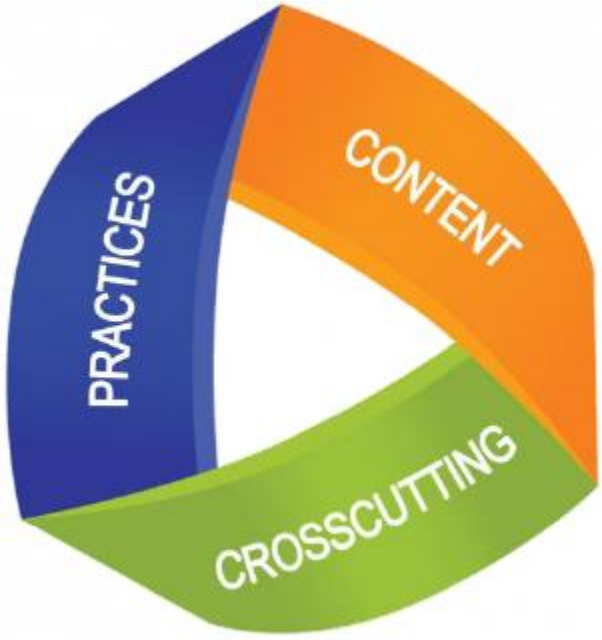
NEXT GENERATION SCIENCE STANDARDS

Middle School Science Level Shifts



Life Science:

Individual organism → its place in an ecosystem → development of these systems over time

- 6th: Structure of cells and organisms: body systems, growth and development, & sexual/asexual reproduction
- 7th: Develop the idea of interdependence of organisms to each other and abiotic factors & flow of energy in an ecosystem
- 8th: Variability and natural selection with deep time and fossil records to look at current time scale and population distribution of traits

Earth & Space Science:

Weather/Climate → plate movement & formation of materials → Earth in the solar system & universe

- 6th: Earth systems: interaction of earth's systems with exploration of hydrosphere and atmosphere to create weather conditions
- 7th: Geosphere and changes: plate movement creating Earth's surface and formation of materials
- 8th: Earth's place: cosmic perspective of Earth's place in solar system, universe, and other galaxies

Human Impact:

Embedded in Earth and Space Science Performance Expectations

- 6th: Apply scientific principles to human impact on environment: concepts of weather and climate
- 7th: Natural hazards: earthquakes and plate tectonics
- 8th: Consequences of human population growth and resource consumption

Physical Science:

Energy as motion of particles → Structure and property of matter →

- 6th: Thermal energy and transfer: potential energy & kinetic energy introduction
- 7th: Atomic modeling: structure and property of matter and chemical reactions
- 8th: Forces and interactions: connect previous relationships with mathematical relationships; waves and electromagnetic interactions

Engineering:

Opportunities to engage students within science disciplines

Next Generation Science Standards
Performance Expectations Table

without human impacts & engineering

Level	Cross Cutting Concepts	Life	Earth & Space	Physical
8th	Stability & Change; Scale, proportion and quantity	Natural selection	History of the Earth; Space Systems	Waves & Electromagnetic radiation; Energy; Forces & Interactions
7th	Energy and matter: flows, cycles, and conservation; Cause and effect	Ecosystems	Natural resources	Structure and property of matter
6th	Patterns; Structure and function; Systems and system models	Cells and organisms	Weather and climate	Energy
5th	Energy and matter: flows, cycles, and conservation	Matter cycles through living and nonliving things	Earth in space; Interactions of earth systems	Properties and structure of matter

8th Grade NGSS Standards

Life Sciences-Natural Selection:

LS3-1. 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.

LS4-5. Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

LS4-1. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.

LS4-2. Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modem and fossil organisms to infer evolutionary relationships.

LS4-3. Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.

LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.

LS4-6. Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

Earth & Space Systems-Earth in the Solar System:

ESS1-1. 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.

ESS1-2. Dewlap and use a model to describe the role of gravity in the motions within galaxies and the solar system.

ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system.

ESS1-4. 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.

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.

Physical Science-Movement:

PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.

PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

PS2-3. Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.

PS2-4. Construct and present arguments using evidence to support the claim that gravitational interactions are attraction and depend on the masses of interacting objects.

PS2-5. Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other own though the objects are not in contact.

PS3-1. Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

PS3-2. Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.

PS4-1. 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.

PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

PS4-3. Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.

Engineering, Technology, & Science:

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.

ETS1-3. 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.

ETS1-4. 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.

7th Grade NGSS Standards

Life Sciences-Photosynthesis:

LS1-6. 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.

LS1-7. Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and for release energy as this matter mows through an organism.

LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

Earth & Space Systems-Earth:

ESS2-2. Construct an explanation based on evidence for how geoscience processes how changed Earth's surface at trying time and spatial scales.

ESS2-3. Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.

ESS2-1. Develop a model to describe the cycling of Earth's materials and the flow of energy that drills this process.

ESS3-1. 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.

ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

Physical Science-Matter:

PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures.

PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.

PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.

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