

Unit 2 Earth Systems

Content Area: **Science**
Course(s): **Integrated Science 5**
Time Period: **1 marking period**
Length: **8 Weeks**
Status: **Published**

Unit Overview

In this unit, students explore Earth's four systems, including how Earth's systems produce weather and climate and how Earth's systems change its surface. Students will assess the anchoring phenomenon and write an article about how Earth's four systems interact during a drought. Students also investigate human interactions on the Earth's systems including how farming, industry, and everyday life affect Earth's systems. Students discover what people can do to protect Earth's systems and create a public service announcement about the water in their communities in the final performance assessment. Using the knowledge they gain on the interactions of Earth's system, can students explain what is causing the California drought?

Transfer

Students will be able to independently use their learning to..

- Advocate carpooling and uses of green transportation to prevent air pollution.
- Practice correct recycling at home and school.
- Actively conserve water at home.
- Predict the weather.
- Utilize composting at home.
- Convince others to install solar panels.
- Purchase organic fruits and vegetables.
- Educate others about the positive outcomes of upcycling electronics.
- Attend town council meetings to advocate laws that will reduce use of material and energy resources.
- Support wildlife refuges.

For more information, read the following article by Grant Wiggins.

http://www.authenticeducation.org/ae_bigideas/article.lasso?artid=60

Meaning

Understandings

Students will understand that...

- The Earth is made up of four systems that work together.
- Earth's systems interact to produce weather and climate.
- Earth's systems interact to cause a change in the Earth's surface.
- There is a cause and effect relationship between farming and industry upon Earth's systems.
- There is a cause and effect relationship between human activity upon Earth's systems.
- People protect the Earth's environment in various ways.

Essential Questions

Students will keep considering...

- Lesson 1: What Are Earth's Four Systems?
- Lesson 2: How Do Earth's Systems Produce Weather and Climate?
- Lesson 3: How Do Earth's Systems Change Earth's Surface?
- Lesson 4: How Do Farming and Industry Affect Earth's Systems?
- Lesson 5: How Do People's Everyday Lives Affect Earth's Systems?
- Lesson 6: What Can People Do to Protect Earth's Systems?

Application of Knowledge and Skill

Students will know...

Students will know...

- Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things including humans).
- The Earth's systems interact in multiple ways to affect Earth's surface materials and processes.
- The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate.
- Winds and clouds in the atmosphere interact with landforms to determine patterns of weather.
- Nearly all of Earth's available water is in the ocean.
- Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.
- The Earth's surface is changed by the Earth's systems.
- Human activities in agriculture, industry, and every day life have had major effects on the land, vegetation, streams, ocean, air, and even outer space.
- Individuals are doing things to help protect Earth's resources and environments.

Students will be skilled at...

Students will be skilled at...

- Developing and using a model.
- Using mathematical and computational thinking.
- Analyzing and interpreting data.
- Obtaining, evaluating, and communicating information.
- Constructing explanations and designing solutions.
- Identifying cause and effect relationships.
- Planning and carrying out investigations.
- Asking questions and defining problems.
- Developing possible solutions to a problem.
- Defining and delimiting engineering problems.

Academic Vocabulary

Lesson 1

atmosphere

biosphere

geosphere

hydrosphere

precipitation

sediments

water cycle

water vapor

Lesson 4

pollution

toxic

Lesson 2
air mass
air pressure
climate
prevailing wind
weather

Lesson 5
recycling
decompose

Lesson 3
deposition
erosion
landform
weathering

Lesson 6
conservation
scrubbers
wildlife refuge

Learning Goal 1

Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

SCI.5-ESS2-1

Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

Target 1 (Lesson 1)

Categorize things into Earth's four systems. (Lesson 1)

Target 2 (Lesson 2)

Explain how Earth's systems interact to produce weather and climate. (Lesson 2)

Target 3 (Lesson 3)

Model how Earth's systems interact to change the Earth's surface. (Lesson 3)

Learning Goal 2

Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

SCI.5-ESS2-2

Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

Target 1 (Lesson 1)

Identify what tools scientists use to explore interactions between the hydrosphere, the geosphere, and the biosphere deep underwater. (Lesson 1)

Learning Goal 3

Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

SCI.5-ESS3-1

Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Target 1 (Lesson 4)

Observe and model the effects farming and industry have on the Earth's geosphere. (Lesson 4)

Target 2 (Lesson 5)

List three ways to reduce the negative impact of human activity on Earth's systems. (Lesson 5)

Target 3 (Lesson 6)

Research different ways people protect Earth's systems. (Lesson 6)

Formative Assessment and Performance Opportunities

- notebook checks
- quiz
- science notebook
- student displays & presentations
- student experiments
- student observations
- student sheets
- teacher observation
- tests
- think/pair/share
- web concept map

Summative Assessment

All assessments are differentiated and aligned to the science standards and curriculum. Alternate assessments may include projects or presentations, or a common paper/pencil assessment, or both. Common summative assessments, which include inquiry reflection are developed based on corresponding TCI Units and are computer based (LinkIt).

