









# Middle School - 6th Grade Earth & Space Science

## North Boone CUSD 200

UNITS (8/8 SELECTED)

SUGGESTED DURATION

 Unit 1: Methods of Science	<i>20 lessons</i>
 Unit 2: Exploring Earth: Earth's Structure, Rocks, Minerals and Weathering	<i>25 lessons</i>
 Unit 3: Plate Tectonics and Earth Dynamics (including earthquakes and volcanoes)	<i>30 lessons</i>
 Unit 4: Clues to Earth's Past	<i>13 lessons</i>
 Unit 5: Weather and Climate	<i>25 lessons</i>
 Unit 6: Human Impact Project	<i>12 lessons</i>
 Unit 7: Exploring the Universe	<i>25 lessons</i>
 Unit 8: Exploratory Science Fair Project	<i>10 lessons</i>

# Unit 1: Methods of Science

Middle School - 6th Grade Earth & Space Science - Last Updated on March 21, 2019

## STANDARDS

**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.

## PRIORITY STANDARDS

<b>MS-ETS1-1</b>	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.
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# Unit 1: Methods of Science

Middle School - 6th Grade Earth & Space Science - Last Updated on March 21, 2019

## DESIRED RESULTS

Enduring Understandings	Essential Question(s)
<p>Being precise leads to more success.</p> <p>A problem needs to be tested and modified if necessary in order to create the best solution.</p>	<p>How do scientists solve problems?</p>

Students will know (Knowledge):	Students will be able to do (Skills):
<ul style="list-style-type: none"><li>• Key concepts and vocabulary used for describing and explaining the processes scientists use when performing scientific investigations: observation, hypothesis, prediction, inference, technology, scientific theory, scientific law, description, explanation, variable, independent variable, dependent variable , International System of Units (SI), significant digits</li><li>• The steps of the scientific method in order</li><li>• Scientific design</li><li>• Laws vs. Theories</li><li>• Fact vs. Opinion</li><li>• Independent and dependent variables</li><li>• Metric System/International System of Units</li></ul>	<ul style="list-style-type: none"><li>• Use key concepts and vocabulary to describe and explain: the processes scientists use when performing scientific investigations; and, how measurement and scientific tools are used in these processes</li><li>• Create an experiment that takes them through the steps of the scientific process</li><li>• Design experiments using scientific inquiry in real-world investigations</li><li>• Analyze and differentiate between laws and theories</li><li>• Differentiate between a fact and opinion</li><li>• Create and Identify independent and dependent variables in an experiment</li><li>• Compare and Contrast vocab words</li><li>• Convert within the metric system</li></ul>

# Unit 2: Exploring Earth: Earth's Structure, Rocks, Minerals and Weathering

Middle School - 6th Grade Earth & Space Science - Last Updated on March 21, 2019

## STANDARDS

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

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

## PRIORITY STANDARDS

<b>MS-ESS2-1</b>	Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
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## DESIRED RESULTS

Enduring Understandings	Essential Question(s)
Earth's structure is always changing and its system are always interacting as a result of processes and changes in materials caused by cycling of energy from the Sun.	How is the structure of Earth organized and how does it change?

Students will know (Knowledge):	Students will be able to do (Skills):
<ul style="list-style-type: none"><li>• How to read topographical maps (in order to understand how earth's surface has changed and can be changed over time)</li><li>• The layers of earth and their composition. (background info)</li><li>• How the processes of melting, crystallization, weathering, deformation, and sedimentation act together to form minerals and rocks through the cycling of Earth's materials</li><li>• The properties and characteristics of minerals and rocks</li><li>• How intrusive and extrusive rocks are formed</li><li>• How the processes of weathering, erosion and deposition affects the surface of the earth and how new landforms are created as a result</li></ul>	<ul style="list-style-type: none"><li>• Create a topographical map of an imaginary city that they create</li><li>• Create a diagram of the rock cycle to identify the conditions needed to change one rock type to another</li><li>• Identify key characteristics of the three different rock types using rock samples</li><li>• Create a model that shows the process of weathering, erosion and deposition</li></ul>

## Unit 3: Plate Tectonics and Earth Dynamics (including earthquakes and volcanoes)

Middle School - 6th Grade Earth & Space Science - Last Updated on March 21, 2019

### STANDARDS

**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.

**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.

### PRIORITY STANDARDS

<b>MS-ESS2-2</b>	Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
<b>MS-ESS3-2</b>	Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

# Unit 3: Plate Tectonics and Earth Dynamics (including earthquakes and volcanoes)

Middle School - 6th Grade Earth & Space Science - Last Updated on March 21, 2019

## DESIRED RESULTS

Enduring Understandings	Essential Question(s)
<p>Looking at the geologic structure of a region and past events that have occurred there can help forecast the likelihood of future events.</p> <p>Investigations of rocks and fossils have given evidence for how Earth's plates have moved in the past.</p>	<p>Why does the world look the way it does?</p> <p>Why do the continents move, and what causes earthquakes and volcanoes?</p>

