8th Grade Science Placemat

Earth's Place in the Universe

The Universe and its Stars

ESS1.A.1: Develop & use a model of the ESM to explain patterns of moon phases & eclipses.
Develop and use a model of the Earth-sun-moon system to explain the cyclic patterns of lunar phases and eclipses of the sun and moon. [Clarification Statement: Examples of models can be physical, graphical, or conceptual and should emphasize relative positions and distances.] (MS-ESS1-1)

ESS1.A.2: Develop and use a model of the ES system to explain the pattern of seasons.
Develop and use a model of the Earth-sun system to explain the cyclical pattern of seasons, which includes the Earth's tilt and directional angle of sunlight on different areas of Earth across the year.[Clarification Statement: Examples of models can be physical, graphical, or conceptual.] (NA)

ESS1.A.3: Develop & use a model to describe gravity's role w/in galaxies & solar system.
Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.[Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical or conceptual.] (MS-ESS1-2)

Earth and the Solar System

ESS1.B.1: Analyze & interpret data to determine scale of objects in the solar system.
Analyze and interpret data to determine scale properties of objects in the solar system. [Clarification Statement: Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photograph, and models.] (MS-ESS1-3)

The History of Planet Earth

ESS1.C.1: Using evidence from rock strata showing geologic time scale & Earth's history.
Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's history. [Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living Organisms, or significant volcanic eruptions.] (MS-ESS1-4)

Earth's System

Earth Materials and System

ESS2.A.1: Develop & use a model;energy from Earth's interior drives convection in the crust
Develop and use a model to illustrate that energy from the Earth's interior drives convection which cycles Earth's crust leading to melting, crystallization, weathering and deformation of large rock formations, including generation of ocean sea floor at ridges, submergence of ocean sea floor at trenches, mountain building and active volcanic chains. [Clarification Statement: The emphasis is on large-scale cycling resulting from plate tectonics that includes changes in rock types through erosion, heat and pressure.] (MS-ESS2-1)

ESS2.A.2: Create an explanation using data for how geoscience processes have changed Earth
Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. [Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.] (MS-ESS2-2)

Plate Tectonics and Large-Scale System

ESS2.B.1: Analyze and interpret data to show past plate motions.(rock strata,plate shapes)
Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. [Clarification Statement: Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches).] (MS-ESS2-3)

The Role of Water in Earth's Surface Processes

ESS2.C.1: Develop a model to describe the water cycle driven by Sun's energy & gravity.
Design and develop a model to describe the cycling of water through Earth's System driven by energy from the sun and the force of gravity. [Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.] (MS-ESS2-4)

ESS2.C.2: Gather & analyze data for how diff air masses result in changes in weather.
Research, collect, and analyze data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. [Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within possible ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).] (MS-ESS2-5)

ESS2.C.3: Uneven heating & Earth rotation cause air & water circulation affecting climates
Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.] (MS-ESS2-6)

Earth and Human Activity				
Natural Resources	**Natural Hazards**	**Human Impacts on Earth's System**		**Global Climate Change**
ESS3.A.1: Explain how uneven dispersal of resources are the result of geoscience processes Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes and human activity. [Clarification Statement: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to 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-ESS3-1)	**ESS3.B.1:** **Use data to forecast catastrophic events and how to mitigate their effects.** Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. [Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite System to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).] (MS-ESS3-2)	**ESS3.C.1: Use data to show relationship b/t human population their impact Earth's System.** Analyze data to define the relationship for how increases in human population and per-capita consumption of natural resources impact Earth's System. [Clarification Statement: Examples of data include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's System as well as the rates at which they change.] (MS-ESS3-4)	**ESS3.C.2: Design a method to monitor and minimize human impact on environment** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.[Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).] (MS-ESS3-3)	**ESS3.D.1: Analyze evidence of factors which caused change in global temperatures** Analyze evidence of the factors that have caused the change in global temperatures over the past century. [Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graph, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities.] (MS-ESS3-5)
Engineering, Technology, and Application of Science				
Defining and Delimiting Engineering Problems 6-8	**Developing Possible Solutions**			
ETS1.A.1: Define constraints of design using scientific principles & impacts on environment Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. (MS-STS1-1)	**ETS1.B.1: Evaluate solutions to determine if they meet criteria & constraints of the problem** Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (MS-ETS1-2)	**ETS1.B.2: Analyze design solutions, identify best elements & combined into a new solution** Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. (MS-ETS1-3)		**ETS1.B.3: Develop model to generate data for iterative testing to achieve optimal design** Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. (MS-ETS1-4)