

Wright City Science Curriculum

Earth Science Curriculum and Missouri Standards

Grade	11th
Unit of Study	<u>Lifespan of the Sun</u>
Length of Unit	4 weeks
Sample Essential Questions	Sample Corresponding Big Ideas
How old is the Sun?	Our sun is approximately 6.5 billion years old - about halfway through its lifespan.
What happens when it dies?	The sun will get hotter and larger before it dies as a Planetary Nebula.
How does it release energy?	The sun slams 2 hydrogen atoms together to produce Helium and a tremendous amount of energy.
Characteristics of the Sun	Size, sun spots, solar flares, CME's (coronal mass ejections) solar prominences, 11-year cycle
What is the role of Nuclear Fusion	Fusion is $H + H \rightarrow He$ + lots of energy Fusion is how the sun and all stars produce energy.
What types of radiation are released by the sun?	The sun releases all 7 types of energy in the Electromagnetic Spectrum.

Missouri Learning Standards	
Priority Standards	Supporting Standards
9-12.ESS1.A.1	
9-12.ESS1.A.3	

Lifespan of the Sun Sequence

MLS	Topic(s)	Learning Targets	Academic Vocabulary
ESS1.A1	Lifespan of the Sun	Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the Sun's core to release energy in the form of radiation. Emphasis is on the energy transfer mechanisms that allow energy from nuclear fusion in the Sun's core to reach Earth. Examples of evidence for the model include observations of the masses and lifetimes of other stars, as well as the ways the sun's radiation varies due to sudden solar flares.	Fusion, Coronal Mass Ejection, Solar Flares, Electromagnetic Radiation, Solar Prominence, Aurora Borealis, Magnetic North
ESS3.A3	How stars produce different elements over their lifespan.	Communicate scientific ideas about the way stars, over their life cycle, produce elements. [Clarification Statement: Emphasis is on the way nucleosynthesis, and therefore the different elements created, varies as a function of the mass of a star and the stage of its lifetime.	Red Giant, Planetary Nebula, Neutron Star, Black Hole, Super Nova, White Dwarf, slough off elements

MLS	Learning Activities	
ESS3.A3	How to use a periodic table	Must Do ▾
ESS1.A1	Fission vs Fusion	Must Do ▾
ESS3.A3	Lifespan of the Sun Flipbook Project	Must Do ▾
ESS1.A1	Lifespans of all stars	Must Do ▾
ESS1.A1	Drawing and explaining the types of radiation in the Electromagnetic Spectrum	Must Do ▾

Assessments		
MLS	Description or Location	Rubric/Location
ESS1.A.1 ESS3.A.3	Student Created Flipbook showing the Lifespan of the Sun Test over Lifespan of the Sun	= Life Span of the Sun-... = Test over the Lifespa... = Page 2 & 3 Test Lifes...

Additional Resources

[Lifespan of the Sun Google Slideshow](#)

Grade	11th
Unit of Study	Big Bang Theory
Length of Unit	4 weeks
Sample Essential Questions	Sample Corresponding Big Ideas
What is the Big Bang Theory?	The Big Bang is described as the instant in which a concentrated ball of energy exploded, turning into matter and expanding at enormous speed.
What evidence supports the Big Bang Theory?	Cosmic Background Radiation, Astronomical objects show Red shift indicating galaxies are moving away
What is Red Shift Blue Shift?	Light spectrum can be used to see if an astronomical object is moving towards or away from you
How do atoms make light?	Light and therefore color are created by electrons absorbing energy and releasing energy.
What are Kepler's 3 Laws?	Law of Ellipses, Law of Equal Areas and the Law of Eccentricity
How do you calculate Kepler's 3rd Law?	$p^2 = a^3$ which means the amount of time it takes a planet to orbit the Sun is related to the planet's average distance from the Sun.

