MIDDLE SCHOOL - EARTH AND SPACE SCIENCES - MISSOURI LEARNING STANDARDS (2016)

6-8.ESS1 Earth's Place in the Universe

Students who demonstrate understanding can:

6-8.ESS1.A.1 **Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.** [Clarification Statement: Examples of models can be physical, graphical, or conceptual.]

6-8.ESS1.A.2 **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.**

6-8.ESS1.A.3 **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 (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as students' school or state).]

6-8.ESS1.B.1 **Analyze and interpret data to determine scale properties of objects in the solar system.** [Clarification Statement: Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects. 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 photographs, and models.]

6-8.ESS1.C.1 **Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old 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.]

The 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
Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.
- Develop and use a model to describe phenomena. (A.1),(A.3)
- Develop and use a model to describe the predictability and patterns of seasons on different areas of Earth over the period of a year.(A.2)

Analyzing and Interpreting Data
Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
- Analyze and interpret data to determine similarities and differences in findings. (B.1)

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 6– 8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
- 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. (C.1)

Disciplinary Core Ideas

ESS1.A: The Universe and Its Stars
- Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (A.1), (A.2)
- Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (A.3)

ESS1.B: Earth and the Solar System
- The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (A.3),(B.1)
- This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (A.1), (A.2)
- The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (A.3)

ESS1.C: The History of Planet Earth
- The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (C.1)

Crosscutting Concepts

Patterns
- Patterns can be used to identify cause- and-effect relationships. (A.1), (A.2)

Scale, Proportion, and Quantity
- Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (B.1),(C.1)

Systems and System Models
- Models can be used to represent systems and their interactions. (A.3)

Connections to other DCIs in this grade-band: **6-8.PS2.A** (6-8.ESS1.A.1),(6-8.ESS1.A.3); **6-8.PS2.B** (6-8.ESS1.A.1),(6-8.ESS1.A.3); **6-8.LS4.A** (6-8.ESS1.C.1); **6-8.LS4.C** (6-8.ESS1.C.1); **6-8.ESS2.A** (6-8.ESS1.B.1)

Articulation of DCIs across grade-bands: **3.PS2.A** (6-8.ESS1.A.1),(6-8.ESS1.A.3); **3.LS4.A** (6-8.ESS1.C.1); **3.LS4.C** (6-8.ESS1.C.1); **3.LS4.D** (6-8.ESS1.C.1); **4.ESS1.C** (6-8.ESS1.C.1); **5.PS2.B** (6-8.ESS1.A.1),(6-8.ESS1.A.3); **5.ESS1.A** (6-8.ESS1.A.3); **5.ESS1.B** (6-8.ESS1.A.1),(6-8.ESS1.A.3),(5-ESS1-3); **9-12.PS1.C** (6-8.ESS1.C.1); **9-12.PS2.A** (6-8.ESS1.A.1),(6-8.ESS1.A.3); **9-12.PS2.B** (6-8.ESS1.A.1),(6-8.ESS1.A.3); **9-12.LS4.A** (6-8.ESS1.C.1); **9-12.LS4.C** (6-8.ESS1.C.1); **9-12.ESS1.A** (6-8.ESS1.A.3); **9-12.ESS1.B** (6-8.ESS1.A.1),(6-8.ESS1.A.3),(6-8.ESS1.B.1); **9-12.ESS1.C** (6-8.ESS1.C.1); **9-12.ESS2.A** (6-8.ESS1.B.1),(6-8.ESS1.C.1)

MIDDLE SCHOOL - EARTH AND SPACE SCIENCES - MISSOURI LEARNING STANDARDS (2016)

Connections to MO LEAP Blocks: *N/A*
Connections to other Missouri Learning Standards:
ELA/Literacy -
6-8.W.2.A Approaching the Task as a Writer. (C.1)
8.RL.1.D Using appropriate text, determine the theme(s) of a text and analyze its development over the course of a text; provide an objective summary of the text. (B.1), (C.1)
8.RI.1.D Explain the central/main idea(s) of a text and analyze its development over the course of a text; provide an objective summary of the text. (B.1), (C.1)
8.SL.1.C Acknowledge new information expressed by others including those presented in diverse media and, when warranted, qualify or justify their own views in light of evidence presented**.** (B.1)
Mathematics -
6.RP.A.1 Understand a ratio as a comparison of two quantities and represent these comparisons. (A.1), (A.3), (B.1)
6.EEI.B.6 Write and solve equations using variables to represent quantities, and understand the meaning of the variable in the context of the situation.(A.3), (C.1)
7.RP.A.2 Recognize and represent proportional relationships between quantities. (A.1), (A.3), (B.1)
7.EEI.B.4 Write and/or solve linear equations and inequalities in one variable. (A.3), (C.1)

6-8.ESS2 Earth's Systems

Students who demonstrate understanding can:

6-8.ESS2.A.1 **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 seafloor at ridges, submergence of ocean seafloor at trenches, mountain building and active volcanic chains.** [Clarification Statement: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.] [Assessment Boundary: Assessment does not include the identification and naming of minerals.]

