

California Middle School Earth and Space Science Tutorials offer targeted instruction, practice, and review designed to help students develop scientific literacy, deepen conceptual understanding, and apply scientific practices. 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 Earth and space science.

1. NATURE OF SCIENCE

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

2. MEASUREMENT AND DATA

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

3. PLANET EARTH

- **MODELS OF EARTH**
 - **MS-ESS2-2** *Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.*
- **EARTH'S STRUCTURE AND CYCLES**
 - **MS-ESS2-1** *Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.*

4. THE GEOSPHERE

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

- **SOIL**

- **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.

5. OUR CHANGING PLANET

- **DEFORMING EARTH'S CRUST**

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

- **WEATHERING AND EROSION**

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

- **GEOLOGIC TIME**

- **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.

6. EARTH'S PLATES

- **PLATE TECTONICS**

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

- **EARTHQUAKES AND VOLCANOES**

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

7. THE ATMOSPHERE, HYDROSPHERE, AND CRYOSPHERE

- **FRESHWATER AND ICE**

- **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-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.

- **OCEANS**

- **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.

- **THE ATMOSPHERE**

- **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.

8. WEATHER AND CLIMATE

• WEATHER

- **MS-ESS2-5** *Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.*

• SEVERE WEATHER

- **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.*

• CLIMATE

- **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.*
- **MS-ESS3-5** *Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.*

9. HUMANS AND EARTH'S RESOURCES

• NATURAL RESOURCES

- **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.*

• IMPACTS OF HUMANS

- **MS-ESS3-5** *Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.*
- **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.*
- **MS-ESS3-3** *Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*

10. THE SOLAR SYSTEM

• SUN-EARTH-MOON SYSTEM

- **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.*

• OUR SOLAR SYSTEM

- **MS-ESS1-2** *Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.*
- **MS-ESS1-3** *Analyze and interpret data to determine scale properties of objects in the solar system.*
- **MS-ESS2-2** *Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.*

11. EXPLORING THE UNIVERSE

• 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.*

• SPACE EXPLORATION

- **MS-PS1-3** *Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.*
- **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 to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.*