Earth and Space Science Essential Standards

Uintah School District
"Success for Every Student"

Essential Standards guarantee that all students receive instruction for college and career readiness. The identified essential standards serve as the guide for all Science instruction at UHS and will allow students to accomplish the following educational goals:

1. Recognize the nature of science as it applies to
    a. Asking questions and defining problems
    b. Collecting data
    c. Making inferences based on the Analysis and interpretation of scientific data
    d. Applying scientific data to real world experience
    e. Synthesizing and drawing conclusions,
    f. Arguing from evidence by providing support for scientific claims, and using Reasoning with evidence
    g. Problem solving
    h. Effectively communicating, through various media, scientific understandings
2. Understand that science is interdisciplinary by
    a. Identifying natural processes and how they impact the human world through patterns, structure and function, and cause and effect relationships.
    b. Recognizing how human decisions have impacts in the natural world,
    c. Understanding that science informs policy
    d. Understanding the connection between technological advances and ideas to the scientific process and thinking

Earth and Space Science

Earth and Space Science Essential Standards	
Strand ESS.1: Matter and Energy in Space	
ESS.1.2	**Construct an explanation** of the Big Bang theory based on astronomical evidence of electromagnetic radiation, motion of distant galaxies, and composition of matter in the universe. Emphasize redshift of electromagnetic radiation, cosmic microwave background radiation, and the observed composition and distribution of matter in the universe. (PS4.B, ESS1.A)

Earth and Space Science Essential Standards	
Strand ESS.2: Patterns in Earth's History and Processes	
ESS.2.3	**Construct an explanation** for how plate tectonics results in patterns on Earth's surface. Emphasize past and current plate motions. Examples could include continental and ocean floor features such as mountain ranges and mid-ocean ridges, magnetic polarity preserved in seafloor rocks, or regional hot spots. (ESS2.B)

Earth and Space Science Essential Standards

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ESS.2.4	**Develop and use a model** to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales. Emphasize how the appearance of land and seafloor features are a result of both constructive forces and destructive mechanisms. Examples of constructive forces could include tectonic uplift or mountain building. Examples of destructive mechanisms could include weathering or mass wasting. (ESS2.B)

Earth and Space Science Essential Standards	
Strand ESS.3: System Interactions: Atmosphere, Hydrosphere, and Geosphere	
ESS.3.1	**Plan and carry out an investigation** of the properties of water and its effects on Earth materials and surface processes. Examples of properties could include water's capacity to expand upon freezing, dissolve and transport material, or absorb, store, and release energy. (ESS2.C)
ESS.3.2	**Construct an explanation** of how heat (energy) and water (matter) move throughout the oceans causing patterns in weather and climate. Emphasize the mechanisms for surface and deep ocean movement. Examples of mechanisms for surface movement could include wind, Sun's energy, or the Coriolis effect. Examples of mechanisms for deep ocean movement could include water density differences due to temperature or salinity. (ESS2.C, ESS2.D)
ESS.3.3	**Construct an explanation** for how energy from the Sun drives atmospheric processes and how atmospheric currents transport matter and transfer energy. Emphasize how energy from the Sun is reflected, absorbed, or scattered; how the greenhouse effect contributes to atmospheric energy; and how uneven heating of Earth's atmosphere combined with the Coriolis effect creates an atmospheric circulation system. (PS3.A, ESS1.B, ESS2.A, ESS2.D)
ESS.3.4	**Analyze and interpret** patterns in **data** about the factors influencing weather of a given location. Emphasize the amount of solar energy received due to latitude, elevation, the proximity to mountains and/ or large bodies of water, air mass formation and movement, and air pressure gradients. (ESS2.D)
ESS.3.5	**Develop and use a** quantitative **model** to describe the cycling of carbon among Earth's systems. Emphasize each of Earth's systems (hydrosphere, atmosphere, geosphere, and biosphere) and how the movement of carbon from one system to another can result in changes to the system(s). Examples could include more carbon absorbed in the oceans leading to ocean acidification or more carbon present in the atmosphere leading to a stronger greenhouse effect. (LS2.B, ESS2.D, ESS3.D)
ESS.3.6	**Analyze and interpret data** from global climate records to illustrate changes to Earth's systems throughout

Earth and Space Science Essential Standards

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	geologic time and make predictions about future variations using modern trends. Examples of data could include average sea surface temperature, average air temperature, composition of gasses in ice cores, or tree rings. (ESS2.D, ESS3.D)
ESS.3.7	**Engage in argument from evidence** to support the claim that one change to Earth's surface can create climate feedback loops that cause changes to other systems. Examples of climate feedbacks could include ice-albedo or warming oceans. (PS3.B, ESS2.A)

Earth and Space Science Essential Standards	
Strand ESS.4: Stability and Change in Natural Resources	
ESS.4.1	**Construct an explanation** for how the availability of natural resources, the occurrence of natural hazards, and changes in climate affect human activity. Examples of natural resources could include access to fresh water, clean air, or regions of fertile soils. Examples of factors that affect human activity could include that rising sea levels cause humans to move farther from the coast or that humans build railroads to transport mineral resources from one location to another. (ESS3.A, ESS3.B)
ESS.4.4	Evaluate **design solutions** for a major global or local environmental problem based on one of Earth's systems. *Define the problem, identify criteria and constraints, analyze available data on proposed solutions, and determine an optimal solution*. Examples of major global or local problems could include water pollution or availability, air pollution, deforestation, or energy production. (ESS3.C, ETS1.A, ETS1.B, ETS1.C)