Grade 7: Overview

Systems and Cycles

Students in grade 7 focus on systems and cycles to build a systems perspective using their understanding of structures and elements developed in earlier grades. A focus on systems requires students to interpret information and apply concepts and skills in the broad context of the discipline, and thus make connections between different domains of knowledge. Standards in grade 7 highlight interdisciplinary connections within and across domains since most natural and designed systems and cycles are complex and interactive. Students begin a process of building expert knowledge, moving from a more concrete to an abstract perspective and creating a foundation for exploring cause and effect relationships in more depth in grade 8. They have experience in observing structure of cells, body systems, matter, the Earth, measuring changes in energy, and applying these ideas to systems and cycles that span domains.

Grade 7: Earth and Space Sciences

Grade 7 MS-ESS2 Earth's Systems

MS-ESS2-2. Construct an explanation based on evidence for how Earth's surface has changed over scales that range from microscopic to global in size and operate at times ranging from fractions of a second to billions of years. [Clarification Statement: Examples of processes occurring over large spatial and time scales include plate motion and ice ages. Examples of changes occurring over small spatial and time scales include earthquakes and seasonal weathering and erosion.]

MS-ESS2-4. Develop a model to explain how the energy of the sun and Earth's gravity drive the cycling of water, including changes of state, as it moves through multiple pathways in Earth's hydrosphere. [Clarification Statement: Examples of models can be conceptual or physical.] [Assessment Boundary: A quantitative understanding of the latent heats of vaporization and fusion is not assessed.]

[Note: MS-ESS2-3 is found in Grade 6. MS-ESS2-1, MS-ESS2-5 and MS-ESS2-6 are found in Grade 8.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models
- Develop a model to describe unobservable mechanisms. (MS-ESS2-4)

Constructing Explanations and Designing Solutions
- Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe nature operate today as they did in the past and will continue to do so in the future. (MS-ESS2-2)

Disciplinary Core Ideas

ESS2.A: Earth's Materials and Systems
- The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. (MS-ESS2-2)

ESS2.C: The Roles of Water in Earth's Surface Processes
- Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS2-4)

Grade 7 MS-ESS3 Earth and Human Activity

MS-ESS3-1. Interpret data to explain that the Earth's mineral, fossil fuel, and groundwater resources are unevenly distributed as a result of geologic processes. [Clarification Statement: Examples of uneven distributions of resources can include petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).]

MS-ESS3-2. Obtain and communicate information on how data from past geologic events are analyzed for patterns and used to forecast the location and likelihood of future catastrophic events. [Clarification Statement: Geologic events include earthquakes, volcanic eruptions, floods, and landslides. Examples of data typically analyzed can include the locations, magnitudes, and frequencies of the natural hazards.] [Assessment Boundary: Assessment does not include analysis of data nor forecasting.]

MS-ESS3-4. Construct an argument supported by evidence that human activities and technologies can be engineered to mitigate the negative impact of increases in human population and per capita consumption of natural resources on the environment. [Clarification Statement: Arguments should be based on examining historical data such as population graphs, natural resource distribution maps, and water quality studies over time. Examples of negative impacts can include changes to the amount and quality of natural resources such as water, mineral, and energy supplies.]

[Note: MS-ESS3-5 is found in Grade 8. MS-ESS3-3 from NGSS has been merged with MS-ESS3-4.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Constructing Explanations and Designing Solutions
- Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-ESS3-1)

Engaging in Argument from Evidence
- Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-ESS3-4)

Obtaining, Evaluating, and Communicating Information
- Critically read scientific texts adapted for classroom use to determine the central ideas and/or obtain scientific and/or technical information to describe patterns in and/or evidence about the natural and designed world(s). (MS-ESS3-2)
- Communicate scientific and/or technical information (e.g. about a proposed object, tool, process, system) in writing and/or through oral presentations. (MS-ESS3-2)

Disciplinary Core Ideas

ESS3.A: Natural Resources
- These resources are distributed unevenly around the planet as a result of past geologic processes. (MS-ESS3-1)

ESS3.B: Natural Hazards
- Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. (MS-ESS3-2)

ESS3.C: Human Impacts on Earth Systems
- Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. (MS-ESS3-4)