

NGSS UNIT OVERVIEW

EARTH'S RESOURCES

Performance Expectation 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.

Performance Expectation 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.

Performance Expectation 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.

Activity Description	Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts	Common Core State Standards
<p>1. Investigation: Observing Earth's Resources This activity establishes the basis for investigating the distribution and formation of natural resources on Earth. Students are introduced to the concept of natural resources as they examine resource samples from Earth's land, water, and biosphere. They identify the resources as renewable or nonrenewable. In discussing the relative values of resources, students take part in the crosscutting concept that science can provide knowledge but does not direct the actions that people take.</p>	MS-ESS3.A	Constructing Explanations and Designing Solutions	Connections to Engineering, Technology, and Applications of Science: Influence of Science, Engineering, and Technology on Society and the Natural World Connections to Nature of Science: Science Addresses Questions about the Natural and Material World	ELA/Literacy: RST.6-8.3
<p>2. Reading: World Resource Consumption This reading examines the consumption and global distribution of natural resources in the context of human population growth. The focus of the reading is on the use of a mineral (copper), an energy source (petroleum), and freshwater. Graphs showing consumption of resources over time and maps of their uneven distribution highlight how these resources are limited.</p>	MS-ESS3.A MS-ESS3.C	Constructing Explanations and Designing Solutions Engaging in Argument from Evidence	Cause and Effect Connections to Engineering, Technology, and Applications of Science: Influence of Science, Engineering, and Technology on Society and the Natural World Connections to Nature of Science: Science Addresses Questions about the Natural and Material World	Mathematics: 7.RP.A.2 ELA/Literacy: RST.6-8.1 RST.6-8.7 WHST.6-8.1 WHST.6-8.9

EARTH'S RESOURCES (continued)

Activity Description	Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts	Common Core State Standards
<p>3. Laboratory: Properties of Natural Resources The idea that resources such as minerals are limited and not renewable is developed through an investigation of the properties of minerals. Students use mineral properties to identify an unknown mineral, and discuss how the properties of a particular mineral make it useful to people.</p>	MS-ESS3.A	Constructing Explanations and Designing Solutions	Connections to Engineering, Technology, and Applications of Science: Influence of Science, Engineering, and Technology on Society and the Natural World Connections to Nature of Science: Science Addresses Questions about the Natural and Material World	ELA/Literacy: RST.6-8.3
<p>4. Talking it Over: Per Capita Consumption Students identify patterns in mineral, energy, and groundwater resource-consumption data over time. Population data are used to calculate per capita consumption, and students examine images from each country to determine the possible negative impacts of resource use on the environment. They construct an argument supported by evidence for how increases in human population and per capita consumption of natural resources impact Earth's systems.</p>	MS-ESS3.C	Engaging in Argument from Evidence	Cause and Effect Connections to Engineering, Technology, and Applications of Science: Influence of Science, Engineering, and Technology on Society and the Natural World Connections to Nature of Science: Science Addresses Questions about the Natural and Material World	Mathematics: 6.SP.B.5 ELA/Literacy: RST.6-8.1 WHST. 6-8.1 WHST.6-8.9
<p>5. Modeling: Finding Resource Deposits Students model how natural resources are discovered using remote sensing techniques. These techniques extend the ability to measure, explore, and identify structures underground. Students analyze the data they collect, which provide evidence that resources are distributed unevenly on Earth. They are introduced to the idea that the distribution of resources is a result of past geological processes.</p>	MS-ESS3.A	Designing and Using Models Analyzing and Interpreting Data	Connections to Engineering, Technology and Applications of Science: Influence of Science, Engineering, and Technology on Society and the Natural World	ELA/Literacy: RST.6-8.3

EARTH'S RESOURCES (continued)

Activity Description	Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts	Common Core State Standards
<p>6. Laboratory: Extracting Resources The extraction and processing of ores helps meet global demand for natural resources while at the same time resulting in short- and long-term consequences for the environment. The crosscutting concept of systems and system models is introduced through a copper extraction model. Students extract copper from malachite using acid, and examine the wastes produced by this process. They apply what they have learned to a question that is informed by science but requires individual decision-making about the trade-offs involved.</p>	<p>MS-ESS3.C</p>	<p>Designing and Using Models Engaging in Argument from Evidence</p>	<p>Cause and Effect Connections to Engineering, Technology, and Applications of Science: Influence of Science, Engineering, and Technology on Society and the Natural World Connections to Nature of Science: Science Addresses Questions about the Natural and Material World Systems and System Models</p>	<p>ELA/Literacy: RST.6-8.3 WHST.6-8.1</p>
<p>7. Reading: Geological Processes Students read about the geological processes that result in the formation and distribution of mineral, energy, and groundwater resources on earth. They practice constructing a scientific explanation based on evidence. The crosscutting concept of stability and change is introduced in the context of geological processes. This activity provides an opportunity to assess Performance Expectations MS-ESS3-1.</p>	<p>MS-ESS3.A</p>	<p>Constructing Explanations and Designing Solutions</p>	<p>Connections to Engineering, Technology, and Applications of Science: Influence of Science, Engineering, and Technology on Society and the Natural World Connections to Nature of Science: Science Addresses Questions about the Natural and Material World Stability and Change</p>	<p>ELA/Literacy: RST.6-8.1 WHST.6-8.1 WHST.6-8.9</p>

