NGSS Grade 6: Unit 4 Sequencing

Human activities can change the amount of global warming and its impacts on plants and animals.

Sequence Developed by TUSD Teachers, April 2016

PEs Assessed: MS-ESS3-3, MS-ESS3-4, MS-ESS3-5, MS-LS1-4, MS-LS1-5, MS-ETS1-1, MS-ETS1-2

DCIs

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.

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.

ETS1.A Defining and Delimiting Engineering Problems
The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions.

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.

ETS1.B: Developing Possible Solutions
There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.

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.

ETS1.B: Developing Possible Solutions
There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.

LS1.B Growth and Development of Organisms
Animals engage in characteristics behaviors that increase the odds of reproduction.

LS1.B Growth and Development of Organisms
Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.

LS1.B Growth and Development of Organisms
Genetic factors as well as local conditions affect the growth of the adult plant.

TUSD Human Growth and Development

Additional Concepts

-What is biosphere?
-Geologic Processes
-How these processes unevenly distribute natural resources
-types of renewable and nonrenewable resources

-uses of fossil fuels
- "rhythm" of neutral processes that happen without human interference
-factors that naturally affect climate
-atmospheric and oceanic influences on climate

-introduce engineering design process
-definition of criteria and constraints
-how to identify a problem
-how to narrow down solutions

-what is extinction?
-ecosystems and natural habitats
-how do environments support specific organisms?

-engineering design process
-how to evaluate solutions
-how to narrow down solutions
-use of lowchard or rubric

-human population growth statistics
-define per-capita consumption
-impacts on Earth's systems due to humans

-how to evaluate solutions
- use of flowchart or rubric
-provide reasoning for the solution selected

-What is a species?
-What are adaptations?
-how does natural selection influence species growth and development

-seed dispersal
-plant structures and functions
-germination
-pollination
-fertilization
-flowering plants

-inheritance of traits
-nature vs. nurture (environmental conditions)
-plant requirements for life
-planting regions/ climate regions

SEPs

Asking Questions and Defining Problems
Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models. Ask questions to identify and clarify evidence of an argument. (MS-ESS3-5)

Asking Questions and Defining Problems
Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models. Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS-ETS1-1)

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.
- Apply scientific principles to design an object, tool, process or system. (MS-ESS3-3)

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. Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-ETS1-2)

Engaging in Argument from Evidence
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Engage 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

Stability and Change
Stability might be disturbed either by sudden events or gradual changes that accumulate over time. (MS-ESS3-5)

Influence of Science, Engineering, and Technology on Society and the Natural World
The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MSESS3-3)

Cause and Effect
Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. (MS-ESS3-3)

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)

Global Warming Performance Task

ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise 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.]

Activity Brainstorm
- Starting with a QFT on Global Climate Change
- Provide maps, graphs, or chharts on Global climate change
- Provide resources that might answer questions
- QFT could be about how some do believe in climate change is human induced even with the data?
- Research
- Come back to research for design challenge

Reducing Human Impact on Climate Change Design Challenge

ESS3-3. 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).]

ETS1-1. 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.

ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

Activity Brainstorm:
- Engineering design challenge
- Design a solution to a problem that contributes to global climate change, problem defined as specific and solution is specific to their problem
- Menu for modeling and presenting their solutions- 3D modeling, poster, explain everything

Earth's Most Endangered Natural Resource Debate

ESS3-4. Construct an argument supported by evidence 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, consumption, 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.]

Activity Brainstorm
- Students research how human population and per-capita consumption have negatively impacted Earth's systems
- Evidence of rates of consumption, impacts to appearance, and rates of change will lead students to decide on Earth's most endangered natural resource
- Students debate on why it is the most endangered natural resource and the conservation actions society should take to protect this natural resource

Factors Affecting Growth of Organisms Lab Investigations

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
- Lab on genetic and environmental factors influencing plant growth
- Extension for groups in unit 3- begin to collect on several experiments- plant growth
- Algae growth in an aquarium- buy it Carolina, buy one or more types
- Yeast- temperature; counting cultures
- Collect data over 3 week period
- Analyze data and construct explanations that explains differences in growth, cause and effect, genetic
- Identify other factors that they are not mentioned

Probability of Successful Reproduction Performance Task

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 include transferring pollen or seeds, and creating conditions for seed germination and growth. Examples of plant structures could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury.]

Activity Brainstorm:
- Use articles and videos to have students identify characteristics that improve success of reproduction
- Performance Task Style
- Writing task using evidence from articles and videos