Accommodations/Modifications

Accommodations available through the TCI program include read aloud, Spanish text and presentations, leveled text, text highlighting, and notetaking.

English Language Learners

- Create a storybook of younger students to teach the four systems.
- For the 3-D assignment let students only write about two students
- Provide a model script
- Provide students with a description of your local weather instead of having them find it on their own.
- Provide students with sentence starters for the Investigation in Lesson 6.
- Put students in mixed ability groups to interpret the placards
- Reduce the reading of each scenario for the Lesson 5 investigation
- Use a variety of vocabulary strategies

- Use a word parts log to break a part the terms such as hydro + sphere

Special Education

- Focus the engineering solely on criteria and constraints in Lesson 6 investigation model the research process.
- Make the act out topics simpler such as continental islands, river deltas, or sea caves
- Pair students to create the Earth model
- Provide answers for the data table
- Put students in mixed ability groups for the act outs
- Reduce the number of scenarios during the investigation of lesson 5
- Simplify the 3-D assignment in Lesson 5 to two questions
- Simplify the Specific Water Data in part 2 of the investigation
- Use symbols to help the student complete the table during the acts outs.

Talented and Gifted

- Build a physical model of the soil layers diagram
- Create bar graphs of the geosphere and atmosphere
- Describe your ideal deserted island
- Find items in the classroom. Draw and label their parts. Identify which sphere they came from.
- Make a skit about how ocean currents circulate water
- Write a poem about the Earth's systems

Unit Resources

Lesson 1

Big Ideas: Earth can be divided into four systems called the atmosphere, biosphere, hydrosphere, and geosphere. These four systems interact with each other and make up the Earth. Often you can see the four systems at the same time, such as when you visit the beach. The air, crabs or fishes, ocean water, and sand are part of different systems. These four systems interact to affect weather, shape landforms, and support living things.

Textbook: Chamberliss, Marilyn, et al. *Bring Science Alive! Exploring Science Practices*. Rancho Cordova: Teachers' Curriculum Institute, 2015. pp. 102-119.

Materials

- 4-Color Modeling Clay
- Colored Pencils
- Cotton Balls
- Food Coloring
- Inflatable Earth Model
- Interactive Student Notebook
- Lesson Guide
- Medium Sand
- Navy Beads
- Notebook Answer Key
- Paper Bowl
- Spanish Interactive Student Notebook

Links

- Eco Investigators: Does Air Have Weight? (simulation): <https://nj.pbslearningmedia.org/>
- Geology (video): <https://nj.pbslearningmedia.org/>
- Our World: What Is Soil? (video):
<https://www.nasa.gov/audience/foreducators/nasaclips/index.html>

Additional Reading

The following books offer opportunities to extend the content in this lesson.

Rain Forests (Research on the Edge) by Louise Spilsbury. (Mankato, MN: Smart Apple Media, 2016)

What is life like for people in a rainforest? Learn about the biosphere in this gripping book that talks both about the rainforest ecosystem and how scientists live and learn inside of rainforests.

Inside the Water Cycle (Mission: Science) by William Rice. (Minneapolis, MN: Compass Point Books, 2010)

Water makes up most of the earth's surface, but how does it get there? Read all about the water cycle, from precipitation to ground water to evaporation, and see all about the path of water before and after it causes changes to the surface of the earth.

Lesson 2

Big Idea: As long as you are living on Earth, you are experiencing the weather and climate. Sometimes the weather is sunny, sometimes it is rainy, and sometimes it is even foggy. Earth's systems interact with each other to produce the weather you are familiar with. You will learn about how Earth's systems interact to produce different weather patterns.

Text: Chamberliss, Marilyn, et al. *Bring Science Alive! Exploring Science Practices*. Rancho Cordova: Teachers' Curriculum Institute, 2015. pp. 120-133.

Materials

- Interactive Student Notebook
- Lesson Guide
- Notebook Answer Key
- Placards A-H
- Spanish Interactive Student Notebook

Links

- Air Pressure Lesson Plan (video): <https://nj.pbslearningmedia.org/>
- Our World: Snowflakes (video): <https://www.nasa.gov/audience/foreducators/nasaclips/index.html>
- Our World: What Is a Cloud? (video):
<https://www.nasa.gov/audience/foreducators/nasaclips/index.html>
- Our World: What Is Weather? (video):
<https://www.nasa.gov/audience/foreducators/nasaclips/index.html>

Additional Reading

The following books offer opportunities to extend the content in these lessons.