Missouri Learning Standards

Priority Standards	Supporting Standards
9-12.ESS1.A.2	

Big Bang Theory Sequence			
MLS	Topic(s)	Learning Targets	Academic Vocabulary
ESS1.A.2		Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. [Clarification Statement: Emphasis is on the astronomical evidence of the red shift of light from galaxies as an indication that the universe is currently expanding, the cosmic microwave background as the remnant radiation from the Big Bang, and the observed composition of ordinary matter of the universe, primarily found in stars and interstellar gases (from the spectra of electromagnetic radiation from stars).]	Doppler Effect, Red Shift - Blue Shift, Big Bang Theory, Electromagnetic Spectrum, Light Spectrum, Cosmic Background Radiation, absorption spectrum, emission spectrum
ESS1.B.1		Use Kepler's Law to Predict the motion of orbiting objects in the solar system. [Clarification Statement: Emphasis is on Newtonian gravitational laws governing orbital motions, which apply to human made satellites as well as planets and moons.]	Ellipse, aphelion, perihelion, eccentricity,

MLS	Learning Activities	
ESS1.A2	Act out the Doppler Effect and apply to Red Shift - Blue Shift	Must Do ▾
ESS1.A2	Work in teams to complete Electron Energy and Light Packet	Must Do ▾
ESS1.A2	Spectroscopy Lab - Learn to identify elements based on their light spectra	Must Do ▾
ESS1.A2	Practice drawing the steps in how an atom produces light	Must Do ▾
ESS1.A2	Look at absorption and emission spectrum to - determine red shift or blue shift - as well as which elements are present in an unknown sample	Must Do ▾
ESS1.A2	Make a model of the Big Bang Theory using words and pictures	Must Do ▾
ESS1.B.1	Kepler's Laws of Planetary Motion Activity - Kepler's 1st Law - Determining Ellipses	Must Do ▾
ESS1.B.1	Kepler's Law of Planetary Motion Activity Packet - Kepler's 2nd and 3rd Laws of Planetary Motion	Must Do ▾

ESS1.B.1	How does gravity affect planetary motion using PHET's Gravity and Orbits simulator	Must Do
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Assessments		
MLS	Description or Location	Rubric/Location
ESS1.A.2	Students will make a 30 second - 2 minute movie over either the Big Bang Theory, Red Shift-Blue Shift or Explaining how color is produced by atoms.	Rubric for Movie
ESS1.A.2	Big Bang Theory Test	Life Span of the Sun-...
ESS1.B.1	Quiz over Kepler's Laws	Test over Kepler's La...

Additional Resources	
Big Bang Theory Slideshow	
Kepler's Law of Planetary Motion Activity Packet	
PHET Gravity and Orbits simulator activity	
Kepler's 1st Law Determining Ellipses	

Grade	11th
Unit of Study	Plate Tectonics
Length of Unit	5 weeks
Sample Essential Questions	Sample Corresponding Big Ideas
What is Pangea?	All continents were once connected
How do scientists know that pangea existed?	Tectonic plate movement explains how continents drifted apart and why similar plant and animal fossils as well as similar rock formations occur on different continents.
Why are rocks on the ocean floor much younger than rocks on continents?	Magma rising up at tectonic plate boundaries in the ocean floor explains "Seafloor Spreading" and why newer rocks are located there.

How does the Earth's interior and surface processes (constructive and destructive) operate at different spatial and temporal scales to form continental and ocean-floor features.	Over millions of years of tectonic plate movement at convergent and divergent plate boundaries similar land and sea features have been created.
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Missouri Learning Standards	
Priority Standards	Supporting Standards
9-12.ESS1.C.1	
9-12.ESS2.A.1	

Unit Sequence			
MLS	Topic(s)	Learning Targets	Academic Vocabulary
9-12.ESS1.C.1		Evaluate evidence of the past and current movements of continental and oceanic crust, the theory of plate tectonics, and relative densities of oceanic and continental rocks to explain why continental rocks are generally much older than rocks of the ocean floor.	Tectonic plates, continental drift, Pangea, Seafloor Spreading, Ring of Fire
9-12.ESS2.A.1		Develop a model to illustrate how Earth's interior and surface processes (constructive and destructive) operate at different spatial and temporal scales to form continental and ocean-floor features. [Clarification Statement: Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and 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	Paleomagnetism, plate boundaries, divergent boundary, convergent boundary, transform boundary

		mechanisms (such as weathering, mass wasting, and coastal)]	
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MLS	Learning Activities	
ESS1.C.1	Cut out present day continents and tape them together to form Pangea's shape.	Must Do ▾
ESS1.C.1	Map Wegener's data onto student's Pangea to prove this formation was correct.	Must Do ▾
ESS1.C.1	Watch a movie for further evidence on Seafloor Spreading.	Must Do ▾
ESS2.A.1	Explain and watch videos on 3 types of plate tectonic boundaries.	Must Do ▾
ESS2.A.1	Use whipping cream, graham crackers and fruit rollups to demonstrate plate boundaries	Must Do ▾
ESS2.A.1	Use flour to form Calderas	Option L... ▾
	Research if there are volcanoes anywhere else in the galaxy - if so what is different about them?	Option L... ▾
		Option L... ▾