EARTH'S RESOURCES (continued)

Activity Description	Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts	Common Core State Standards
<p>8. Laboratory: Groundwater Formation Students use earth materials to explore the phenomena of groundwater movement and the formation of aquifers. This contributes to their understanding of the uneven distribution of Earth's resources. The activity reinforces the crosscutting concept that humans depend on groundwater resources, and extracting groundwater has both short- and long-term consequences, positive as well as negative, for the health of people and the natural environment.</p>	MS-ESS3.A	Designing and Using Models Analyzing and Interpreting Data	Connections to Engineering, Technology and Applications of Science: Influence of Science, Engineering, and Technology on Society and the Natural World Structure and Function	ELA/Literacy: RST.6-8.3
<p>9. Modeling: Modeling Rock Layers Rock strata provide a way to understand Earth's history. Students use a model of the formation of rock layers to begin to investigate the history of Earth. The crosscutting concept of systems and system models as well as scale, proportion, and quality are developed. Understanding resource formation as a process that happens over extremely long periods of time is the focus of the next few activities.</p>	MS-ESS1.C	Constructing Explanations and Designing Solutions Designing and Using Models	Scale, Proportion, and Quantity Systems and System Models Stability and Change	ELA/Literacy: RST.6-8.3 WHST.6-8.1
<p>10. Investigation: Earth's History Students continue a series of activities focusing on how evidence from rock strata has been used to organize Earth's 4.6-billion-year history. They investigate geological time by first ordering their own history over time. They then order events in Earth's history into one of four time periods before examining the work of modern geologists. The crosscutting concept of scale, proportion, and quality is further developed with the introduction of the geologic time scale.</p>	MS-ESS1.C	Constructing Explanations and Designing Solutions Planning and Carrying Out Investigations	Scale, Proportion, and Quantity	ELA/Literacy: RST.6-8.3
<p>11. Investigation: Fossils Through Time The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Students analyze data from the rock strata and the fossil record and construct a relative time scale of Earth's 4.6-billion-year history.</p>	MS-ESS1.C	Constructing Explanations and Designing Solutions Connections to Nature of Science: Scientific Knowledge Is Based on Empirical Evidence	Patterns Scale, Proportion, and Quantity Stability and Change	ELA/Literacy: RST.6-8.3 WHST.6-8.1 WHST.6-8.9

EARTH'S RESOURCES (continued)

Activity Description	Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts	Common Core State Standards
<p>12. Investigation: Reading Rock Strata Students 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 history. They correlate layers in stratigraphic columns from different hypothetical locations and use the fossil evidence to determine relative time periods. The crosscutting concepts of pattern, scale, and stability and change are reinforced. The crosscutting concepts of pattern, scale, and stability and change are reinforced. This activity provides an opportunity to assess Performance Expectation MS-ESS1-4.</p>	MS-ESS1.C	Constructing Explanations and Designing Solutions	Patterns Scale, Proportion, and Quantity Stability and Change	ELA/Literacy: RST.6-8.3 WHST.6-8.1 WHST.6-8.9
<p>13. Reading: Impact on Earth Systems Students read about everyday examples that show the cause-and-effect relationship between the increases in human population and per capita consumption of natural resources. They construct an argument about how removing natural resources such as water, food, minerals, and energy negatively impacts Earth's systems. They consider the short- and long-term consequences, positive as well as negative, for the health of people and the natural environment that results from withdrawing natural resources from the earth. This activity provides an opportunity to assess Performance Expectation MS-ESS3-4.</p>	MS-ESS3.C	Engaging in Argument from Evidence	Cause and Effect Connections to Engineering, Technology, and Applications of Science: Influence of Science, Engineering, and Technology on Society and the Natural World Connections to Nature of Science: Science Addresses Questions about the Natural and Material World	ELA/Literacy: RST.6-8.1 WHST.6-8.1 WHST.6-8.9
<p>14. Talking It Over: The Rockford Range Decision Students use geological processes to explain the distribution of resources in a land area. They look at the cause and effect of human activity on Earth's nonrenewable resources. They make decisions about the short- and long-term consequences, positive as well as negative, for those in a given community faced with a need for resources. This activity provides an opportunity to assess Performance Expectation MS-ESS3-1.</p>	MS-ESS3.A	Constructing Explanations and Designing Solutions	Cause and Effect Connections to Engineering, Technology, and Applications of Science: Influence of Science, Engineering, and Technology on Society and the Natural World	ELA/Literacy: RST.6-8.1 WHST.6-8.2 WHST.6-8.9