Climatologists and Meteorologists (Out of the Lab: Extreme Jobs in Science) by Ruth Owen. (New York, NY: Powerkids Press, 2013)

Everyone checks the weather forecast sometimes, but some people study the weather all day! Learn about the careers of climatologists and meteorologists, who sometimes work in very dangerous conditions in order to understand how weather and climate work.

Weather and Climate Through Infographics by Rebecca Rowell. (Minneapolis, MN: Lerner Publishing Group,

2013)

Sometimes, it can be hard to understand what numbers used to represent the weather mean. That's where infographics come in! Use these visual graphs and charts to help you understand what weather and climate really are.

A Storm Called Katrina by Myron Uhlberg. Illustrations by Colin Bootman. (Atlanta, GA: Peachtree Publishers, 2015)

Hurricane Katrina is one of the most destructive natural disasters in America in recent years. Learn all about the storm and how it affected the community of New Orleans in this fictional story about a young boy experiencing the hurricane.

Forces of Nature by Chana Stiefel. (New York, NY: Scholastic Inc., 2010)

Are you curious about how weather works? This book, written with help from the weather channel, will answer many of your questions about weather and climate, and is full of tips to get you through storms and other bad weather.

Lesson 3

Big Idea: Earth's surface looks very different now from how it looked thousands of years ago. Earth's systems are constantly interacting with each other and the Earth's surface changes as a result. Canyons in the geosphere, like the Grand Canyon in Arizona are formed when rivers in the hydrosphere wear away rock.

Text: Chamberliss, Marilyn, et al. *Bring Science Alive! Exploring Science Practices*. Rancho Cordova: Teachers' Curriculum Institute, 2015. pp. 134-145.

Materials

- Handout: Changes to Earth's Deposition
- Interactive Student Notebook
- Lesson Guide
- Notebook Answer Key
- Spanish Handout: Changes to Earth's Deposition
- Spanish Interactive Student Notebook

Links

- Coastal Geological Processes (simulation): <https://nj.pbslearningmedia.org/>
- Florida's Springs (video): <https://nj.pbslearningmedia.org/>
- Rivers (video): <https://nj.pbslearningmedia.org/>

Lesson 4

Big Idea: Humans have a huge impact on Earth's systems. The food you eat is grown and raised in farms. The electricity you use is generated in a power plant. Objects are manufactured in industries. Most of these activities produce pollution that affects Earth's system.

Text: Chamberliss, Marilyn, et al. *Bring Science Alive! Exploring Science Practices*. Rancho Cordova: Teachers' Curriculum Institute, 2015. pp. 146-157.

Materials

- Chocolate Chip Cookies
- Interactive Student Notebook
- Large Paper Clip
- Lesson Guide
- Notebook Answer Key
- Paper Cup
- Paper Towels
- Plastic Fork
- Plastic Knife
- Spanish Interactive Student Notebook
- Toothpicks

Links

- Turning Waste Into Energy (video): <https://nj.pbslearningmedia.org/>
- Water Quality – Hydrology (video): <https://nj.pbslearningmedia.org/>

Additional Reading

The following books offer opportunities to extend the content in this lesson.

Fracking: Fracturing Rock to Reach Oil and Gas Underground (Next Generation Energy) by Nancy Dickmann. (New York, NY: Crabtree Publishing Company, 2015)

What is fracking, and why is it so controversial? As oil and gas resources run low, people turned to underground fracking, but many environmentalists are opposed to it. Learn about both sides of this debate to come to a more informed opinion about fracking.

Rachel Carson and Her Book That Changed the World by Laurie Lawlor. Illustrations by Laura Beingessner. (New York, NY: Holiday House, 2014)

More than fifty years ago, environmentalist Rachel Carson wrote a book about the ways in which people were hurting the earth's systems. Read this biography of Carson to find out what motivated her to write the book as well as what effect the book had on the rest of the world.

Is There a Future for Fossil Fuels? by Ellen Rodger. (New York, NY: Crabtree Publishing Company, 2010)

How much do you know about fossil fuels? You probably use natural gas, coal, and oil every day, but these resources are quickly running out. Learn about why people are so dependent on these resources and what options for energy exist beyond fossil fuels.

Lesson 5

Big Idea: Every day you interact with the Earth's systems. When you are at home, when you are at school, and even when you are just walking around on the street. The food you eat and the objects you use all come from Earth's systems.

Text: Chamberliss, Marilyn, et al. *Bring Science Alive! Exploring Science Practices*. Rancho Cordova: Teachers' Curriculum Institute, 2015. pp. 158-167.

