

CCC – Systems and System Models
 Planning Template

Main Topic/ Question for Unit/Lesson	What determines where water travels on and through the surface of the Earth?
NGSS standard (s)	MS-ESS2-4. Develop a model to describe the cycling of water through Earth’s systems driven by energy from the sun and the force of gravity. [<i>Clarification Statement:</i> Emphasis is on the ways in which water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.] [<i>Assessment Boundary:</i> A quantitative understanding of the latent heats of vaporization and fusion is not assessed.]

	System of Focus: Watersheds	System of Focus:
Input	Rain/Precipitation Water moved by animals	
Output	Evaporation Transpiration Humans/Animals Removing Water	
Boundary	Areas of higher elevation that divide the landscape, causing water to flow in different directions	
Components (parts of the system):	Tributaries, creeks, rivers, lakes, landforms, human influences	
Interactions:	Infiltration Animal use of water Plant use of water	
Nested System:	Smaller bodies of water join larger bodies of water that include other watersheds.	

CCC – Cause and Effect
 Planning Template

Main Topic/ Question for Unit/Lesson	How do we make a stronger electromagnet?
NGSS standard (s)	Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. MS-PS2-3

Components of the Disciplinary Core Idea	Cause	Effect
Electric and magnetic forces can be attractive or repulsive.	Object is near an electromagnetic force.	The object is either pushed away or pulled closer.
The size of electromagnetic forces depend on the magnitudes of the charges.	The number of the charges is increased.	The size of the electromagnetic force increases.
The size of electromagnetic forces depend on the magnitudes of the currents.	The magnitude of the current is increased.	The size of the electromagnetic force increases.
The size of electromagnetic forces depend on the magnitudes of the magnetic strengths.	The magnetic strength is increased.	The size of the electromagnetic force increases.
The size of the electromagnetic forces depend on the distance between the interacting objects.	The distance between the two interacting objects is decreased.	The size of the electromagnetic force between the two interacting object is increased.

CCC – Energy and Matter
 Planning Template

Main Topic/ Question for Unit/Lesson	Photosynthesis
NGSS standard (s)	Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. MS-LS1-6

	How does the disciplinary core idea apply to this category?
Matter involved	Water, carbon dioxide, carbon-based organic molecules, complex food molecules (sugars), oxygen
Flows or cycles of the matter	The atoms in carbon dioxide and water are used to make the carbon-based organic molecules such as simple sugars. Oxygen is also released. The sugars may be used immediately or stored for growth or later used. (The atoms in oxygen and sugar is cycled into carbon dioxide and water during cellular respiration.)
Forms of energy	Sunlight (light energy) Chemical bonds in carbon-based organic molecules (chemical energy)
Transfers/flows of energy	Energy from the light is transferred to chemical energy make sugars. Chemical reactions transfer the energy stored in bonds to other molecules or processes in an organism.
How the energy drives the motion or cycling of the matter	The energy from the light is used to make sugars from carbon dioxide and water and to release oxygen. (During cellular respiration, the energy in the chemical bonds will be transferred to other forms of energy and oxygen and water is released.)

CCC – Patterns
 Planning Template

Main Topic/ Question for Unit/Lesson	How do we experience different lights and sounds?
NGSS standard (s)	Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. MS-PS4-1 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. MS-PS4-2

Components of the Disciplinary Core Idea	What is the Repeating Relationship (Pattern) in this Component?	What does the pattern provide information about?
A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude.	The movement of the wave.	The wavelength, frequency and amplitude of the wave can affect explain the type of sound or light we experience. For sound, this includes pitch and volume. For light, this includes the brightness, color, and the frequency-dependent bending of light at a surface between media.
A sound wave needs a medium through which it is transmitted. Because light can travel through space, it cannot be a matter wave.	All of the materials vibrate when they make a sound or a sound moves through them. The sound did not travel through a vacuum. The light traveled in a path through the air, water, glass, and space.	The pattern shows that a sound wave is a matter wave (mechanical wave). This pattern shows that light is not a matter wave.
When light shines on an object, it is reflected, absorbed, or transmitted	When the light shone on an object, it is either reflected, absorbed, or	The pattern shows what happens to light when it hits a surface.

CCC – Patterns
 Planning Template

<p>through the object depending on the object's material and the frequency (color of the light).</p>	<p>transmitted. Different colors of light were reflected, absorbed, or transmitted differently.</p>	
<p>The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends.</p>	<p>The path of light could always be traced in a straight line from the source of the light to the place where the light shone on an object.</p> <p>When path of light hit the surface of the water, it bent. When the path of light hit the surface of glass, it bent.</p>	<p>This pattern shows that the path of the light is a straight line.</p> <p>This pattern shows that the light bend at surfaces of different transparent materials.</p>

CCC – Scale, Proportion, and Quantity
 Planning Template

Main Topic/ Question for Unit/Lesson	The Solar System
NGSS standard (s)	Analyze and interpret data to determine scale properties of objects in the solar system. MS-ESS1-3

Component of the Disciplinary Core Idea:	What is the scale, proportion or quantity of focus?	How do we apply the scale, proportion or quantity to the disciplinary core?
The solar system consists of the sun and planets that are held in orbit.	Length/distance	How the distances between objects in the solar system compare? How does the size of the orbits compare?
The solar system consists of the sun, planets, their moon, and asteroids.	mass	How do the mass of the objects in the solar system compare?
The solar system consists of the sun, planets, their moon, and asteroids that are held in orbit	time	How do the times of the orbits and rotations of objects compare?

CCC – Stability and Change
 Planning Template

Main Topic/ Question for Unit/Lesson	What is the evidence for climate change?
NGSS standard (s)	Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. MS-ESS3-5

	Part of the System/Topic: Changing the Atmosphere	Part of the System/Topic: Increasing Temperature
What is remaining stable?	The input of radiation from the Sun on our planet, the processes that cycle energy and matter cycle on the Earth (e.g., how the water moves, how energy is transferred)	The input of radiation from the Sun on our planet, the processes that cycle energy and matter cycle on the Earth (e.g., how the water moves, how energy is transferred)
What is changing?	The make-up for the atmosphere, particularly the increase in greenhouse gases	The climate (the average temperatures, amount of waterfall, etc)
What is causing the change?	Human activities are causing the change, especially from the burning of fossil fuels	The change in the atmosphere.
What is the timeframe?	The change appears to be happening over years. (We often compare the changes over decades or centuries as well).	The change appears to be happening over years. (We often compare the changes over decades or centuries as well).

CCC – Stability and Change
Planning Template

CCC – Structure and Function
 Planning Template

Main Topic/ Question for Unit/Lesson	What causes different traits in organisms of the same species?
NGSS standard (s)	Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. MS-LS3-1

Components of the Disciplinary Core Idea	Structure	Function
Genes	Genes are located in the chromosome of cells, with each chromosome pair containing variants of each of many distinct genes. Genes are made up of DNA, The DNA is strands of nucleotides in a particular order.	Each distinct gene chiefly controls the production of specific proteins. Changes (mutations) to genes can result in changes to the proteins.
Chromosome	Chromosomes are located in nucleus the cell. They are in a double helix structure and made up of DNA. Each chromosomes have many genes on them.	The chromosomes contain the genes. The chromosomes are divided equally during cell division. The chromosomes are passed down from parents.
Proteins	Proteins are made of linked amino acid. They have particular structures due to the ordering of the amino acids.	Proteins function in many roles that create the traits of the organism including (structural roles (e.g., parts of the eyes, and other organs), part of processes (e.g., breaking down food). A change in the structure of the protein will change its function. Some of these change can be beneficial, others harmful, and some neutral to the organism.