Middle School Grade 8 Science Tutorials offer targeted instruction, practice, and review designed to help students develop scientific literacy, deepen conceptual understanding, and apply scientific practices. Students explore concepts such as the formation of Earth's physical features, heredity and reproduction, and the relationship between force and motion.

Students engage with the content in an interactive, feedback-rich environment as they progress through standards-aligned modules. By continually honing their ability to apply knowledge in real-world scenarios, students build the depth of knowledge and higher-order skills required to demonstrate their mastery when put to the test.

In each module, the Learn It and Try It make complex ideas accessible to students as they explore the nature of science through focused content, interactive mini investigations, multi-modal representations, and personalized feedback. The Review It offers a high-impact summary of key concepts and relates those concepts to students' lives. The Test It assesses students' mastery of the module's concepts, providing granular performance data to students and teachers after each attempt. To help students focus on the content most relevant to them, unit-level pretests and posttests can quickly identify where students are strong and where they're still learning.

These Tutorials are built to the Next Generation Science Standards for middle school science.

Unit 1: Nature of Science

- **WHAT IS SCIENCE?**
- **TYPES OF INVESTIGATIONS**
- **USING MODELS**

Unit 2: Measurement and Data

- **TOOLS AND MEASUREMENT**
- **DISPLAYING AND INTERPRETING DATA**

Unit 3: Energy

- **DESCRIBING ENERGY**
  - MS-PS3-1: Energy 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.
- **ENERGY TRANSFER AND TRANSFORMATION**
  - MS-PS3-2: Energy 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.

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- MS-PS3-5: Energy 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.

Unit 4: Force and Motion

- **DESCRIBING FORCES**
  - MS-PS2-5: Motion and Stability: Forces and Interactions 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.
- **DESCRIBING MOTION**
  - MS-PS2-1: Motion and Stability: Forces and Interactions Apply Newtons Third Law to design a solution to a problem involving the motion of two colliding objects.
  - MS-PS2-2: Motion and Stability: Forces and Interactions Plan an investigation to provide evidence that the change in an objects motion depends on the sum of the forces on the object and the mass of the object.
- **EFFECTS OF FORCES**
  - MS-PS2-2: Motion and Stability: Forces and Interactions Plan an investigation to provide evidence that the change in an objects motion depends on the sum of the forces on the object and the mass of the object.

Unit 5: Noncontact Forces

- **ELECTROMAGNETIC FORCES**
  - MS-PS2-3: Motion and Stability: Forces and Interactions Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
  - MS-PS2-5: Motion and Stability: Forces and Interactions 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.
- **GRAVITATIONAL FORCE**
  - MS-PS2-4: Motion and Stability: Forces and Interactions Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.

Unit 6: Waves

- **MECHANICAL WAVES**
  - MS-PS4-1: Waves and Their Applications in Technologies for Information Transfer 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.
- **ELECTROMAGNETIC WAVES**
  - MS-PS4-1: Waves and Their Applications in Technologies for Information Transfer Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is

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related to the energy in a wave.

Unit 7: Applications of Waves

- **INTERACTIONS OF WAVES WITH MATTER**
  - MS-PS4-2: Waves and Their Applications in Technologies for Information Transfer Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
- **WAVES AND TECHNOLOGY**
  - MS-PS4-3: Waves and Their Applications in Technologies for Information Transfer 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.

Unit 8: The Solar System

- **SUN-EARTH-MOON SYSTEM**
  - MS-ESS1-1: Earths Place in the Universe 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.
- **OUR SOLAR SYSTEM**
  - MS-ESS1-2: Earths Place in the Universe Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
  - MS-ESS1-3: Earths Place in the Universe Analyze and interpret data to determine scale properties of objects in the solar system.
  - MS-ESS1-3: Earths Place in the Universe Analyze and interpret data to determine scale properties of objects in the solar system.
  - MS-ESS2-2: Earths Systems Construct an explanation based on evidence for how geoscience processes have changed Earths surface at varying time and spatial scales.

Unit 9: Exploring the Universe

- **THE UNIVERSE**
  - MS-ESS1-2: Earths Place in the Universe Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
- **SPACE EXPLORATION**
  - MS-PS1-3: Matter and Its Interactions Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
  - MS-ETS1-1: Engineering Design 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: Engineering Design Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
  - MS-ETS1-3: Engineering Design 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

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a new solution to better meet the criteria for success.

- MS-ETS1-4: Engineering Design 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.

- **OUR SUN AND OTHER STARS**
  - MS-ESS1-3: Earths Place in the Universe Analyze and interpret data to determine scale properties of objects in the solar system.
  - MS-ESS1-2: Earths Place in the Universe Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.

Unit 10: Living Things

- **CLASSIFICATION OF LIVING THINGS**
  - MS-LS4-2: Biological Evolution: Unity and Diversity 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.
  - MS-LS4-3: Biological Evolution: Unity and Diversity 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.
- **CELL GROWTH AND REPRODUCTION**
  - MS-LS1-2: From Molecules to Organisms: Structures and Processes Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function.
  - MS-LS1-7: From Molecules to Organisms: Structures and Processes 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.
- **LIFE CYCLES**
  - MS-LS4-1: Biological Evolution: Unity and Diversity 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.

Unit 11: Genetics

- **INHERITANCE**
  - MS-LS1-5: From Molecules to Organisms: Structures and Processes Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
  - MS-LS3-2: Heredity: Inheritance and Variation of Traits 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.
- **GENES AND DNA**
  - MS-LS1-2: From Molecules to Organisms: Structures and Processes Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function.

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- MS-LS3-1: Heredity: Inheritance and Variation of Traits 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.

- **BIOTECHNOLOGY**
  - MS-LS4-5: Biological Evolution: Unity and Diversity Gather and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms.

Unit 12: Evolution

- **THEORY OF EVOLUTION**
  - MS-LS4-1: Biological Evolution: Unity and Diversity 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-LS4-2: Biological Evolution: Unity and Diversity 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**
  - MS-LS1-4: From Molecules to Organisms: Structures and Processes 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.
  - MS-LS4-4: Biological Evolution: Unity and Diversity 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.
  - MS-LS4-4: Biological Evolution: Unity and Diversity 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.
  - MS-LS4-6: Biological Evolution: Unity and Diversity Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

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