Materials

- Handout: Earth System Chips
- Interactive Student Notebook
- Lesson Guide

- Notebook Answer Key
- Spanish Handout: Earth System Chips
- Spanish Interactive Student Notebook

Links

- A Tale of Two Soup Cans (simulation): <https://nj.pbslearningmedia.org/resource/kids-lab-video-martha-speaks-true-stories-soupcans/true-stories-a-tale-of-two-soup-cans-martha-speaks/>
- How Much Can You Reduce, Reuse, Recycle? (video): <http://www.pbslearningmedia.org/>

Additional Reading

The following books offer opportunities to extend the content in this lesson.

Reducing Your Foodprint: Farming, Cooking, and Eating for a Healthy Planet by Ellen Rodger. (New York, NY: Crabtree Publishing Company, 2010)

Did you know that every day, the foods you eat have a big impact on the environment? In this helpful book, learn how to eat and live so that the foods you eat can help save the planet.

Living in a Sustainable Way: Green Communities (Next Generation Energy) by Megan Kopp. (New York, NY: Crabtree Publishing Company, 2015)

Little changes to your daily life can affect the planet in a very big way! Learn about different green actions, from carpooling to turning off lights, that people all over the world do in order to live in a more sustainable way.

Lesson 6

Big Idea: All of Earth's systems are connected. When one system changes, the rest of the systems change as well. It is important to protect Earth's systems so you can continue to live on Earth. There are many ways individuals, engineers, communities, and government can protect Earth's systems.

Text: Chamberliss, Marilyn, et al. *Bring Science Alive! Exploring Science Practices*. Rancho Cordova: Teachers' Curriculum Institute, 2015. pp. 168-185.

Materials

- 250 mL beaker
- 500 mL Bottle with Cap
- Coffee Filter
- Cotton Balls
- Gravel
- Handout: Problem Scenarios
- Interactive Student Notebooks
- Lesson Guide
- Medium Sand
- Notebook Answer Key
- Paper Cup
- Plastic Spoon
- Ruler
- Safety Gloves
- Scissors
- Shoe Box Size Plastic Bin
- Small Rocks
- Soil
- Spanish Handout: Problem Scenarios
- Spanish Interactive Student Notebooks
- Sponge
- Vinyl Apron
- Water

Links

- Paws and Effect (video): <https://pbskids.org/>
- Waste Not, Want Not (simulation): <https://nj.pbslearningmedia.org/resource/kids-lab-video-martha-speaks-waste-not-pdf/waste-not-want-not-pdf-martha-speaks/>

Additional Reading

The following books offer opportunities to extend the content in this lesson.

Energy Island by Allan Drummond. (New York, NY: Farrar, Straus, and Giroux, Inc., 2015)

On this Danish island, the citizens took their energy use into their own hands and became almost completely independent on energy from the rest of the world. This book provides both a fascinating story and the scientific explanations behind their actions.

Renewable Energy, Discover the Fuel of the Future With 20 Projects by Joshua Sneideman and Erin Twamley. Illustrations by Heather Jane Brinesh. (White River Junction, VT: Nomad Press, 2016)

As people develop more resources for renewable energy, the future of energy seems more and more in the hands of this technology. Learn about different types of renewable energy, and even try experiments with some forms of energy, in this engaging experiment.

Green Homes (Young Architect) by Saranne Taylor. (New York, NY: Crabtree Publishing Company, 2014)

How can we use renewable energy in our own lives? One simple way is by making our homes greener, and in this book in the Young Architect series, readers will learn about solar panels, recycling, and many more ways to make their homes greener.

21st Century Life and Careers

CAEP.9.2.8.B.3 Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

Interdisciplinary Connections

LA.RI.5.1 Quote accurately from a text and make relevant connections when explaining what the text says explicitly and when drawing inferences from the text.

LA.RI.5.2 Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.

LA.RI.5.3 Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.

LA.RI.5.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.

LA.RI.5.5 Compare and contrast the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in two or more texts.

LA.RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.

MA.5.MD.B Represent and interpret data.

MA.5.G.A.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

LA.W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.

LA.SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations

when appropriate to enhance the development of main ideas or themes.

SCI.3-5-ETS1-2

Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

SCI.3-5-ETS1-1

Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

TECH.8.1.5

Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

TECH.8.1.5.A.1

Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.

TECH.8.1.5.A.3

Use a graphic organizer to organize information about problem or issue.

TECH.8.1.5.A.4

Graph data using a spreadsheet, analyze and produce a report that explains the analysis of the data.

TECH.8.1.5.D.CS3

Exhibit leadership for digital citizenship.