6-8.ESS2.A.2 **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.]

6-8.ESS2.B.1 **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).]

6-8.ESS2.C.1 **Design and develop a model to describe the cycling of water through Earth's systems 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.]

6-8.ESS2.C.2 **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 probabilistic 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).]

6-8.ESS2.C.3 **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.]

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

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. • Develop and use a model to describe phenomena. (A.1),(C.3) • Develop a model to describe unobservable mechanisms. (C.1) **Planning and Carrying Out Investigations** Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions. • Collect data to produce data to serve as the basis for evidence to answer scientific questions	**ESS1.C: The History of Planet Earth** • Tectonic processes continually generate new ocean sea floor at ridges and destroy old seafloor at trenches. *(9-12.ESS1.C GBE) (secondary to B.1)* **ESS2.A: Earth's Materials and Systems** • All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (A.1) • 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. (A.2) **ESS2.B: Plate Tectonics and Large-Scale System Interactions**	**Patterns** • Patterns in rates of change and other numerical relationships can provide information about natural systems. (B.1) **Cause and Effect** • Cause and effect relationships may be used to predict phenomena in natural or designed systems. (C.2) **Scale Proportion and Quantity** • Time, space, and energy phenomena can be observed at various scales

or test design solutions under a range of conditions. (C.2)

Analyzing and Interpreting Data
Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- Analyze and interpret data to provide evidence for phenomena. (B.1)

Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- 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. (A.2)

- Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (B.1)

ESS2.C: The Roles of Water in Earth's Surface Processes

- Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. (C.1)
- The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (C.2)
- Global movements of water and its changes in form are propelled by sunlight and gravity. (C.1)
- Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (C.3)
- Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. (A.2)

ESS2.D: Weather and Climate

- Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (C.3)
- Because these patterns are so complex, weather can only be predicted probabilistically. (C.2)
- The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. (C.3)

using models to study systems that are too large or too small. (A.2)

Systems and System Models

- Models can be used to represent systems and their interactions—such as inputs, processes and outputs— and energy, matter, and information flows within systems. (C.3)

Energy and Matter

- Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. (C.1)

Stability and Change

- Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale. (A.1)

Connections to other DCIs in this grade-band: **6-8.PS1.A** (6-8.ESS2.A.1),(6-8.ESS2.C.1),(6-8.ESS2.C.2); **6-8.PS1.B** (6-8.ESS2.A.1), (6-8.ESS2.A.2); **6-8.PS2.A** (6-8.ESS2.C.2),(6-8.ESS2.C.3); **6-8.PS2.B** (6-8.ESS2.C.1); **6-8.PS3.A** (6-8.ESS2.C.1), (6-8.ESS2.C.2); **6-8.PS3.B** (6-8.ESS2.A.1),(6-8.ESS2.C.2),(6-8.ESS2.C.3); **6-8.PS3.D** (6-8.ESS2.C.1); **6-8.PS4.B** (6-8.ESS2.C.3); **6-8.LS2.B** (6-8.ESS2.A.1),(6-8.ESS2.A.2); **6-8.LS2.C** (6-8.ESS2.A.1); **6-8.LS4.A** (6-8.ESS2.B.1); **6-8.ESS1.B** (6-8.ESS2.A.1); **6-8.ESS3.C** (6-8.ESS2.A.1)

