Smart Science® Lessons and Middle School Next Generation Science Standards

You have chosen the right place to find great science learning and, **beyond learning**, **how to think**. The NGSS emphasize thinking and inquiry, which sit front and center in every Smart Science® lesson. These lessons improve student test scores because the students come to understand the material and, importantly, the **nature of science.**

Middle school students benefit greatly in their understanding by doing real experiments and taking their own data in a hands-on fashion, the hallmarks of Smart Science® lessons.

These web-delivered lessons use HTML5 to ensure that your students can use them on any modern device from desktops to smart phones. Furthermore, you will see the software and content constantly improving to provide the best in online and virtual learning tools you can find anywhere and to do so always. We look forward to welcoming you to the Smart Science® family of educators.

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Next Generation Science Standards
Domain: Physical Science

Disciplinary Core Idea	Performance Expectation	Students who demonstrate understanding can:	Smart Science® Lessons
Matter and Its Interactions	MS-PS1-1	Develop models to describe the atomic composition of simple molecules and extended structures.	• Gas Volume-Pressure • Brownian Motion/Temperature
Matter and Its Interactions	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.	• Phase Change • Chemical Change
Matter and Its Interactions	MS-PS1-3	Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.	
Matter and Its Interactions	MS-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.	• Phase Change • Brownian Motion/Temperature • Specific Heat • Heat Transfer
Matter and Its Interactions	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.	• Conservation of Mass*
Matter and Its Interactions	MS-PS1-6	Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.*	• Enthalpy of Solution
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.	• Collisions • Inelastic Collisions • Inelastic Collisions and Mass
Motion and Stability: Forces and Interactions	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.	• Water Rockets • Atwood Machine • Definition of Speed • Mass of Falling Objects
Motion and Stability: Forces and Interactions	MS-PS2-3	Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.	• Magnetic Force

Next Generation Science Standards
Domain: Physical Science

Disciplinary Core Idea	Performance Expectation	Students who demonstrate understanding can:	Smart Science® Lessons
Motion and Stability: Forces and Interactions	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.	• Gravity and Speed • Mass of Falling Objects
Motion and Stability: Forces and Interactions	MS-PS2-5	Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact	• Magnetic Force
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.	• Work-Energy Theorem • Projectile Motion & Energy • Pendulums & Energy
Energy	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.	• Projectile Motion & Energy • Springs & Energy • Pendulums & Energy • Magnet Cannon
Energy	MS-PS3-3	Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.	• Heat Transfer • Heat Radiation & Color • Specific Heat
Energy	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.	• Phase Change • Brownian Motion/Temperature • Specific Heat • Heat Transfer

Next Generation Science Standards
Domain: Physical Science

Disciplinary Core Idea	Performance Expectation	Students who demonstrate understanding can:	Smart Science® Lessons
Energy	MS-PS3-5	Construct, use, and present arguments to support the claim that when the motion energy of an object changes, energy is transferred to or from the object.	• Water Rockets • Inelastic Collisions • Elastic Collisions • Magnet Cannon
Waves & Electromagnetic Radiation	MS-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.	• Sound Intensity & Distance • Sound Resonance
Waves & Electromagnetic Radiation	MS-PS4-2	Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.	• Light Reflection
Waves & Electromagnetic Radiation	MS-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.	• Noise*

Next Generation Science Standards
Domain: Life Science

Disciplinary Core Idea	Performance Expectation	Students who demonstrate understanding can:	Smart Science® Lessons
From Molecules to Organisms: Structures & 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.	• Stem Structure • Mitosis Activity
From Molecules to Organisms: Structures & Processes	MS-LS1-2	Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.	• Photosynthesis & Light • Mitosis
From Molecules to Organisms: Structures & Processes	MS-LS1-3	Use arguments supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.	• Frog Dissection, Identify • Shark Dissection, Identify
From Molecules to Organisms: Structures & Processes	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.	• Species Diversity • Beaks of Birds
From Molecules to Organisms: Structures & Processes	MS-LS1-5	Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organism.	• Plants & Water • Plants & Salt • Stem Structure • Mitosis
From Molecules to Organisms: Structures & Processes	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.	• Photosynthesis & Light • Cell Respiration • Food Web Exercise • Food Webs
From Molecules to Organisms: Structures & Processes	MS-LS1-7	Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.	• Yeast Metabolism • Yeast & Sugar • Cell Respiration
From Molecules to Organisms: Structures & Processes	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.	• Sound Pitch

