

NGSS OVERVIEW

LAND, WATER, AND HUMAN INTERACTIONS

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

Performance Expectation 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.

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

Performance Expectation 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.

Performance Expectation MS-ETS1-2: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

* *Performance expectations marked with an asterisk integrate traditional science content with engineering through a science and engineering practice or disciplinary core idea.*

| Activity Description | Disciplinary Core Ideas | Science and Engineering Practices | Crosscutting Concepts | Common Core State Standards |
|--|-------------------------|--|--|----------------------------------|
| <p>1. Investigation: Where Should We Build? Students are introduced to the human impact on land and water use with a scenario that engages them in the issues in the context of a community’s building project. When considering the impact of development, they apply the crosscutting concept of the influence of science, engineering, and technology on the natural world.</p> | MS-ESS3.C | Asking Questions and Defining Problems | Cause and Effect Influence of Science, Engineering, and Technology on Society and the Natural World | |
| <p>2. Laboratory: Does It Dissolve? Students carry out a laboratory experiment that helps them develop a conceptual model for the phenomenon of dissolving salts in water. They apply what they have learned in the investigation to explain how the natural world is affected by the physical properties of water. The movement of dissolved substances into water is related to the crosscutting concept of <i>energy and matter</i>.</p> | MS-ESS2.C MS-PS1.A | Constructing Explanations and Designing Solutions Planning and Carrying out Investigations | Energy and Matter | ELA/Literacy: RST.6-8.3 |
| <p>3. Investigation: Water Quality Students conduct a data analysis of water-quality indicators that monitor the human impact on waterways. They compare graphical displays of data that show changes to Earth’s surface water at varying times in relation to increases in population. The crosscutting concept of <i>cause and effect</i> is explored through the introduction of a correlation and a causal relationship.</p> | MS-ESS3.C | Analyzing and Interpreting Data Connections to the Nature of Science: Scientific Knowledge Is Based on Empirical Evidence | Cause and Effect Patterns Influence of Science, Engineering, and Technology on Society and the Natural World | Mathematics: 6.SP.B.5 MP.4 |

LAND, WATER, AND HUMAN INTERACTIONS (continued)

| Activity Description | Disciplinary Core Ideas | Science and Engineering Practices | Crosscutting Concepts | Common Core State Standards |
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| <p>4. Investigation: Living Indicators Students identify patterns in data from simulated catches of aquatic invertebrates and construct arguments for possible cause-and-effect relationships to human activities. The crosscutting concept of <i>cause and effect</i> is applied to the phenomenon seen in the effect of human activity on the types and number of aquatic invertebrates found over time.</p> | <p>MS-ESS2.A MS-ESS3.C MS-LS2.A MS-LS2.C</p> | <p>Analyzing and Interpreting Data Engaging in Argument from Evidence Connections to the Nature of Science: Scientific Knowledge Is Based on Empirical Evidence</p> | <p>Patterns Cause and Effect Scale, Proportion, and Quantity Influence of Science, Engineering, and Technology on Society and the Natural World</p> | <p>Mathematics: 6.SP.B.5 6.RP.A.1 ELA/Literacy: RST.6-8.3</p> |
| <p>5. Laboratory: Nutrients as Contaminants Students use a model to gather evidence about the interaction of soil, water, and fertilizers in a laboratory investigation to understand how human activities have altered the environment. They apply the crosscutting concept of <i>cause and effect</i> to human activity and environmental impacts.</p> | <p>MS-ESS3.C MS-ESS2.C</p> | <p>Developing and Using Models Constructing Explanations and Designing Solutions Planning and Carrying Out Investigations</p> | <p>Cause and Effect Influence of Science, Engineering, and Technology on Society and the Natural World</p> | <p>ELA/Literacy: RST.6-8.3</p> |
| <p>6. Reading: Gulf of Mexico Dead Zone Students read about the phenomenon of dead zones—their formation, causes, and effects on the environment. They apply the crosscutting concept of scale, proportion, and quantity when they draw a model diagram to explain how human impact on natural resources in one place can have large-scale impacts in another, distant part of the ecosystem.</p> | <p>MS-ESS3.C MS-ESS2.A</p> | <p>Developing and Using Models Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information Connections to the Nature of Science: Scientific Knowledge Is Based on Empirical Evidence</p> | <p>Cause and Effect Scale, Proportion, and Quantity Influence of Science, Engineering, and Technology on Society and the Natural World</p> | <p>ELA/Literacy: RST.6-8.1</p> |
| <p>7. Modeling: Cutting Canyons and Building Deltas Students model the phenomenon of sediment movement in a river to provide evidence for how geoscience processes change Earth’s surface. They demonstrate how water’s movements under the force of gravity contribute to the formation of landforms. Students then apply the scientific and engineering practice of <i>asking questions and defining problems</i> as they use criteria and constraints to design a system to hold sediments in place in the stream.</p> | <p>MS-ESS2.A MS-ESS2.C MS-ETS1.A</p> | <p>Asking Questions and Defining Problems Constructing Explanations and Designing Solutions Developing and Using Models</p> | <p>Scale, Proportion, and Quantity Energy and Matter Influence of Science, Engineering, and Technology on Society and the Natural World Stability and Change</p> | <p>ELA/Literacy: RST.6-8.3</p> |

