NGSS Grade 6: Unit 3 Sequencing

Regional climates strongly influence regional plant and animal structures and behaviors.

Sequence Developed by TUSD Teachers, April 2016

PEs Assessed: MS-ESS2-5, MS- ESS2-6, MS-PS3-4, MS-LS1-4, MS-LS1-5, MS-LS1-8, MS-LS3-2

DCIs

PS3.A: Definitions of Energy
• Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. (MS-PS3-3),(MS-PS3-4)

PS3.B: Conservation of Energy and Energy Transfer
• When the motion energy of an object changes, there is inevitably some other change in energy at the same time. (MS-PS3-5)
• The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. (MS-PS3-4)
• Energy is spontaneously transferred out of hotter regions or objects and into colder ones. (MS-PS3-3)

ESS2.C: The Roles of Water in Earth's Surface Processes
• 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. (MS-ESS2-5)
• Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS2-6)

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. (MS-ESS2-6)

ESS2.D: Weather and Climate
* Because these patterns are so complex, weather can only be predicted probabilistically. (MS-ESS2-5)

LS1.C: Organization for Matter and Energy Flow in Organisms
* Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (MS-LS1-6) *

LS1.D: Information Processing
* Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories. (MS-LS1- 8)

LS1.B: Growth and Development of Organisms
* Animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4) * Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4)

LS3.B: Variation of Traits
* In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS3-2)

LS1.B: Growth and Development of Organisms
* Genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5)

Additional Concepts

-Review types of energy
-states of matter
-total energy in a system
-mass & matter
-measurement

-introduce properties of matter
-density
-volume
-mass

-global ocean currents

-latitude, longitude
-topography
-local and regional geography
-effects on oceanic and atmospheric flow patterns

-weather forecasting
-high pressure, low pressure
-extreme weather conditions

-flow of energy from weather and climate systems into living things
-connections between living and nonliving revisited

-connect back to body systems
-deeper dive into nervous system
-connect influence of climate and weather on behaviors & adapted structures of plants and animals

-environmental factors
-plant and animal behaviors
-successful reproduction
-reproductive strategies: competition, mating rituals

-inheritance of traits
-genetic factors
-reproductive strategies: adapted structures, pheromones
-Punnett Squares

-combination of how genetic and environmental factors affect the growth of a plant

SEPs

Planning and Carrying Out Investigations
Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.
* Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded Scientific Knowledge is Based on Empirical Evidence Science knowledge is based upon logical and conceptual connections between evidence and explanations (MS-PS3-4),(MS-PS3-5)

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. (MS-ESS2-6)

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 or test design solutions under a range of conditions. (MS-ESS2-5)

Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in 6-8 builds on K-5 experiences and progresses to evaluating the merit and validity of ideas and methods.
* Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-LS1-8)

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).
* Use 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-LS1-4)

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 knowledge, 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. (MS-LS1-5)

CCCs

Scale, Proportion, and Quantity
* Proportional relationships (e.g. speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes. (MS-PS3-1),(MS-PS3-4)

Energy and Matter
* Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion). (MS-PS3- 5) * The transfer of energy can be tracked as energy flows through a designed or natural system. (MS0-PS3-3)

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. (MS-ESS2-6)

• Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS2-5)

Energy and Matter
* Within a natural system, the transfer of energy drives the motion and/or cycling of matter. (MS-LS1- 6)

Cause and Effect
* Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS1-8)

Cause and Effect
• Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS1-4),(MS-LS1-5)

Cause and Effect
Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS3-2)

Cause and Effect
• Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS1-4),(MS-LS1-5)

PEs (boundaries of PE)

What Difference Does Matter Make? Energy Transfer Investigations Continued

MS-PS3-4.
Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. [Clarification Statement: Examples of experiments could include comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.] [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]

Activity Brainstorm
https://docs.google.com/a/mytusd.org/document/d/1hdU19-QscYDRWY-DIgo9qqoDpo8PIZ8QK8FamLdWXpI/edit?usp=sharing

