EARTH AND SPACE SYSTEMS (5.ES.NGSS)

UNIT AT A GLANCE

ACTIVITY 1 - Preserving Resources & Protecting the Environment

QUESTIONS: What do scientists and engineers need to know to better protect Earth's resources and environment? How do the land, air, water, and living organisms interact to make up Earth's processes?

Time to Complete

Preparation: 30 minutes
Activity 1:
- Lesson 1A: 50–55 min. 2 days
- Lesson 1B: 50–55 min. 2 days
- Lesson 1C: 50–55 min.

Phenomena

Plastic throwaways make up a large percentage of trash and litter.

Plastic throwaways as an environmental problem.

Summary: Students Will...

- Analyze the results of a schoolyard cleanup and a plastic waste video.
- Determine the amount of plastic used on a daily basis.
- Analyze articles about different organizations that are taking steps to preserve resources and the environment.
- Brainstorm the components that make up Earth's systems.

Students Figure Out How To:

- Relate their findings from the cleanup, video, and reading to explain how human activities impact Earth's resources and the environment.
- Obtain information from videos, explorations, and articles to explain human impact and design a solution.
- Analyze a model that explains the four systems.

Practices

Obtaining, Evaluating, and Communicating Information

Developing and Using Models

Cause and Effect

Systems and System Models

Performance Expectations (PE) at Lesson Level and Assessment

PE at Lesson Level

Obtain, evaluate, and communicate information to explain how human activities impact Earth's resources and environment.

Brainstorm what components make up Earth's systems.

Formative Assessment

Science Talk
Journal Entries/Respond to Text
Activity Pages

ACTIVITY 2 - The Atmosphere

QUESTIONS: What are the gases of the atmosphere? What makes the wind? How does the wind interact with Earth's systems? How do clouds in the atmosphere interact with Earth's systems?

Time to Complete

Preparation: 30 minutes
Activity 2:
- Lesson 2A: 55–60 min.
- Lesson 2B: 55–60 min.
- Lesson 2C: 55–60 min.

Phenomena

Only the slightest change in the percentage of oxygen that makes up the air results in a large change in the ability of plants and animals to survive.

Summary: Students Will...

- Obtain information that explains the distribution of gases in the atmosphere.
- Build and observe models that explain how wind occurs.
- Use a model to explain how clouds are made.

ACTIVITY 2 - The Atmosphere - *Continued*

Students Figure Out How To:

- Determine that when the balance of gases is changed, life on Earth changes.
- Analyze models to explain how the wind occurs.
- Make the connection between air movement, temperature, and gravity.
- Relate the problem of throwaway plastics to the atmosphere.

Practices

Obtaining, Evaluating, and Communicating Information

Developing and Using Models

Cause and Effect

Systems and System Models

Performance Expectations (PE) at Lesson Level and Assessment

PE at Lesson Level

Use models to explain how wind occurs and clouds form.

Slight changes in the balance of gases in the atmosphere cause change.

Formative Assessment

Science Talk
Journal Entries
Activity Pages

ACTIVITY 3 - The Hydrosphere

QUESTIONS: How is water distributed on Earth and what is the percentage of water available for living organisms? What makes the oceans move? How does water move through the atmosphere, geosphere, hydrosphere, and biosphere? How does the flow of water change the surface of Earth?

Time to Complete

Preparation: 30 minutes
Activity 3:
Lesson 3A: 55–60 min.
Lesson 3B: 55–60 min.
plus data collection
Lesson 3C: 55–60 min.
3 days
Lesson 3D: 55–60 min.
4 days
Lesson 3E: 55–60 min.

Phenomena

The amount of water that can be used by living things is a small fraction of the total amount of water on Earth.

People around the world use different sources for their water.

Mudslides occur when the land cannot hold great amounts of water and the water flows as run-off.

Summary: Students Will...

- Use text to relate the amount of fresh water and available drinking water to the importance of water conservation.
- Use a model that explains the distribution of water on Earth.
- Determine how ocean currents form and affect surrounding land.
- Use a model to determine how moving water changes the shape of the land.
- Determine how the atmosphere and hydrosphere interact, causing erosion of the geosphere.

Students Figure Out How To:

- Develop a model to explain how the wind affects the motion of the ocean.
- Use a mathematical model to demonstrate how only a tiny fraction of Earth's water is fresh water and usable by living things.
- Collect data to determine the average amount of water used by individuals and the class.
- Develop a model that will determine the effects of a hard rainstorm on a future development on a hillside.
- Use a model to explain how watersheds form.
- Obtain and use information to describe their local watershed.

Practices

Developing and Using Models

Using Mathematics and Computational Thinking

Analyzing and Interpreting Data

Planning and Carrying Out Investigations

Systems and System Models

Science Addresses Questions About the Natural and Material World

Scale, Proportion, and Quantity

Performance Expectations (PE) at Lesson Level and Assessment

PE at Lesson Level

Use models to explain:

- that only a the tiny fraction of water on Earth is fresh water.
- how ocean currents form.
- how watersheds form.
- how moving water across the surface of Earth causes change.

Formative Assessment

Science Talk
Activity Pages

Summative Assessment

Science Talk
Journal Entries

ACTIVITY 4 - The Geosphere

QUESTIONS: How can we use real-time data on earthquakes to determine a pattern in where they occur?
What causes earthquakes?

Time to Complete

Preparation: 15 minutes
Activity 4:
Lesson 4A: 55–60 min.
3–4 days
Lesson 4B: 55–60 min.
2 days

Phenomena

Earth has two nicknames, the Blue Marble and Planet Rock.

Summary: Students Will...

- Research and present information on a landform.
- Use text to determine what is beneath the surface of Earth.