Articulation of DCIs across grade-bands: **3.PS2.A** (6-8.ESS2.C.1),(6-8.ESS2.C.3); **3.LS4.A** (6-8.ESS2.B.1); **3.ESS2.D** (6-8.ESS2.C.2), (6-8.ESS2.C.3); **3.ESS3.B** (6-8.ESS2.B.1); **4.PS3.B** (MS-ESS2- 1),(6-8.ESS2.C.1); **4.ESS1.C** (6-8.ESS2.A.2), (6-8.ESS2.B.1); **4.ESS2.A** (6-8.ESS2.A.1),(6-8.ESS2.A.2); **4.ESS2.B** (6-8.ESS2.B.1); **4.ESS2.E** (6-8.ESS2.A.2); **4.ESS3.B** (6-8.ESS2.B.1); **5.PS2.B** (6-8.ESS2.C.1); **5.ESS2.A** (6-8.ESS2.A.1),(6-8.ESS2.A.2),(6-8.ESS2.C.2),(6-8.ESS2.C.3); **5.ESS2.C** (6-8.ESS2.C.1); **9-12.PS1.B** (6-8.ESS2.A.1); **9-12.PS2.B** (6-8.ESS2.C.1),(6-8.ESS2.C.3); **9-12.PS3.B** (6-8.ESS2.A.1),(6-8.ESS2.C.1),(6-8.ESS2.C.3); **9-12.PS3.D** (6-8.ESS2.A.2),(6-8.ESS2.C.3); **9-12.PS4.B** (6-8.ESS2.C.1); **9-12.LS1.C** (6-8.ESS2.A.1); **9-12.LS2.B** (6-8.ESS2.A.1),(6-8.ESS2.A.2); **9-12.LS4.A** (6-8.ESS2.B.1);**9-12.LS4.C** (6-8.ESS2.B.1); **9-12.ESS1.B** (6-8.ESS2.C.3); **9-12.ESS1.C** (6-8.ESS2.A.2),(6-8.ESS2.B.1); **9-12.ESS2.A** (6-8.ESS2.A.1),(6-8.ESS2.A.2),(6-8.ESS2.B.1), (6-8.ESS2.C.1),(6-8.ESS2.C.3); **9-12.ESS2.B** (6-8.ESS2.A.2), (6-8.ESS2.B.1); **9-12.ESS2.C** (6-8.ESS2.A.1),(6-8.ESS2.A.2),(6-8.ESS2.C.1),(6-8.ESS2.C.2); **9-12.ESS2.D** (6-8.ESS2.A.2), (6-8.ESS2.C.1),(6-8.ESS2.C.2),(6-8.ESS2.C.3); **9-12.ESS2.E** (6-8.ESS2.A.1),(6-8.ESS2.A.2); **9-12.ESS3.D** (6-8.ESS2.A.2)

Connections to MO LEAP Blocks: *New York: A View From Below* (6-8.ESS2.A.1); *Evolution of the Andes* (6-8.ESS2.A.1)

Connections to other Missouri Learning Standards:.

ELA/Literacy -

6-8.W.1.A Approaching the Task as a Researcher. (C.2)

6-8.W.2.A Approaching the Task as a Writer. (A.2)

8.RL.1.D Using appropriate text, determine the theme(s) of a text and analyze its development over the course of a text; provide an objective summary of the text. (A.2), (B.1), (C.2)

8.RL.3.B Explain how contemporary texts make use of archetypal characters or universal themes from older or traditional texts. (B.1), (C.2)

8.RI.1.D Explain the central/main idea(s) of a text and analyze its development over the course of a text; provide an objective summary of the text. (A.2), (B.1), (C.2)

8.RI.3.A Compare and contrast information presented in different mediums and analyze how the techniques unique to each medium contribute to meaning. (B.1), (C.2)

8.RI.3.B Analyze two or more texts that provide conflicting information on the same topic and identify where the texts disagree on matter of fact or interpretation. (B.1), (C.2)

8.SL.1.C Acknowledge new information expressed by others including those presented in diverse media and, when warranted, qualify or justify their own views in light of evidence presented. (B.1)

Mathematics -

6.EEI.B.6 Write and solve equations using variables to represent quantities, and understand the meaning of the variable in the context of the situation. (A.2), (B.1)

6.NS.C.5 Use positive and negative numbers to represent quantities. (C.2)

7.EEI.B.4 Write and/or solve linear equations and inequalities in one variable.(A.2), (B.1)

6-8.ESS3 Earth and Human Activity

Students who demonstrate understanding can:

6-8.ESS3.A.1 **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.** [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).]

6-8.ESS3.B.1 **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 systems to monitor hurricanes or forest fires) or local (such as building basements in tornado- prone regions or reservoirs to mitigate droughts).]

6-8.ESS3.C.1 **Analyze data to define the relationship for how increases in human population and per-capita consumption of natural resources impact Earth's systems.** [Clarification Statement: Examples of evidence 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 systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.]

6-8.ESS3.C.2 **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).]

6-8.ESS3.D.1 **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, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.]