LAND, WATER, AND HUMAN INTERACTIONS (continued)

| Activity Description | Disciplinary Core Ideas | Science and Engineering Practices | Crosscutting Concepts | Common Core State Standards |
|--|--|--|--|--|
| <p>8. Investigation: Traveling with the Water Cycle Students model the phenomenon of global water movement as driven by the sun and gravity. Students construct an explanation on the water cycle and the cycling of matter. They consider how the planet’s systems interact over various time and spatial scales. They use the crosscutting concept of <i>scale, proportion, and quantity</i> to discuss how water movement can be studied using a model of a system too large to observe all at once.</p> | <p>MS-ESS2.A MS-ESS2.C</p> | <p>Developing and Using Models Constructing Explanations and Designing Solutions</p> | <p>Scale, Proportion and Quantity Energy and Matter</p> | <p>ELA/Literacy: WHST.6-8.2</p> |
| <p>9. Reading: Human Impact on Earth’s Water Students read about human impacts on Earth’s water. Scientific principles are applied to a discussion of methods for monitoring and minimizing human impact on Earth’s water. The crosscutting concept of the influence of science, engineering, and technology on society and the natural world is developed, as students consider the health of people and the natural environment. Students are formally assessed on Performance Expectation MS-ESS2-4.</p> | <p>MS-ESS2.C MS-ESS2.A MS-ESS3.C</p> | <p>Constructing Explanations and Designing Solutions Obtaining, Evaluating, and Communicating Information Developing and Using Models</p> | <p>Energy and Matter Influence of Science, Engineering, and Technology on Society and the Natural World Stability and Change</p> | <p>ELA/Literacy: RST.6-8.1 RST.6-8.9</p> |
| <p>10. Investigation: Making Topographic Maps Students conduct a hands-on investigation to model Earth’s landforms using topographic maps. They create a map of a landform and then apply their understanding to interpret other maps. They consider how the maps reflect evidence for how geoscience processes have changed Earth’s surface at varying time and spatial scales.</p> | <p>MS-ESS2.A</p> | <p>Developing and Using Models Planning and Carrying Out Investigations Analyzing and Interpreting Data</p> | <p>Patterns Scale, Proportion, and Quantity</p> | <p>Mathematics: MP.2 MP.4 ELA/Literacy: RST.6-8.3</p> |
| <p>11. Investigation: Boomtown’s Topography Students analyze data from topographic maps that display temporal and spatial information about a particular area. They construct explanations based on this evidence for how geoscience processes have changed Earth’s surface over time. They consider how water’s movements on the land and underground have changed the land’s form. The crosscutting concept of <i>stability and change</i> is applied to the scenario as students use evidence from the past to make predictions of what future changes are likely in Boomtown.</p> | <p>MS-ESS2.A MS-ESS2.C</p> | <p>Constructing Explanations and Designing Solutions Analyzing and Interpreting Data Connections to the Nature of Science: Scientific Knowledge Is Based on Empirical Evidence</p> | <p>Cause and Effect Scale Proportion and Quantity Stability and Change</p> | <p>Mathematics: MP.2 MP.4</p> |

