9th-12th Grades: Earth and Space Sciences

Earth's Place in the Universe HS-ESS1

What is Earth's place in the Universe? What makes up our solar system and how can the motion of Earth explain seasons and eclipses? How do people figure out that the Earth and life on Earth have changed through time?

1. Use mathematical and computational thinking to qualitatively predict the motion of objects in the solar system, describe that the processes and elements produced within stars depend on the mass and age of the star, and apply evidence to construct an account of Earth's formation and early history. WA.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 energy in the form of radiation. HS-ESS1-1
    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
    3. Communicate scientific ideas about the way stars, over their life cycle, produce elements. HS-ESS1-3
    4. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. HS-ESS1-4
    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
    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

Earth's Systems HS-ESS2

How do the materials in and on Earth's crust change over time? How does the movement of tectonic plates impact the surface of Earth? How does water influence weather, circulate in the oceans, and shape Earth's surface? What factors interact and influence weather? How have living organisms changed the Earth and how have Earth's changing conditions impacted living organisms?

2 Develop and use models based on data and evidence to describe how changes in Earth's internal and surface processes, especially climate, are caused by variations in energy flow into and out of Earth's systems at different size and time scales. WA.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

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. [ESE] HS-ESS2-2

3 Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. HS-ESS2-3

4 Use a model to describe how variation in the flow of energy into and out of Earth's systems result in changes in climate. [Climate] [ESE] HS-ESS2-4

5 Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. [ESE] HS-ESS2-5

6 Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. [Climate] [ESE] HS-ESS2-6

7 Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth. HS-ESS2-7

Earth and Human Activity HS-ESS3

How is the availability of needed natural resources related to naturally occurring processes? How can natural hazards be predicted? How do human activities affect Earth systems? How do we know our global climate is changing?

3 Use computational representations based on evidence to explain how human activity modifies relationships between and among Earth's systems and human activity and to predict how the rate of a changing climate can impact Earth's systems and human activity. Apply this understanding to solutions that reduce the impacts of human activities on natural systems. WA.HS.ESS3

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. [Climate] [ESE] HS-ESS3-1

2 Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios. [Climate] [Engineering] [ESE] HS-ESS3-1

3 Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity. [ESE] HS-ESS3-1

4 Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. [Climate] [Engineering] [ESE] HS-ESS3-1

5 Analyze geoscience data and 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. [Climate] [ESE] HS-ESS3-1

6 Use computational representation to illustrate the relationship among Earth systems and how those relationships are being modified due to human activity. [ESE] HS-ESS3-1