

Unit 7: Earth Processes (Earth and Human Activity)

Content Area: **Science**
Course(s):
Time Period: **Generic Time Period**
Length: **3 weeks**
Status: **Published**

Essential Questions

Specific NGSS: 4-ESS2-2, 4-ESS3-2, 3-5-ETS1-2, and 3-5-ETS1-3

Essential Unit Question:

- Is it possible to engineer ways to protect humans from natural Earth?

Guiding Questions:

- What can maps tell us about the features of the world?
- In what ways can the impact of natural Earth processes on humans be reduced?

Objectives:

- SWBAT analyze and interpret data from maps to describe patterns of Earth's features.
- SWBAT generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.
- SWBAT 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.
- SWBAT plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Concepts that will be taught...

1. Patterns can be used as evidence to support an explanation.
2. Maps can help locate the different land and water features of Earth.
3. The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns.
4. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans.
5. Major mountain chains form inside continents or near their edges.
6. Cause-and-effect relationships are routinely identified, tested, and used to explain change.
7. Engineers improve existing technologies or develop new ones to increase benefits, decrease known risks, and meet societal demands.

8. A variety of hazards result from natural processes (e.g., earthquakes, floods, tsunamis, volcanic eruptions).
9. Humans cannot eliminate the hazards, but they can take steps to reduce their impacts.
10. Research on a problem should be carried out before beginning to design a solution.
11. Testing a solution involves investigating how well it performs under a range of likely conditions.
12. At whatever stage, communicating with peers about proposed solutions to a problem is an important part of the design process, and shared ideas can lead to improved designs.
13. Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved.
14. Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.

Disciplinary Core Ideas

Natural Resources

Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not.

Natural Hazards

A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts.

Designing Solutions to Engineering Problems

Testing a solution involves investigating how well it performs under a range of likely conditions.

SCI.4-ESS3

Earth and Human Activity

LA.4.W.4.7

Conduct short research projects that build knowledge through investigation of different aspects of a topic.

LA.4.W.4.8

Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.

MA.4.4.OA.A.1	Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.
LA.4.W.4.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
CAEP.9.2.4.A.2	Identify various life roles and civic and work - related activities in the school, home, and community.
SCI.4-ESS3-1	Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.
LA.4.RI.4.1	Refer to details and examples in a text and make relevant connections when explaining what the text says explicitly and when drawing inferences from the text.
CAEP.9.2.4.A.4	Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.
SCI.4-ESS3-2	Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

Learning Activities

- Students analyze and interpret data from maps to describe patterns of Earth's features.
- Students can use topographic maps of Earth's land and ocean floor in order to locate features such as mountains, mountain ranges, deep ocean trenches, and other ocean floor structures. As students analyze and interpret these types of maps, they begin to notice patterns in the types of structures and where these structures are found.
- Students learn that major mountain chains often form along or near the edge of continents.
- Once students locate continental boundaries, a further analysis of data can show students that there is a noticeable pattern of earth events, including volcanoes and earthquakes, which occur along these boundaries.
- Students also learn that engineers develop or improve technologies to solve societal problems. A variety of hazards result from natural processes (e.g. earthquakes, floods, tsunamis, volcanic eruptions). Although we cannot eliminate the hazards, we can take steps to reduce their impacts. Students must have the opportunity to engage in the engineering design process in order to generate and compare multiple solutions that reduce the impacts of natural Earth processes on humans.
 - This process should include the following steps:
 - Students brainstorm possible problems that Earth processes can cause for humans. (Earth processes should be limited to earthquakes, volcanic eruptions, tsunamis, and floods.)
 - Either as a class or in small groups, have students select one problem (such as the effects of volcanic eruptions on humans) to research.
 - Small groups conduct research to determine possible solutions (such as consistent monitoring of volcanic activity and the use of early warning systems) that reduce the impacts of the

chosen Earth process on humans.

- As a class, determine criteria and possible constraints on the design solutions. Criteria might include: saving lives and/or reducing property loss.
 - Small groups investigate how well the solutions perform under a range of likely conditions. This may involve additional research and analysis of available data or planning and conducting investigations to produce data that will serve as the basis for evidence. During this process, students should plan and carry out fair tests in which variables are controlled and failure points are considered in order to identify elements of the design solution that do and do not meet criteria.
 - Students compare the solutions based on how well they meet criteria and constraints, using data as evidence to support their thinking. At every stage, communicating with peers is an important part of the design process, because shared ideas can lead to improved designs. Students should routinely identify and test cause-and-effect relationships and use these relationships to explain the changes that they observe as they test design solutions.
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- **Engineering Connection:** Students are expected to research a problem, generate and compare possible design solutions, and test the design solutions to determine how well each performs under a range of likely conditions. Using data as evidence, students identify elements of each design that need improvement and determine which design solution best solves the problem, given the criteria and the constraints. This process is outlined in greater detail in the previous section.

Mystery Science

Still in development

Assessments

Science Textbook

- Chapter Review
- Chapter Test

Mystery Science

- Individual Mystery Assessments
- Summative Assessment
- Informal Observation during explorations & activities

Teacher-Made Assessments

- Quizzes
- Tests
- Classwork
- Homework
- Projects

Materials & Resources

www.mysteryscience.com

topographic maps

virtual maps showing continents

Accommodations & Modifications

- Large print textbooks
- Additional time for assignments
- Review of directions
- Have student restate information
- Provision of notes or outlines
- Concrete examples
- Adaptive writing utensils
- Support auditory presentations with visuals
- Weekly home-school communication tools (notebook, daily log, phone calls or email messages)
- Space for movement or breaks
- Extra visual and verbal cues and prompts
- Books on tape
- Graphic organizers
- Quiet corner or room to calm down and relax when anxious
- Preferential seating
- Alteration of the classroom arrangement
- Reduction of distractions
- Answers to be dictated
- Hands-on activities
- Use of Manipulatives
- Follow a routine/schedule
- Alternate quiet and active time
- Teach time management skills
- Rest breaks
- Verbal and visual cues regarding directions and staying on task
- Daily check-in special education teacher
- Visual daily schedule

- Varied reinforcement procedures
- Immediate feedback
- Personalized examples