Students will know (Knowledge):	Students will be able to do (Skills):
<ul style="list-style-type: none"><li>• The three types of plate boundaries and how they move</li><li>• What types of landforms are created from convergent, divergent and transform plate boundaries</li><li>• How changes in density can cause motion in Earth's crust</li><li>• and understand the effect of heat on different materials</li><li>• and understand the processes that shape earth, and how humans are affected by them .</li><li>• What processes build mountains and what types of mountains are formed as a result</li><li>• The types of stress that occur along plate boundaries: tension, shear, compression</li><li>• What causes an earthquake and the scales used to measure the magnitude of one: Mercalli Scale, Richter Scale</li><li>• The 3 types of volcanoes and their structure</li></ul>	<ul style="list-style-type: none"><li>• Model the way plates move by putting different types of stress on an object and observing the kinds of landforms that are created from them</li><li>• Model the density that occurs in Earth's crust</li><li>• Model the effects of heat on silly putty (related to the effects of heat on earth's crust)</li><li>• Research a mountain and explain how it has changed over time</li><li>• Identify the magnitude of an earthquake by looking at various scenarios</li><li>• Design an earthquake resistant building, test its effectiveness using an earthquake simulation, and evaluate ways to improve their model</li><li>• Apply their knowledge of what happens in an earthquake to a real-life scenario</li><li>• Build replicas of the 3 types of volcanoes.</li></ul>

# Unit 4: Clues to Earth's Past

Middle School - 6th Grade Earth & Space Science - Last Updated on March 21, 2019

## STANDARDS

**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.

**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.

## PRIORITY STANDARDS

<b>MS-ESS1-4</b>	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.
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## DESIRED RESULTS

Enduring Understandings	Essential Question(s)
Rock strata and the fossils within them provide a way to organize earth's history.	<p>What evidence is used to interpret earth's history?</p> <p>Does looking at the evidence of Earth's past give any clues to what the future may hold?</p>

Students will know (Knowledge):	Students will be able to do (Skills):
<ul style="list-style-type: none"> <li>• Key concepts and vocabulary used for studying and investigating the evidence of earth's past: fossil, catastrophism, uniformitarianism, carbon film, mold, cast, trace fossil, paleontologist, relative age, superposition, absolute age, eon, era, period, mass extinction, land bridge, paleozoic era, mesozoic era, cenozoic era</li> <li>• The different ways fossils are formed and preserved</li> <li>• The various dating methods that scientists use to age rock strata</li> <li>• About major events and era's in earth's history</li> </ul>	<ul style="list-style-type: none"> <li>• Use key concepts and vocabulary in discussions and investigations of earth's past</li> <li>• Model creating different types of fossils</li> <li>• Observe different "cast" fossils and identify possible objects that may have caused that imprint to occur</li> <li>• Model absolute and relative age dating by working collaboratively with peers</li> <li>• Create a timeline of their past and relate it to the era's of earth's past</li> </ul>

# Unit 5: Weather and Climate

Middle School - 6th Grade Earth & Space Science - Last Updated on March 21, 2019

## STANDARDS

**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.

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

**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.

**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.

## PRIORITY STANDARDS

<b>MS-ESS2-5</b>	Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions
<b>MS-ETS1-1</b>	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.
<b>MS-ESS3-5</b>	Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.



# Unit 5: Weather and Climate

Middle School - 6th Grade Earth & Space Science - Last Updated on March 21, 2019

## DESIRED RESULTS

Enduring Understandings	Essential Question(s)
<p>Weather and climate are influenced by interactions and locations on the earth, with the sun being the major driving factor.</p>	<p>What regulates weather and climate and how does it impact the Earth?</p> <p>What scientific instruments are used to collect weather data; and, how is this data useful in the development of regional climate trends?</p> <p>How can various weather instrument design solutions be compared and improved?</p>

Students will know (Knowledge):	Students will be able to do (Skills):
<ul style="list-style-type: none"> <li>• Key concepts and vocabulary used for studying and investigating weather and climate: atmosphere, ozone layer, air pollution, acid rain, weather, air pressure, humidity, relative humidity, dew point, high and low pressure systems, air masses, front, tornado, hurricane, climate, specific heat, ice age, el nino, global warming, greenhouse gas, deforestation</li> <li>• The importance of the Earth's atmosphere &amp; how it supports life here on earth.</li> <li>• And understand the process of the greenhouse effect and the composition of earth's atmosphere.</li> <li>• The layers of the atmosphere &amp; how temperature and air pressure vary in each.</li> <li>• The various ways energy is transferred in the atmosphere: radiation, conduction, convection.</li> <li>• The various types of air currents: trade winds, westerlies, polar easterlies, jet stream, sea breeze, land breeze.</li> <li>• The different ways weather is described and the different instruments used to measure the weather.</li> <li>• The different types of weather patterns (air masses &amp; types of fronts) and the natural disasters that come from them.</li> <li>• The difference between climate and weather.</li> <li>• That climates vary depending on region.</li> </ul>	<ul style="list-style-type: none"> <li>• Use key concepts and vocabulary in discussions and investigations of weather and climate</li> <li>• Model the greenhouse effect.</li> <li>• Create a weather instrument to describe local weather.</li> <li>• Analyze weather journal data and compare it to the local weather station and local climate trends.</li> <li>• Analyze data on climate change.</li> </ul>