Assessments		
MLS	Description or Location	Rubric/Location
	Plate Tectonic Test	 Plate Tectonics Test
	Earthquake Presentation	 Earthquake Slides Ru...
	Test over Earthquakes, Volcanoes and Tsunamis	 Volcanoes, Earthquak...

Additional Resources
 Plate Tectonics Slideshow
Pangea Map Cutout
Wegener's data
Seafloor Spreading Movie
Snack Tectonics
Caldera lab
Watch videos on Mt. St. Helen's Eruption in Washington State
Volcano information slides 18-30

Earthquake information on slides 31-38
Activity - Learn how to measure p and s wave distances for earthquakes Here is the link to the packet.
Tsunami information slides 51-54

Grade	11th
Unit of Study	Water Cycle and Rock Cycle
Length of Unit	3 weeks
Sample Essential Questions	Sample Corresponding Big Ideas
What unique properties does water have?	Our planet's characteristics are greatly influenced by the properties that water has.
How do water's properties affect the world we live in?	The polar nature of water allows it to float as a solid and not sink and destroy the ecosystem below it!
What is a universal solvent and why is it so important?	Water can dissolve more substances than any other compound. Thus allowing it to dilute almost any substance over time and with a large enough volume.
Why is the Water Cycle so important to our planet?	The Water Cycle is how water is moved throughout all components of our planet. Not just precipitation - evaporation- condensation.
How can just one change to the Earth's surface result in changes to other parts of the Earth?	Weathering, erosion and deposition results in the movement of materials around the Earth. Glaciers are composed of fresh water. When global warming melts them, the fresh water becomes part of the salty ocean water. Thus losing that fresh water for drinking and sea levels rise.
Is desalination a possible answer to the lack of fresh water our planet is experiencing?	Desalination removes salt and minerals from ocean water. Positives - it can be drinkable by humans. Negatives - it is a costly process and something has to be done with the salt, minerals and chemicals used to clean it. Sadly many countries are just dumping the waste back into the oceans.
How do rocks move through the Rock Cycle?	There are three types of Rocks - Igneous, Metamorphic and Sedimentary. By applying a combination of either heat, compression, pressure and melting one type of rock can become a

	different type of rock. Providing an example of how one change to the Earth's surface can create changes to other Earth systems.
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Missouri Learning Standards	
Priority Standards	Supporting Standards
ESS2.C.1	
ESS2-2	

Unit 1 Sequence			
MLS	Topic(s)	Learning Targets	Academic Vocabulary
ESS2.C.1		Plan and conduct an investigation of the properties of water and its effects on Earth's materials and surface processes.	Polar, universal solvent, cohesion, adhesion, water cycle, transpiration, deposition, infiltration
ESS2-2		Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.	Weathering, erosion, deposition, glaciers, sediment, compaction, cementation, desalination

MLS	Learning Activities	
ESS2.C.1	Demonstrate adhesion by counting the number of drops of water that can fit onto a penny resting on a table.	Must Do ▾
ESS2.C.1	Demonstration cohesion by showing students how they can pour water into a beaker using a piece of yarn.	Must Do ▾
ESS2.C.1	Play the Water Cycle Game, then write a VERY creative story about the life of your water molecule.	Must Do ▾
ESS2-2	Use Starburst candy to demonstrate the Rock Cycle. Starburst rock cycle	Option L... ▾
ESS2-2	Students will make rocks from sediment by making Borax Crystals. How to make Borax Crystals	Option L... ▾

Assessments		
MLS	Description or Location	Rubric/Location
	The test questions over this unit were part of the <i>Semester 1 Final - # 13 -17</i>	 1st Sem. Earth Scienc...

