The Role of Earth & Space Science in the NGSS

Content Area Domains of the NGSS

HIGH SCHOOL

PHYSICAL SCIENCE	LIFE SCIENCE	EARTH AND SPACE SCIENCES
HS.Structure and Properties of Matter	HS.Structure and Function	HS.Space Systems
HS.Chemical Reactions	HS.Matter and Energy in Organisms and Ecosystems	HS.History of Earth
HS.Forces and Interactions	HS.Interdependent Relationships in Ecosystems	HS.Earth's Systems
HS.Energy	HS.Inheritance and Variation of Traits	HS.Weather and Climate
HS.Waves and Electromagnetic Radiation	HS.Natural Selection and Evolution	HS.Human Sustainability

https://www.nextgenscience.org/overview-topics

Earth and Space Science Comes of Age in the NGSS

Michael E. Wysession *Professor of Earth and Planetary Sciences,* **NORTHWESTERN UNIVERSITY**

Look at the news over the course of a year and you'll see Earth and space science dominates: hurricanes, tornadoes, earthquakes, tsunamis, volcanoes, climate change… droughts, floods, coal resources, gas prices, mineral resources, water supplies, oil spills…

Earth and space science directly impacts the lives of humans... The course of civilization has been intimately shaped by climate change, natural catastrophes, and the availability of natural resources...

The fact that no civilization in human history has lasted very long poses a reminder to us that those who do not learn from the past are doomed to repeat it... It's not only timely that the NGSS will provide students with a much deeper understanding of Earth and space science. Our very survival may depend upon it.

Source of edit

ESS standards in D86 Physics, Chemistry, and Biology

The NGSS Earth and Space Science standards integrated into core courses were chosen based upon their relationship to Physics, Chemistry and Biology standards.

Earth and Space Science typically requires an understanding of concepts found in these core courses, so the ESS standards were matched to the appropriate course units based on their ability to add to the contextual experience for our students.

Examples of NGSS ESS within Core Courses

NGSS	Performance Expectation	Physics	Chem	Biology
ESS1-1	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 as radiation.			
ESS1-2	Construct an explanation of the Big Bang theory based on astronomical evidence of ***light spectra, motion of distant galaxies***, and the ***composition of matter*** in the universe.			
ESS1-3	Communicate scientific ideas about the way stars, over their life cycle, ***produce elements***.			
ESS1-4	Use mathematical or computational representations to predict the ***motion of orbiting objects*** in the solar system.			
ESS2-7	Construct an argument based on evidence about the simultaneous ***coevolution*** of Earth's systems and ***life on Earth***.			
ESS3-3	Create a computational simulation to illustrate relationships among natural resources, *the sustainability of* ***human populations****, and* ***biodiversity***.			

Examples of NGSS ESS within Core Courses

NGSS	Performance Expectation	Physics	Chem	Biology
ESS1-1	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 as radiation.		X	
ESS1-2	Construct an explanation of the Big Bang theory based on astronomical evidence of ***light spectra, motion of distant galaxies***, and the ***composition of matter*** in the universe.	X	X	
ESS1-3	Communicate scientific ideas about the way stars, over their life cycle, ***produce elements***.		X	
ESS1-4	Use mathematical or computational representations to predict the ***motion of orbiting objects*** in the solar system.	X		
ESS2-7	Construct an argument based on evidence about the simultaneous ***coevolution*** of Earth's systems and ***life on Earth***.			X
ESS3-3	Create a computational simulation to illustrate relationships among natural resources, *the sustainability of* ***human populations****, and* ***biodiversity***.			X

Overview of ESS standards in Physics, Chemistry and Biology

NGSS PE	Performance Expectation	PITU & PITU H	COES & COES H	BOTLE
HS-ESS1-1	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		X	
HS-ESS1-2	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. HS-ESS1-2	X	X	
HS-ESS1-3	Communicate scientific ideas about the way stars, over their life cycle, produce elements. HS-ESS1-3		X	
HS-ESS1-4	Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. HS-ESS1-4	X		
HS-ESS1-5	Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. HS-ESS1-5	X*		X
HS-ESS1-6	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. HS-ESS1-6			X
HS-ESS2-1	Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. HS-ESS2-1	X*		
HS-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. HS-ESS2-2		X	
HS-ESS2-3	Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. HS-ESS2-3	X		
HS-ESS2-4	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. HS-ESS2-4	X	X	X
HS-ESS2-5	Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. HS-ESS2-5			X
HS-ESS2-6	Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. HS-ESS2-6			X
HS-ESS2-7	Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth. HS-ESS2-7			X
HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and chang			X
HS-ESS3-2	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios. HS-ESS3-2		X	
HS-ESS3-3	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of huma			X
HS-ESS3-4	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. HS-ESS3-4			X
HS-ESS3-5	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 systems. HS-ESS3-5	X	X	X
HS-ESS3-6	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity. HS-ESS3-6			X