# Unit 6: Human Impact Project

Middle School - 6th Grade Earth & Space Science - Last Updated on March 21, 2019

## STANDARDS

**MS-ESS3-3.:** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

**MS-ESS3-4.:** Construct an argument supported by evidence for how increases in human population and per-capital consumption of natural resources impact Earth's systems.

**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.

## PRIORITY STANDARDS

<b>MS-ESS3-3</b>	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
<b>MS-ETS1-1</b>	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.

## DESIRED RESULTS

<b>Enduring Understandings</b>	<b>Essential Question(s)</b>
Humans can influence different living things both positively and negatively as the Earth's environment is changed.	How have humans impacted the earth and its systems?

<b>Students will know (Knowledge):</b>	<b>Students will be able to do (Skills):</b>
<ul style="list-style-type: none"><li>How humans have impacted the environment (water usage, land usage, and pollution (of air, water and land).</li></ul>	<ul style="list-style-type: none"><li>Create action steps to reduce human impact on the environment.</li><li>Design a method for minimizing a human impact on the environment</li></ul>

# Unit 7: Exploring the Universe

Middle School - 6th Grade Earth & Space Science - Last Updated on March 21, 2019

## STANDARDS

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

## PRIORITY STANDARDS

<b>MS-ESS1-1</b>	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.
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# Unit 7: Exploring the Universe

Middle School - 6th Grade Earth & Space Science - Last Updated on March 21, 2019

## DESIRED RESULTS

Enduring Understandings	Essential Question(s)
<p>Patterns in the Universe can be observed and described. Data collected can then be used in making future predictions.</p> <p>The solar system consists of various objects that are held in orbit based on the gravitational pull of nearby objects.</p>	<p>What is the universe; and, what theories are used to explain its origin?</p> <p>What predictable patterns occur in the universe?</p>

Students will know (Knowledge):	Students will be able to do (Skills):
<ul style="list-style-type: none"><li>• Key concepts and vocabulary used for studying and investigating the universe: orbit, revolution, rotation, rotational axis, solstice, equinox, solar and lunar eclipse, umbra, penumbra, tide, spectroscope, galaxy, the Big Bang Theory</li><li>• The stages of the life cycle of a star: nebula, white dwarf, super nova, neutron star, black hole</li><li>• The objects in the solar system: sun, dwarf planets, asteroids, comets, meteors</li><li>• the composition of the 8 planets and their relation to one another: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune.</li><li>• how the planets and other objects move in relation to one another in the solar system.</li><li>• the phases of the moon: waxing, waning.</li></ul>	<ul style="list-style-type: none"><li>• Use key concepts and vocabulary in discussions and investigations of the universe</li><li>• Create a model of the solar system.</li><li>• Create a model of the moon's phases.</li><li>• Model gravity's affect on the orbits of planets.</li><li>• Apply their knowledge of the moon's characteristics (atmosphere, gravity etc.) to do a survival activity.</li></ul>

# Unit 8: Exploratory Science Fair Project

Middle School - 6th Grade Earth & Space Science - Last Updated on March 21, 2019

## STANDARDS

**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.

## PRIORITY STANDARDS

<b>MS-ETS1-1</b>	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.
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## DESIRED RESULTS

Enduring Understandings	Essential Question(s)
Exploration and problem are the heart of science. Problems are researched before beginning to design solutions. Possible solutions are tested to see how they perform under various conditions and results are communicated with others in order to improve solutions.	What is the process for exploring science and developing potential solutions to problems?

Students will know (Knowledge):	Students will be able to (Skills):
<ul style="list-style-type: none"><li>• Key components and vocabulary about conducting a scientific experiment, including: control, dependent and independent variables</li><li>• The components of the scientific method, including: how to question, research, hypothesize, experiment, analyze, conclude</li><li>• Effective research strategies and techniques</li></ul>	<ul style="list-style-type: none"><li>• Use key components and vocabulary in conducting and presenting a scientific experiment</li><li>• Research a scientific topic of interest</li><li>• Carry out an experiment using the scientific method</li><li>• Describe their project to their peers</li><li>• Showcase their project and findings for the public.</li></ul>