Additional Resources	
	Water and Rock Cycles ESS2.C.1

Minerals and Rocks (Optional 1-5 days as time permits)

No Standards associated with this unit.

Grade	11th
Unit of Study	<u>Carbon Cycle</u>
Length of Unit	1 week
Sample Essential Questions	Sample Corresponding Big Ideas
What is the Carbon Cycle?	The carbon cycle is the continuous movement of carbon atoms between the Earth's atmosphere, oceans, land (soil, rocks, living organisms), and fossil fuels, involving both fast biological processes and slow geological processes.
Besides the water cycle, what are the two other biogeochemical cycles?	There are three major biogeochemical cycles. Besides the water cycle, the carbon cycle and nitrogen cycle are the main recycling systems to move essential elements throughout the Earth.

Why do carbon reservoirs play such an important role in the Carbon Cycle?	Carbon reservoirs (like oceans, soil, plants, rocks) are vital because they store and cycle carbon, the building block of life, regulating Earth's climate by controlling atmospheric CO ₂ levels, but human activities disrupt this balance, releasing excess carbon and causing global warming, making protection of these natural sinks crucial.
How can we green the world's deserts and reverse climate change?	It is possible to reverse climate change but it requires changing our mindset and willingness to experiment.
How do greenhouse gases actually work?	Water and Carbon dioxide molecules react differently in the atmosphere compared to oxygen and nitrogen molecules.
Are cow farts really destroying our ozone layer and if so what can be done about it.	Cows release methane which is a greenhouse gas that traps heat in our atmosphere.

Missouri Learning Standards	
Priority Standards	Supporting Standards
ESS2.D.1	

Unit 1 Sequence			
MLS	Topic(s)	Learning Targets	Academic Vocabulary
ESS2.D.1		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 (including humans) , providing the foundation for living organisms.	Biogeochemical cycle, biosphere, reservoirs, biodiversity, methane gas and nitrification

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MLS	Learning Activities	
ESS2.D.1	Draw and label the Carbon Cycle.	Must Do ▾
	Learn how carbon reservoirs lock up carbon and keep our planet cool.	Must Do ▾
	Play the Carbon Cycle Game and write up results.	Must Do ▾
	Watch videos on ways to decrease global warming.	Option L... ▾
	Use a computer simulation “Can You Reach Net Zero” to find a way to save the planet by 2050.	Option L... ▾

Assessments		
MLS	Description or Location	Rubric/Location
ESS2.D.1	Writing Assignment - students answer 3 questions based on what they learned regarding the Carbon Cycle - 3 to 5 paragraphs.	Slide 16 in the Carbon Cycle slides

Additional Resources
Carbon Cycle Slideshow

2nd SEMESTER

Grade	11th
Unit of Study	<u>How Old is the Earth</u>
Length of Unit	2 ½ weeks
Sample Essential Questions	Sample Corresponding Big Ideas
How Old is the Earth?	Based on many sources of evidence, the Earth is believed to be 4.5 billion years old.

Missouri Learning Standards	
Priority Standards	Supporting Standards
ESS1.C.2	
ESS2.A.3	

Unit 1 Sequence			
MLS	Topic(s)	Learning Targets	Academic Vocabulary
ESS1.C.2		Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.	
ESS2.A.3		Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.	

MLS	Learning Activities	
		Must Do ▾
		Must Do ▾
		Must Do ▾

Assessments		
MLS	Description or Location	Rubric/Location

Additional Resources

Grade	11th
Unit of Study	Utilizing energy and mineral resources
Length of Unit	2 weeks
Sample Essential Questions	Sample Corresponding Big Ideas

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Missouri Learning Standards	
Priority Standards	Supporting Standards
ESS3.A.2	

Unit 1 Sequence			
MLS	Topic(s)	Learning Targets	Academic Vocabulary
ESS3.A.2		Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on economic, social, and environmental cost-benefit ratios.	

MLS	Learning Activities	
		Must Do ▾
		Must Do ▾
		Must Do ▾

Assessments		
MLS	Description or Location	Rubric/Location

Additional Resources	

Grade	11th
Unit of Study	<u>Availability of Natural Resources/influence on Human Activity</u> (9-12.ESS3.A.1)
Length of Unit	1 week
Sample Essential Questions	Sample Corresponding Big Ideas

Missouri Learning Standards	
Priority Standards	Supporting Standards

Unit 1 Sequence			
MLS	Topic(s)	Learning Targets	Academic Vocabulary
9-12-ESS3.A-1		Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.	