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

Science and Engineering Practices

Analyzing and Interpreting Data
Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- Analyze and interpret data to determine similarities and differences in findings. (B.1)

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- 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. (A.1)
- Apply scientific principles to design an object, tool,

Disciplinary Core Ideas

ESS3.A: Natural Resources

- Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (A.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. (B.1)

ESS3.C: Human Impacts on Earth Systems

- Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. (C.2)
- Typically as human populations and per-capita

Crosscutting Concepts

Patterns

- Graphs, charts, and images can be used to identify patterns in data. (B.1)

Cause and Effect

- Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. (C.2)
- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (A.1),(C.1)

Stability and Change

- Stability might be disturbed either by sudden events or gradual changes that

process or system. (C.2) **Engaging in Argument from Evidence** Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). ● 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. (C.1) ● Analyze evidence to identify factors that have caused changes in global temperatures over the past century. (D.1)	consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. (C.2),(C.1) **ESS3.D: Global Climate Change** ● Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (D.1)	accumulate over time. (D.1)

Connections to other DCIs in this grade-band: **6-8.PS1.A** (6-8.ESS3.A.1); **6-8.PS1.B** (6-8.ESS3.A.1); **6-8.PS3.A** (6-8.ESS3.D.1); **6-8.PS3.C** (6-8.ESS3.B.1); **6-8.LS2.A** (6-8.ESS3.C.2),(6-8.ESS3.C.1); **6-8.LS2.C** (6-8.ESS3.C.2),(6-8.ESS3.C.1); **6-8.LS4.D** (6-8.ESS3.C.2),(6-8.ESS3.C.1); **6-8.ESS2.D** (6-8.ESS3.A.1)

Articulation of DCIs across grade-bands: **3.LS2.C** (6-8.ESS3.C.2),(6-8.ESS3.C.1); **3.LS4.D** (6-8.ESS3.C.2),(6-8.ESS3.C.1); **3.ESS3.B** (6-8.ESS3.B.1); **4.PS3.D** (6-8.ESS3.A.1); **4.ESS3.A** (6-8.ESS3.A.1); **4.ESS3.B** (6-8.ESS3.B.1); **5.ESS3.C** (6-8.ESS3.C.2), (6-8.ESS3.C.1); **9-12.PS3.B** (6-8.ESS3.A.1),(6-8.ESS3.D.1); **9-12.PS4.B** (6-8.ESS3.D.1); **9-12.LS1.C** (6-8.ESS3.A.1); **9-12.LS2.A** (6-8.ESS3.C.1); **9-12.LS2.C**

Connections to MO LEAP Blocks: *Natural Hazards* (6-8.ESS3.B.1); *Planning for Extreme Weather* (6-8.ESS3.B.1)

Connections to other Missouri Learning Standards:

ELA/Literacy -

6-8.W.1.A Approaching the Task as a Researcher. (C.2)

6-8.W.2.A Approaching the Task as a Writer. (A.1), (C.1), (C.2)

6-8.W.3.A Approaching the Task as a Reader. (C.1), (C.2)

8.RL.1.A Draw conclusions, infer and analyze by citing the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text. (D.1)

8.RL.1.D Using appropriate text, determine the theme(s) of a text and analyze its development over the course of a text; provide an objective summary of the text. (A.1), (B.1)

8.RI.1.A Draw conclusions, infer and analyze by citing the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text. (D.1)

8.RI.1.D Explain the central/main idea(s) of a text and analyze its development over the course of a text; provide an objective summary of the text. (A.1), (B.1)

8.RI.2.D Evaluate an author's argument, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced**.** (A.1), (C.1)

8.SL.1.B Delineate a speaker's argument and claims, evaluating reasoning and sufficiency of evidence in order to pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas**.** (A.1), (C.1)

8.SL.1.C Acknowledge new information expressed by others including those presented in diverse media and, when warranted, qualify or justify their own views in light of evidence presented. (B.1)

Mathematics -

6.RP.A.1 Understand a ratio as a comparison of two quantities and represent these comparisons. (C.1), (C.2)

6.EEI.B.6 Write and solve equations using variables to represent quantities, and understand the meaning of the variable in the context of the situation. (A.1), (B.1), (C.1), (C.2), (D.1)

7.RP.A.2 Recognize and represent proportional relationships between quantities. (C.1), (C.2)

7.EEI.B.4 Write and/or solve linear equations and inequalities in one variable. (A.1), (B.1), (C.1), (C.2), (D.1)