS1-4	The geological time scale is interpreted from rock strata to organize Earth's history
6E.1.1.1.3	MS-ESS3-5	Evidence exists of changes in Earth's climate.
6E.1.2.1.1	MS-ESS2-5	Interactions between air masses cause weather changes.
6E.2.1.1.1	MS-ESS1-3	Gravity holds objects in orbit around the sun to form the solar system.
6E.2.1.1.2	MS-ESS2-3	Tectonic processes continually generate new ocean sea floor at ridges and destroy old seafloor.
6E.2.1.1.3	MS-ESS3-2	Technologies can be used to predict and mitigate the effects of natural hazards.
6E.3.1.1.1	MS-ESS1-2	The Milky Way galaxy is one of many galaxies in the universe formed by gravity pulling matter into enormous spinning disks.
6E.3.1.1.2	MS-ESS2-1	Energy drives the cycling of Earth's materials (rock cycle)
6E.3.1.1.3	MS-ESS2-4	The water cycle is driven by energy from the Sun.
6E.3.2.1.1	MS-ESS1-4	Rock strata and the fossil record provide evidence of Earth's history.
6E.3.2.1.2	MS-ESS3-1	Minerals, fresh water, and biosphere resources are limited and are distributed unevenly around the planet.
6E.3.2.1.3	MS-ESS3-3	Human populations and per-capita consumption of natural resources increase the negative impacts on the Earth system.
6E.4.1.1.1	MS-ESS2-2	Geoscience processes are constantly changing Earth's surfaces at various time scales.
6E.4.2.2.1	MS-ESS1-1	Native Minnesota cultures have used various ways to describe the apparent motion of the sun, moon, and Earth.
This crosswalk was developed to help science educators find GRC lessons aligned with the Minnesota science standards.		

Astronomy		Geology		Weather and Climate		Natural Disasters and Resources	
1.1.1.1	MS-ESS1-1	1.1.1.2	MS-ESS1-4	1.2.1.1	MS-ESS2-5	2.1.1.3	MS-ESS3-2
2.1.1.1	MS-ESS1-3	3.2.1.1	MS-ESS1-4	3.1.1.3	MS-ESS2-4	3.2.1.2	MS-ESS3-1
3.1.1.1	MS-ESS1-2	4.1.1.1	MS-ESS2-2	1.1.1.3	MS-ESS3-5	3.2.1.3	MS-ESS3-3
4.2.2.1	MS-ESS1-1	2.1.1.2	MS-ESS2-3				
		3.1.1.2	MS-ESS2-1				

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MS GRC Lessons- Earth and Space Science

Arizona 6th Grade Earth and Space Science Standards Alignment to NGSS		
6.E1U1.6	MS-ESS2-6	Investigate and construct an explanation demonstrating that radiation from the Sun provides energy and is absorbed to warm the Earth's surface and atmosphere.
6.E2U1.7	MS-ESS1-3	Use ratios and proportions to analyze and interpret data related to scale, properties, and relationships among objects in our solar system.
6.E2U1.8	Unique	Develop and use models to explain how constellations and other night sky patterns appear to move due to Earth's rotation and revolution.
6.E2U1.9	MS-ESS1-1	Develop and use models to construct an explanation of how eclipses, moon phases, and tides occur within the Sun-Earth-Moon system.
6.E2U1.10		Use a model to show how the tilt of the Earth's axis causes variations in the length of the day and gives rise to seasons
Arizona 7th Grade Earth and Space Science Standards Alignment to NGSS		
7.E1U1.5	MS-ESS2-1 MS-ESS2-4	Construct a model that shows the cycling of matter and flow of energy in the atmosphere, hydrosphere, and geosphere.
7.E1U1.6	MS-ESS2-3	Construct a model to explain how the distribution of fossils and rocks, continental shapes, and seafloor structures provides evidence of past plate motions.
7.E1U2.7	MS-ESS2-5	Analyze and interpret data to construct an explanation for how advances in technology have improved weather prediction.
Arizona 8th Grade Earth and Space Science Standards Alignment to NGSS		
8.E1U1.6	MS-ESS1-4 MS-LS4-1	Analyze and interpret data about the Earth's geological column to communicate the relative ages of rock layers and fossils.
8.E1U3.7	MS-ESS3-2	Obtain, evaluate, and communicate information about data and historical patterns to predict natural hazards and other geological events.
8.E1U3.8	MS-ESS3-4	Construct and support an argument about how human consumption of limited resources impacts the biosphere.

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Middle School Earth and Space Science Pennsylvania STEELS Standards		
PA Standards	**NGSS**	**Earth and Space Science**
3.3.6-8.A.	MS-ESS1-1	The Earth-sun-moon system has cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
3.3.6-8.B	MS-ESS1-2	Gravity is the fundamental component in the motion within galaxies and the solar system.
3.3.6-8.C	MS-ESS1-3	The solar system is described in terms of the scale and properties of objects within the system.
3.3.6-8.D	MS-ESS1-4	The rock strata provide evidence of the geologic time scale of Earth's 4.6 billion-year-old history.
3.3.6-8.E	MS-ESS2-2	Geoscience processes have changed Earth's surface at varying times and spatial scales.
3.3.6-8.F	MS-ESS2-1	The flow of energy in Earth's process drives the cycling of Earth's materials.
3.3.6-8.G	MS-ESS2-3	The distribution of fossils and rocks, continental shapes, and seafloor structures are evidence of the past motion of tectonic plates.
3.3.6-8.H	MS-ESS2-4	The cycling of water through Earth's systems is driven by energy from the sun and the force of gravity.
3.3.6-8.I	MS-ESS2-6	Unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates
3.3.6-8.J	MS-ESS2-5	The motion and complex interactions of air masses result in changes in weather conditions.
3.3.6-8.K	MS-ESS3-1	The uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
3.3.6-8.L	MS-ESS3-2	The development of technologies has been used to forecast future catastrophic events and mitigate their effects.
3.3.6-8.M	MS-ESS3-3	Apply scientific principles to design a method for monitoring and minimizing human impact on the environment.
3.3.6-8.N	MS-ESS3-4.	Increases in human population and per capita consumption of natural resources impact Earth's systems.
3.3.6-8.O	MS-ESS3-5	The rise in global temperatures over the past century was caused by multiple factors.

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POSSIBLE FUTURE LESSONS

MS-ESS1-4 *Rock strata and geologic time scale*		UT		***Phenomena:*** *Ogden Canyon near Ogden, Utah has very odd rock layering that appears to be standing on edge.*		
MS-ESS2-2 *Geoscience processes have changed Earth's surface at varying times and spatial scales*		AZ		***Grand Falls Arizona*** ***On the Little Colorado River***		