Part 1: Directed Lab with water
- 5 min ice water bath
- 5 minute hot plate
- Students measure initial mass, initial temperature, final mass, final temperature
- Complete data table

Part 2: Student Created Lab- using ideas created from part 1
- Students choose substances to test, predict results using lab format
- They weigh, the measured temperature, they complete data table
- Conclude: How the energy transferred is affected by mass and type of matter of an object.
- Connect to average kinetic energy in the particles of a substance is the reason why this happening
- **Assessment:** Conclusion paragraph: students include an inference about the relationship between the energy transferred, the type of matter, the change in mass, and the average kinetic energy of the particles as measured by temperature.

Island Project

MS-ESS2-6.
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.] [Assessment Boundary: Assessment does not include the dynamics of the Coriolis effect.]

Activity Brainstorm:
- Students will choose a location for an island that would be the best for a tourist location.
- The must create a model (poster, digital product) and explain why the latitude and longitude help to make this island a good choice
- They must explain how the ocean currents, winds,and land distribution contribute to the island's weather and climate
- They must the effects of the sun on the island in regards to uneven heating, seasons, and temperature
- **Assessment:** Students create a commercial, brochure, or writing assignment explaining why their island is the best for tourism and include their model in the presentation

Weather Forecast Touchast

MS-ESS2-5.
Collect 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).] [Assessment Boundary: Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations.]

Activity Brainstorm
- Students will be provided with maps over a several week period to analyze the patterns of high and low pressure cells and their relationship to weather conditions across the country
- Students will then be given a high and low pressure map and will predict the weather that might come about from these types of patterns.
- **Assessment:** Students will collaborate and create a Touchcast Newscast, using the high and low pressure map as the background, to forecast the weather

Performance Task: How does the nervous system protect organisms from harmful environmental conditions?

MS-LS1-8.
Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. [Assessment Boundary: Assessment does not include mechanisms for the transmission of this information.]

Activity Brainstorm
- Students are provided with articles on the nervous system that help to protect animals/humans
- Students are provided with information about sensory receptors and how signals are sent throughout nervous system
- **Assessment:** Students must produce a writing product that concludes how the nervous system could animals/humans from extreme weather conditions (lightning, tornadoes, hurricanes, extreme temperatures, ect) and predict what would be the result of a faulty nervous system

Animal Behavior Research Project

MS-LS1-4.
Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. [Clarification Statement: Examples of behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could

Activity Brainstorm:
- Students research a particular animal and report on their findings
- Students must answer how the behaviors of this animals affect their probability of survival and successful reproduction
- Students will create a wiki project to share their findings with the rest of the class
- **Assessment:** Students will peer review several wiki projects and create a double bubble thinking map to compare and contrast two different species, other than their own

Asexual vs. Sexual Reproduction Punnett Squares

MS-LS3-2.
Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. [Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.]

Activity Brainstorm:
- Students will complete Punnett Squares to describe the cause and effect relationship of gene transmission to offspring
- **Assessment:** Students will create a fictitious Punnett Square for several traits of the animal they researched the the previous project. Students will then use their Punnett Squares to explain why their animal could be classified as a sexual or asexual organism.
- Extension: students must find an example of an asexual organism online and create a fictitious Punnet Square for that organism.
- These models can be added to student wiki projects

Plant Growth Investigation (continues into unit 4 with Factors Affecting Growth of Organisms Lab Investigations)

MS-LS1-5.
Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. [Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.] [Assessment Boundary: Assessment does not include genetic mechanisms, gene regulation, or biochemical processes.]

Activity Brainstorm:
- Students perform a lab on a type of plant that they grow from seed. (nasturtium, green bean, or radish works well)
- They choose one environmental variable to change from their control
- Students take pictures and annotate the characteristics from the plant that are derived from genetic factors vs. environmental factors (color, height, number of leaves, days of germination)
- **Assessment:** Students must conclude which factor had a larger influence and why.