Unit 1- Earth: Land and Changing Shape

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OpenSci Ed

Lesson 1: Anchoring Phenomenon- How is land changing shape?

- Phenomenon- Land is changing shape without animals and people moving it.
    - Watch a news story and make observations about land changing shape.
    - Develop a group and class picture (model) to explain how the land might be changing shape.
    - Determine who land changes affect and develop ways we could investigate how land changes shape.
    - Prepare to make observations about land changing shape around us.

Lesson 2: Investigation- How can we develop a model to test how wind and water might move the land in our community?

- Phenomenon- Land in our community seems to be moving without animals or people moving it.
    - Share examples of land moving in our community.
    - Make a 3D land change bin model and plan an investigation.

Lesson 3: Investigation- How could wind and water change the land in our models?

- Phenomenon- Land models may change by wind or water.
    - Test whether and how wind and water move different types of land using our land change bin models.
    - Identify patterns in how different types of land were moved by wind and water.

Lesson 4: Investigation- How do both wind and water move land near our school?

- Phenomenon- Wind and water may change the land around our school.
    - Test how wind and water move different types of land around our schoolyard.
    - Find patterns in how different types of land were moved by wind and water.
    - Read an article to learn about how land changing is impacting other communities.

Lesson 5: Investigation- How might wind and water change the shape of rocks and rocky land?

- Phenomenon-Rocks seem to change shape, size, and place over time.
    - Test how wind and water affect the shape of rocks and rocky land by using rocks we found in

our community.

- Read a book to observe rocks over time to observe any changes made by wind and water.
- Look for patterns in how rocks or rocky land might be affected by wind and water.

Lesson 6: Putting Pieces Together- How much time does it take for rocky land to change shape?

- Phenomenon- Images of land over different periods of time seem to have different amounts of shape change.
    - Look at images of land and find changes to shape, size, or lines as evidence.
    - Describe possible changes to land caused by either wind or water.
    - Explain if the change was quick or slow.

Lesson 7: Investigation- How can we define our community problem and develop a model to test our solutions?

- Phenomenon- There are many potential Community Example land change problems that we might be able to solve.
    - Identify the problem that we want to solve with engineering.
    - Develop a model to test our design solutions. Test the model to determine if it functions like the real-world problem.
    - Draft a design solution.

Lesson 8: Investigation- What ideas from existing land change solutions can we apply to our designs?

- Phenomenon- Existing land change solutions might give us ideas for our own solutions.
    - Share our existing community design solutions for land changing shape.
    - Read an infographic about existing land change solutions for wind and/or water.
    - Discuss which materials can be used to build these solutions.
    - Develop a design solution drawing for our community's land change problem.

Lesson 9: Investigation- How can we determine if our design solutions to the community land change problem are effective?

- Phenomenon- We have many design solutions that might be effective, and we need to test them.
    - Read a book about people who engineer, build, test, and communicate ideas about design solutions.
    - Build and test model solutions to determine if they are effective at limiting land from changing shape.
    - Look for patterns in how the shape of the solution relates to how well it works.

Essential Questions

- What are the effects of wind & water on the land?
- What are landforms that help prevent wind and water erosion?
- How can the effects of wind and water erosion be controlled or reduced?
- What types of events occur in cycles?
- What types of events on Earth happen very quickly or very slowly?

- How do wind and water change the shape of land and what can we do about it?

Big Ideas

Land is on the move, and people and animals aren't moving it! At the beginning of this unit, students engage with a puzzling news story about land changing shape, and people and animals don't seem to be causing these changes. Students try to figure out how this land could be changing shape, and they inquire with their communities and families to find examples of this happening around them. Through a series of investigations and community examples, students learn about how wind and water can change the shape of the land over various timescales. Once students have figured out how the land is changing shape, students work to solve a land change problem in their communities. Students act as engineers to design and test a solution. Students compare designs and determine what solution would be most effective to solve their community land change problem to become land change experts.

Cross-Curricular Integration

Integration Area: Language Arts

RI.2.1: Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (2-ESS1-1)

RI.2.3: Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-ESS1-1)

W.2.6: With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (2-ESS1-1)

W.2.7: Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-ESS1-1)

W.2.8: Recall information from experiences or gather information from provided sources to answer a question. (2-ESS1-1)

SL.2.2 Recount or describe key ideas or details from a text read aloud or information presented orally or through other media. (2-ESS1-1)

Activity:

Students will be able to ask and answer questions to better understand the water cycle and weathre. Students will be able to make predictions and add a nonfiction text feature to their pictures.

Integration Area: Mathematics

MP.2: Reason abstractly and quantitatively. (2-ESS1-1)
MP.4: Model with mathematics. (2-ESS1-1)
2.NBT.A: Understand place value. (2-ESS1-1)

Student Learning Standards

Mathematics

2.NBT.A.3. Read and write numbers to 1000 using base-ten numerals, number names, and expanded form. Science example: Students write about a lake that is 550 feet deep, a river that is 687 miles long, a forest that began growing about 200 years ago, and soon.

MD.B.5. Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem. Science example: A gulley is 17 inches deep before a rainstorm and 42 inches deep after a rainstorm. How much deeper did it get during the rainstorm?

NBT.A.11 Understand place value. Science example: As part of comprehending media to identify the varying timescales on which Earth events can occur, students understand that a period of thousands of years is much longer than a period of hundreds of years, which is in turn much longer than a period of tens of years.