Next Generation Science Standards
Domain: Life Science

Disciplinary Core Idea	Performance Expectation	Students who demonstrate understanding can:	Smart Science® Lessons
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.	• Bacteria Growth • Plants & Water • Food Webs
Ecosystems Interactions. Energy and Dynamics	MS-LS2-2	Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.	• Species Diversity • Biomes • Food Webs
Ecosystems Interactions. Energy and Dynamics	MS-LS2-3	Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.	• Food Webs • Plant Transpiration • Photosynthesis & Light
Ecosystems Interactions. Energy and Dynamics	MS-LS2-4	Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.	• Plants & Water • Plants & Salt • Biomes • Food Webs
Ecosystems Interactions. Energy and Dynamics	MS-LS2-5	Evaluate competing design solutions for maintaining biodiversity and ecosystem services.	• Species Diversity
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.	• Corn Genetics • Genetic Code • Natural Selection
Heredity: Inheritance and Variation of Traits	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.	• Corn Genetics
Heredity: Inheritance and Variation of Traits	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.	• Fossils*

Next Generation Science Standards
Domain: Life Science

Disciplinary Core Idea	Performance Expectation	Students who demonstrate understanding can:	Smart Science® Lessons
Biological Evolution: Unity and Diversity	MS-LS4-2	Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.	• Natural Selection
Biological Evolution: Unity and Diversity	MS-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.	
Biological Evolution: Unity and Diversity	MS-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.	• Natural Selection • Biomes
Biological Evolution: Unity and Diversity	MS-LS4-5	Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.	• Corn Genetics
Biological Evolution: Unity and Diversity	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.	• Natural Selection • Corn Genetics

Next Generation Science Standards
Domain: Earth & Space Science

Disciplinary Core Idea	Performance Expectation	Students who demonstrate understanding can:	Smart Science® Lessons
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.	• Moon Phases • Star Paths • Shadows • Daily Tides
Earth's Place in the Universe	MS-ESS1-2	Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.	• Mass of Falling Objects • Water Rockets • Star Paths • Moon Phases
Earth's Place in the Universe	MS-ESS1-3	Analyze and interpret data to determine scale properties of objects in the solar system.	• Solar System
Earth's Place in the Universe	MS-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.	
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	
Earth's Systems	MS-ESS2-2	Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.	• Erosion & Flow • Erosion & Slope • Basic Rock Identification
Earth's Systems	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.	• Fossils*

Next Generation Science Standards
Domain: Earth & Space Science

Disciplinary Core Idea	Performance Expectation	Students who demonstrate understanding can:	Smart Science® Lessons
Earth's Systems	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.	• Clouds • Soil Permeability • Plant Transpiration • Evaporation
Earth's Systems	MS-ESS2-5	Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.	• Clouds • Weather Maps
Earth's Systems	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.	• Heat Radiation & Color
Earth & 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.	• Heat Transfer • Basic Rock Identification • Minerals Exercise*
Earth & Human Activity	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.	• Earthquakes
Earth & Human Activity	MS-ESS3-3	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.	• Renewable Energy Resources • Non-Renewable Energy Resources • Air Pollution
Earth & Human Activity	MS-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.	• Renewable Energy Resources • Non-Renewable Energy Resources • Air Pollution • Acid Rain • Species Diversity • Water Quality & Seeds
Earth & Human Activity	MS-ESS3-5	Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century	• Non-Renewable Energy Resources