MLS	Learning Activities	
		Must Do ▾
		Must Do ▾
		Must Do ▾

Assessments		
MLS	Description or Location	Rubric/Location

Additional Resources

Grade	11th
Unit of Study	How Human Activity affects the Earth
Length of Unit	3 weeks
Sample Essential Questions	Sample Corresponding Big Ideas

Missouri Learning Standards	
Priority Standards	Supporting Standards

Unit 1 Sequence			
MLS	Topic(s)	Learning Targets	Academic Vocabulary
9-12.ESS3.D.2		Predict how human activity affects the relationships between Earth systems in both positive and negative ways. [Clarification Statement: Examples of Earth systems to be considered are the hydrosphere, atmosphere, geosphere and cryosphere]	

MLS	Learning Activities	
		Must Do ▾
		Must Do ▾
		Must Do ▾

Assessments		
MLS	Description or Location	Rubric/Location

Additional Resources

Grade	11th
Unit of Study	Coevolution
Length of Unit	2 weeks
Sample Essential Questions	Sample Corresponding Big Ideas

Missouri Learning Standards	
Priority Standards	Supporting Standards

Unit 1 Sequence			
MLS	Topic(s)	Learning Targets	Academic Vocabulary
9-12.ESS2.E.1		9-12.ESS2.E.1 Construct an argument based on evidence about the simultaneous coevolution of Earth’s systems and life on Earth.	

MLS	Learning Activities	
		Must Do ▾
		Must Do ▾
		Must Do ▾

Assessments		
MLS	Description or Location	Rubric/Location

Additional Resources

Grade	11th
Unit of Study	Meteorology
Length of Unit	3 weeks
Sample Essential Questions	Sample Corresponding Big Ideas

Missouri Learning Standards	
Priority Standards	Supporting Standards

Unit 1 Sequence

MLS	Topic(s)	Learning Targets	Academic Vocabulary
9-12.ESS3.D.1		Analyze geoscientific 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 systems	
9-12.ESS2.A.4		Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.	

MLS	Learning Activities	
		Must Do ▾
		Must Do ▾
		Must Do ▾

Assessments

MLS	Description or Location	Rubric/Location

Additional Resources

Grade	11th
Unit of Study	Can the Future be Cool and Sustainable?
Length of Unit	1 ½ weeks
Sample Essential Questions	Sample Corresponding Big Ideas

Missouri Learning Standards	
Priority Standards	Supporting Standards

Unit 1 Sequence			
MLS	Topic(s)	Learning Targets	Academic Vocabulary
9-12.ESS3.C.2		Evaluate or refine a technological solution that reduces impacts of human activities on natural systems in order to restore stability and or biodiversity of the ecosystem as well as prevent their reoccurrences.	

MLS	Learning Activities	
		Must Do ▾
		Must Do ▾
		Must Do ▾

Assessments		
MLS	Description or Location	Rubric/Location

Additional Resources

Grade	11th
Unit of Study	Easter Island and the Rapa Nui
Length of Unit	1 ½ weeks
Sample Essential Questions	Sample Corresponding Big Ideas

Missouri Learning Standards	
Priority Standards	Supporting Standards

Unit 1 Sequence			
MLS	Topic(s)	Learning Targets	Academic Vocabulary
HS-ESS3-3		Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.	

MLS	Learning Activities	
		Must Do ▾
		Must Do ▾
		Must Do ▾

Assessments		
MLS	Description or Location	Rubric/Location

Additional Resources

Grade	11th
Unit of Study	Refine a technological solution
Length of Unit	1 ½ weeks
Sample Essential Questions	Sample Corresponding Big Ideas

Missouri Learning Standards	
Priority Standards	Supporting Standards

Unit 1 Sequence			
MLS	Topic(s)	Learning Targets	Academic Vocabulary
9-12.ESS3-4		Refine a technological solution that reduces impacts of human activities on natural systems.	

MLS	Learning Activities	
		Must Do ▾
		Must Do ▾
		Must Do ▾

Assessments		
MLS	Description or Location	Rubric/Location

Additional Resources		