Science and Engineering Practices

Engineering Design:

• K-2-ETS1-1 Ask questions, make observations, and gather information about a situation people want to change (e.g., climate change) to define a simple problem that can be solved through the development of a new

or improved object or tool.

- 2-ETS1.A: Defining and Delimiting Engineering Problems:
    - A situation that people want to change or create can be approached as a problem to be solved through engineering.
    - Ask questions, make observations, and gather information about a situation people want to change (e.g., climate change) to define a simple problem that can be solved through the development of a new or improved object or tool.
    - Before beginning to design a solution, it is important to clearly understand the problem.

• K-2-ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

- Developing Possible Solutions:
    - 2-ETS1.B: Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.

•K-2-ETS1-3 Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

- Optimizing the Design Solution:
    - 2-ETS1.C: Because there is always more than one possible solution to a problem, it is useful to compare and test designs.

Asking Questions and Defining Problems:

- Ask questions based on observations to find more information about the natural and/or designed world(s).
- Ask and/or identify questions that can be answered by an investigation.
- Define a simple problem that can be solved through the development of a new or improved object or tool.

Developing and Using Models:

- Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s).
- Develop a simple model based on evidence to represent a proposed object or tool.

Planning and Carrying Out Investigations:

- With guidance, plan and conduct an investigation in collaboration with peers (for K).
- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.
- Evaluate different ways of observing and/or measuring a phenomenon to determine which way can answer a question.
- Make observations (firsthand or from media) and/or measurements to collect data that can be used to make comparisons.
- Make observations (firsthand or from media) and/or measurements of a proposed object or tool or

solution to determine if it solves a problem or meets a goal.
- Make predictions based on prior experiences.

Analyzing and Interpreting Data:

- Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems.
- Compare predictions (based on prior experiences) to what occurred (observable events).

Constructing Explanations and Designing Solutions:

- Use information from observations (firsthand and from media) to construct an evidence-based account for natural phenomena.
- Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem.

Engaging in Argument from Evidence:

- Identify arguments that are supported by evidence.
- Distinguish between explanations that account for all gathered evidence and those that do not.
- Make a claim about the effectiveness of an object, tool, or solution that is supported by relevant evidence.

Obtaining, Evaluating, and Communicating Information:

- Describe how specific images (e.g., a diagram showing how a machine works) support a scientific or engineering idea.
- Communicate information or design ideas and/or solutions with others in oral and/or written forms using models, drawings, writing, or numbers that provide detail about scientific ideas, practices, and/or design ideas.

CSDT Technology Integration

8.1.2.DA.1: Collect and present data, including climate change data, in various visual formats.

8.1.2.DA.4: Make predictions based on data using charts or graphs.

Activity:

Mystery Science lesson How Can You Stop a Landslide? This is a lab. The students will complete a lab using the guided video process to explore the mystery.

Enduring Understanding

Next Generation Science Standards

Earth's Place in the Universe:

2-ESS1-1: Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

- The History of Planet Earth:
    - 2-ESS1.C- Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe.

Earth's Systems:

2-ESS2-1: Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.

- Earth Materials and Systems
    - 2-ESS2.A-Wind and water can change the shape of the land.

2-ESS2-2: Develop a model to represent the shapes of land and bodies of water in an area.

- Plate Tectonics and Large-Scale System
    - 2-ESS2.B:Maps show where things are located. One can map the shapes and kinds of land and water in any area.

Focus Areas

Knowledge

- What the effects of wind and water are on the land.
- How wind erosion creates land forms
- How water erosion creates land forms
- Animals use land forms as homes.
- Be able to describe events occur in cycles, such as day and night.
- Identify events have a beginning and an end, like a volcanic eruption.
- Explain the impact of events can happen very quickly.
- Describe events can happen very slowly over a time period much longer than anyone can observe.

Skills

- Explain how wind shapes the land.
- Explain how water shapes the land.
- Describe how wind erosion is reduced
- Describe how water erosion is reduced.
- Describe what a cycle is and give examples.

- Describe events that have a beginning and an end.
- Describe events that happen quickly.
- Describe events that happen very slowly.

Understandings

- Develop a model to represent the shapes and kinds of land and bodies of water in an area.
- Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.
- Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

Climate Change

Social Studies: Cross-Curricular

6.1.2.GeoPP.1: Explain the different physical and human characteristics that might make a location a good place to live (e.g., landforms, climate and weather, resource availability).

- Activity: In this lesson, students explore the phenomenon of flash floods and create an explanation of why these severe weather events are more or less likely in different regions. They specifically attempt to locate and explain a unique region in Texas known as Flash Flood Alley. In the activity, Find Flash Flood Alley, students develop a map to document how land and water interact across the state. Students then use that map to explain how different shapes and kinds of land increase or decrease the chances of rainfall causing a flash flood.

Resources

Primary Resources

- Mystery Science
- OpenSci Ed

Scientific Inquiry Core

- How can you stop a landslide? Lab
- If you floated down a river, where would you end up? Lab
- Why is there sand at the beach? Lab
- What’s strong enough to make a canyon? Lab
- Water Cycle Activity

Supplemental

- BrainPop Jr. Water Cycle Video, Land Changes Video

- Bodies of Water Interactive Notebook
- Magic School Bus “Wet All Over”
- Rock Cycle Activity
- Erosion Activity