



Range of Domain (%) on the WY-TOPP Science Assessment

Grade	PS – Physical Science	LS – Life Science	ESS – Earth & Space Science	ETS embedded – Engineering, Technology, and Applications of Science
4	40-50%	20-27%	33-43%	Embedded within PS, LS, & ESS
8	32-40%	32-40%	27-35%	Embedded within PS, LS, & ESS
10	32-40%	40-50%	15-20%	Embedded within PS, LS, & ESS

Approved by the Wyoming State Board of Education on February 28, 2020.

WY-TOPP Gr. 4 Science Blueprint

[2016 Wyoming Science Content Standards](#)

PHYSICAL SCIENCE [40-50%]

PS3 Energy

4-PS3-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object.

4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

4-PS3-3 Ask questions and predict outcomes about the changes in energy that occur when objects collide.

4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. [ETS1-1, 1-2, 1-3 are embedded]

PS4 Waves and Their Applications in Technologies for Information Transfer

4-PS4-2 Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.

LIFE SCIENCE [20-27%]

LS1 From Molecules to Organisms: Structure and Processes

4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

4-LS1-2 Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

EARTH & SPACE SCIENCE [33-43%]

ESS1 Earth's Place in the Universe

4-ESS-1-1 Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.

ESS2 Earth's Systems

4-ESS-2-1 Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

4-ESS-2-2 Analyze and interpret data from maps to describe patterns of Earth's features.

ESS3 Earth and Human Activity

4-ESS-3-2 Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. [ETS1-2 embedded]

ENGINEERING, TECHNOLOGY, & APPLICATIONS OF SCIENCE (ETS) [embedded within grade 4 PS, LS, and ESS]

3-5-ETS1

3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

WY-TOPP Gr. 8 Science Blueprint

[2016 Wyoming Science Content Standards](#)

PHYSICAL SCIENCE [32-40%]

PS1 Matter and Its Interactions

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

MS-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.

MS-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.

PS2 Motion and Stability: Forces and Interactions

MS-PS2-1 Apply Newton's third law to design a solution to a problem involving the motion of two colliding objects. [ETS1-1, 1-2, 1-3, 1-4, 2-2 are embedded]

MS-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.

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

PS3 Energy

MS-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.

MS-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.

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.

MS-PS3-5 Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

PS4 Waves and Their Applications in Technologies for Information Transfer

MS-PS4-1 Use mathematical representations to describe a simple model for waves, which includes how the amplitude of a wave is related to the energy in a wave.

LIFE SCIENCE [32-40%]

LS1 From Molecules to Organisms: Structure and Processes

MS-LS1-1 Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.

MS-LS1-2 Develop and use models to describe the parts, functions, and basic processes of cells.

MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

MS-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.

LS2 Ecosystems: Interactions, Energy, and Dynamics

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

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

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

LS3 Heredity: Inheritance and Variation of Traits

MS-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.

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.

LS4 Biological Evolution: Unity and Diversity

MS-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.

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

MS-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 SCIENCE [27-35%]

ESS1 Earth's Place in the Universe

MS-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.

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

MS-ESS1-4 Construct a scientific explanation based on evidence from rocks and rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.

ESS2 Earth's Systems

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

MS-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.

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.

ESS3 Earth and Human Activity

MS-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.

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

MS-ESS3-3 Apply scientific principles to design a method for monitoring, evaluating, and managing a human impact on the environment. [ETS1-1, 1-2, 1-3, 1-4, 2-2 are embedded]

ENGINEERING, TECHNOLOGY, & APPLICATIONS OF SCIENCE (ETS) [embedded within grade 8 PS, LS, and ESS]

MS-ETS1

MS-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.

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

MS-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.

MS-ETS1-4 Develop a model for a proposed object, tool or process and then use an iterative process to test the model, collect data, and generate modification ideas trending toward an optimal design.

MS-ETS2

MS-ETS2-2 Develop a model defining and prioritizing the impacts of human activity on a particular aspect of the environment, identifying positive and negative consequences of the activity, both short and long-term, and investigate and explain how the ethics and integrity of scientists and engineers and respect for individual property rights might constrain future development.

WY-TOPP Gr. 10 Science Blueprint

[2016 Wyoming Science Content Standards](#)

PHYSICAL SCIENCE [32-40%]

PS1 Matter and Its Interactions

HS-PS1-1 Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

HS-PS1-2 Construct an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties, and revise, as needed.

HS-PS1-5 Apply scientific principles and use evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

HS-PS1-7 Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

HS-PS1-8 Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.

PS2 Motion and Stability: Forces and Interactions

HS-PS2-1 Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

HS-PS2-2 Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.

HS-PS2-3 Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision. [ETS1-2, 1-3, 1-4 are embedded]

PS3 Energy

HS-PS3-1 Create or apply a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. [ETS1-4 embedded]

HS-PS3-3 Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. [ETS1-2, 1-4 are embedded]

PS4 Waves and Their Applications in Technologies for Information Transfer

HS-PS4-1 Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. [ETS 1-2, 1-4, 1-5 are embedded]

LIFE SCIENCE [40-50%]

LS1 From Molecules to Organisms: Structure and Processes

HS-LS1-1 Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

HS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multi-cellular organisms.

HS-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

HS-LS1-4 Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

HS-LS1-5 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

HS-LS1-6 Construct explanations and revise, as needed, based on evidence for: 1) how carbon, hydrogen, and oxygen may combine with other elements to form amino acids and/ or other large carbon-based molecules, and 2) how other hydrocarbons may also combine to form large carbon-based molecules.

HS-LS1-7 Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of sugar molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

LS2 Ecosystems: Interactions, Energy, and Dynamics

HS-LS2-2 Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. [ETS1-4 embedded]

HS-LS2-3 Construct an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions, and revise as needed.

HS-LS2-4 Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

HS-LS2-5 Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

HS-LS2-6 Evaluate the claims, evidence, and reasoning that the complex biotic and abiotic interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a modified ecosystem. [ETS1-5 are embedded]

LS3 Heredity: Inheritance and Variation of Traits

HS-LS3-1 Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

HS-LS3-2 Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. [ETS1-5 embedded]

HS-LS3-3 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

LS4 Biological Evolution: Unity and Diversity

HS-LS4-2 Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

HS-LS4-4 Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

HS-LS4-5 Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. [ETS1-5 embedded]

EARTH & SPACE SCIENCE [15-20%]

ESS1 Earth's Place in the Universe

HS-ESS1-3 Communicate scientific ideas about the way stars, over their life cycle, produce elements.

HS-ESS1-5 Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.

ESS2 Earth's Systems

HS-ESS2-4 Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. [ETS1-4, 1-5 are embedded]

HS-ESS2-7 Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth. [ETS1-5 embedded]

ESS3 Earth and Human Activity

HS-ESS3-1 Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. [ETS1-1, 1-5 are embedded]

HS-ESS3-5 Analyze data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.

ENGINEERING, TECHNOLOGY, & APPLICATIONS OF SCIENCE (ETS) [embedded within grade 10 PS, LS, and ESS]

HS-ETS1

HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

HS-ETS1-4 Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

HS-ETS1-5 Evaluate the validity and reliability of claims in a variety of materials.