LAND, WATER, AND HUMAN INTERACTIONS (continued)

| Activity Description | Disciplinary Core Ideas | Science and Engineering Practices | Crosscutting Concepts | Common Core State Standards |
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| <p>12. Modeling: Modeling Cliff Erosion Students apply what they have learned about the phenomena of erosion and deposition to a model of cliff erosion. They use the model to design an erosion-mitigation structure for the cliff using relevant scientific principles that might limit solutions. They use design criteria to develop a solution that is evaluated by others who use a systematic process to determine how well they meet the criteria and constraints of the problem. Students are formally assessed on Performance Expectation MS-ETS1-1.</p> | <p>MS-ESS2.C MS-ETS1.A MS-ETS1.B</p> | <p>Constructing Explanations and Designing Solutions Asking Questions and Defining Problems Developing and Using Models Engaging in Argument from Evidence</p> | <p>Influence of Science, Engineering, and Technology on Society and the Natural World Scale, Proportion, and Quantity Energy and Matter Stability and Change</p> | <p>ELA/Literacy: RST.6-8.3</p> |
| <p>13. Reading: Weathering, Erosion, and Deposition Students read about phenomena related to geologic processes and how they work on Earth’s surface over varying time and spatial scales. They investigate how changes in the soil and water change the landscape either by sudden events or by gradual changes that accumulate over time. Students construct an explanation about changes they observe due to erosion and deposition based on information in this and previous hands-on activities. Students use the crosscutting concept of energy and matter is used to examine how the transfer of energy drives the motion and/or cycling of matter in geologic processes.</p> | <p>MS-ESS2.A MS-ESS2.C</p> | <p>Constructing Explanations and Designing Solutions</p> | <p>Energy and Matter Stability and Change Scale, Proportion, and Quantity Influence of Science, Engineering, and Technology on Society and the Natural World</p> | <p>ELA/Literacy: RST.6-8.9 WHST.6-8.9</p> |
| <p>14. Role Play: Building on the Mississippi Students apply what they have learned about geologic phenomena and the monitoring and mitigation of human impact to the Mississippi River and Delta. They use the crosscutting concepts of <i>cause and effect</i> and <i>stability and change</i> to investigate how New Orleans has coexisted with the river. The use of unprecedented engineering in this area was driven by the needs of the city and its people. Students are formally assessed on Performance Expectation MS-ESS2-2.</p> | <p>MS-ESS2.A MS-ESS2.C MS-ESS3.C</p> | <p>Constructing Explanations and Designing Solutions Obtaining, Evaluating, and Communicating Information</p> | <p>Scale, Proportion, and Quantity Energy and Matter Influence of Science, Engineering, and Technology on Society and the Natural World Stability and Change Cause and Effect</p> | <p>ELA/Literacy: RST.6-8.1</p> |

LAND, WATER, AND HUMAN INTERACTIONS (continued)

| Activity Description | Disciplinary Core Ideas | Science and Engineering Practices | Crosscutting Concepts | Common Core State Standards |
|--|--|--|---|--|
| <p>15. Investigation: Building in Boomtown Students use criteria and constraints for building and the information provided in the unit to choose a building site. They identify the consequences of their choices on the health of the people and environment. They compare and critique others' choices and determine whether they emphasize similar or different interpretations of evidence.</p> | <p>MS-ESS2.A MS-ESS2.C MS-ESS3.C</p> | <p>Constructing Explanation and Designing Solutions</p> | <p>Influence of Science, Engineering, and Technology Connections to the Nature of Science: Science Is a Way of Knowing Cause and Effect</p> | <p>ELA/Literacy: WHST.6-8.9 WHST.6-8.2</p> |
| <p>16. Design: Building Site Plan In this final activity, students apply scientific principles and knowledge of geologic phenomena to design the school and fields at one of the sites. Students evaluate the solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. Students are formally assessed on Performance Expectations MS-ESS3-3 and MS-ETS1-2.</p> | <p>MS-ESS3.C MS-ESS2.C MS-ETS1.B</p> | <p>Constructing Explanations and Designing Solutions Engaging in Argument from Evidence</p> | <p>Cause and Effect Influence of Science, Engineering, and Technology on Society and the Natural World</p> | <p>ELA/Literacy: WHST.6-8.2 SL.8.4</p> |