Students Figure Out How To:

- Develop an informative advertisement about a landform.
- Obtain, evaluate, and communicate information about a landform.
- Determine how the atmosphere and hydrosphere interact to shape the landform.

Practices

Obtaining, Evaluating, and Communicating Information

Developing and Using Models

Systems and System Models

Performance Expectations (PE) at Lesson Level and Assessment

PE at Lesson Level

Use research to gain information and develop a model of a landform.

Use text to determine what is beneath the surface of Earth.

Formative Assessment

Science Talk
Activity Pages

Summative Assessment

Science Talk
Journal Entries

ACTIVITY 5 - The Biosphere

QUESTIONS: What are the components of the biosphere?
How do the components of the biosphere interact with the atmosphere, geosphere, and hydrosphere?

Time to Complete

Preparation: 15 minutes
Activity 5:
Lesson 5A: 55–60 min.
2 days
Lesson 5B: 55–60 min.

Phenomena

Components of the biosphere can be found in the schoolyard. Living organisms are dependent on the balance in the geosphere, hydrosphere, and atmosphere.

Summary: Students Will...

- Conduct an exploration in the field to observe specimens from the biosphere.
- Connect their specimens to the atmosphere, hydrosphere, and geosphere.

Students Figure Out How To:

- Develop a concept map to explain the connections between their biosphere specimens and the geosphere, hydrosphere, and atmosphere.
- Use patterns in their findings to support a claim that Earth's systems are interconnected and dependent on one another.

Practices

Developing and Using Models

Constructing Explanations and Designing Solutions

Systems and System Models

Patterns

Performance Expectations (PE) at Lesson Level and Assessment

PE at Lesson Level

Develop models to support the claim that Earth's systems interact and are dependent on each other.

Formative Assessment

Activity Page
Group facilitation

Summative Assessment

Journal Entry
Activity Pages

ACTIVITY 6 - When Components & Systems Change

QUESTIONS: What happens when one component of Earth's systems changes? What can humans do to limit the impact on Earth's systems? What can a fifth-grade student (class) do to help protect Earth's resources and environment?

Time to Complete

Preparation: 15 minutes
Activity 6:
- Lesson 6A: 55–60 min. 2 days
- Lesson 6B: 55–60 min. 3 days
- Lesson 6C: 55–60 min. 2–3 days

Phenomena

Revisit:
Only the slightest change in the percentage of oxygen that makes up the air results in a large change in the ability of plants and animals to survive.

Plastic throwaways as an environmental problem.

Summary: Students Will...

- Use information from previous lessons to make lists of the components of the biosphere, atmosphere, hydrosphere, and geosphere.
- Use the lists of components to create a concept map and demonstrate how one change causes changes throughout Earth's systems.
- Revisit articles about environmental programs from the beginning of the unit.
- Develop a fifth-grade program to help preserve and protect Earth's resources and environments.

Students Figure Out How To:

- Develop a model to explain how change in one system has an effect on the other systems.
- Apply new knowledge about Earth's systems to the articles about environmental programs from the beginning of the unit.
- Determine how to evaluate human activity in relation to its effect on the environment.
- Use information and understanding about the connectivity between Earth's systems to develop a program to preserve and protect Earth's resources and environments.

Practices

Developing and Using Models

Constructing Explanations and Designing Solutions

Obtaining, Evaluating, and Communicating Information

Cause and Effect

Systems and System Models

Performance Expectations (PE) at Lesson Level and Assessment

PE at Lesson Level
Develop and implement a fifth-grade program to help preserve and protect Earth's resources and environments.

Formative Assessment
Class Concept Map
Student Plan

Summative Assessment
Science Talk
Journal Entries
Activity Pages

ACTIVITY 7 - Earth & Beyond

QUESTIONS: What makes the land of the midnight sun? How do we get day and night? How do we get our seasons? How can we develop a model to explain the different temperatures and length of day in different regions?

Time to Complete

Preparation: 15 minutes
Activity 7:
- Lesson 7A: 45–50 min. 2 days
- Lesson 7B: 55–60 min. 2 days
- Lesson 7C: 55–60 min. 2 days
- Lesson 7D: 55–60 min.
- Lesson 7E: 55–60 min.

Phenomena

Arctic Lights, Arctic Nights: Light in Alaska and how it changes from month to month.

Summary: Students Will...

- Raise questions about the changes in the amount of light in Alaska and the Arctic.
- Develop and use models to explain the uneven lighting and heating of Earth.
- Collect and analyze data to show patterns that give evidence as to why we get day and night, seasons, changes in the shape and location of shadows throughout the day and year, and the different locations of the sun and moon at different times of the day and year.

ACTIVITY 7 - Earth & Beyond - *Continued*

Students Figure Out How To:	Practices	Performance Expectations (PE) at Lesson Level and Assessment
• Use information from text to raise questions and gain information. • Demonstrate day and night, seasons, and changes in the position of sun and moon in the sky using models. • Analyze data to find patterns that provide evidence for the reason for day and night, the seasons, changes in the shape and location of shadows throughout the day and year, and the different locations of the sun and moon at different times of the day.	**Developing and Using Models** **Constructing Explanations and Designing Solutions** **Obtaining, Evaluating, and Communicating Information** **Systems and System Models** **Patterns** **Cause and Effect**	**PE at Lesson Level** Collect and graph data to show patterns that demonstrate how we get day and night, the different position of the sun and moon in the sky, and different lengths and positions of shadows throughout the day. **Formative Assessment** Lesson 7A: Journal Entry Science Talk **Summative Assessment** Lessons 7B and 7C: Activity Pages Journal Entries Science Talk