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| Subject: Science | Grade: 7 | Unit ID:  |
| Unit 1: Earth’s Changing Surface | Length: 8 weeks |
| Stage 1: Desired Results |
| Standards:**Content Standards:****7.MS-ESS2-2.****Pearson Grade 7 Textbook: Ch 1: Weathering and Soil and Ch 2: Earthquakes**Construct an explanation based on evidence for how Earth’s surface has changed over scales that range from local to global in size. Clarification Statements: • Examples of processes occurring over large, global spatial scales include plate motion, formation of mountains and ocean basins, and ice ages. • Examples of changes occurring over small, local spatial scales include earthquakes and seasonal weathering and erosion. **7.MS-ESS3-2.****Pearson Grade 7 Textbook: Ch 2: Earthquakes and ch 3: Volcanoes** Obtain and communicate information on how data from past geologic events are analyzed for patterns and used to forecast the location and likelihood of future catastrophic events. Clarification Statements: • Geologic events include earthquakes, volcanic eruptions, floods, and landslides. • Examples of data typically analyzed can include the locations, magnitudes, and frequencies of the natural hazards. State Assessment Boundary: • Active analysis of data or forecasting is not expected in state assessment. **7.MS-ESS2-4.****Pearson Grade 7 Textbook: Ch 5: Water and Ch 10: Balance within an Ecosystem** Develop a model to explain how the energy of the Sun and Earth’s gravity drive the cycling of water, including changes of state, as it moves through multiple pathways in Earth’s hydrosphere. Clarification Statement: • Examples of models can be conceptual or physical. State Assessment Boundary: • A quantitative understanding of the latent heats of vaporization and fusion is not expected in state assessment.***Note: Optional Standard to include. 7.MS-ESS3-4. Is also covered in Unit 5. Lesson suggestions will be in orange for this standard.*****7.MS-ESS3-4.** Construct an argument supported by evidence that human activities and technologies can mitigate the impact of increases in human population and per capita consumption of natural resources on the environment[Clarification Statement: Arguments should be based on examining historical data such as population graphs, natural resource distribution maps, and water quality studies over time. Examples of negative impacts can include changes to the amount and quality of natural resources such as water, mineral, and energy supplies.].**7.MS-ETS3-3(MA).** **/Pearson Grade 7 Textbook: STC Skills Handbook: Part 1 and 2**  Research and communicate information about how transportation systems are designed to move people and goods using a variety of vehicles and devices. Identify and describe subsystems of a transportation vehicle, including structural, propulsion, guidance, suspension, and control subsystems. Clarification Statements: • Examples of design elements include vehicle shape to maximize cargo or passenger capacity, terminals, travel lanes, and communications/controls. • Examples of vehicles can include a car, sailboat, and small airplane. **7.MS-ETS3-4(MA). /Pearson Grade 7 Textbook: STC Skills Handbook: Part 1 and 2**  Show how the components of a structural system work together to serve a structural function. Provide examples of physical structures and relate their design to their intended use. Clarification Statements: • Examples of components of a structural system could include foundation, decking, wall, and roofing. • Explanations of function should include identification of live vs. dead loads and forces of tension, torsion, compression, and shear. • Examples of uses include carrying loads and forces across a span (such as a bridge), providing livable space (such as a house or office building), and providing specific environmental conditions (such as a greenhouse or cold storage). State Assessment Boundary: • Calculations of magnitude or direction of loads or forces are not expected in state assessment. **7.MS-ETS3-5(MA). /Pearson Grade 7 Textbook: STC Skills Handbook: Part 1 and 2**  Use the concept of systems engineering to model inputs, processes, outputs, and feedback among components of a transportation, structural, or communication system.**Practice Standards/Concepts & Skills:**1. Asking questions (for science) and defining problems (for engineering). 2. Developing and using models. 3. Planning and carrying out investigations. 4. Analyzing and interpreting data. 5. Using mathematics and computational thinking. 6. Constructing explanations (for science) and designing solutions (for engineering). 7. Engaging in argument from evidence. 8. Obtaining, evaluating, and communicating information |
| Overview:Earth’s surface has changed over scales that range from microscopic to global in size and operate at times ranging from fractions of a second to billions of years. Agents of change include water (water cycle), wind, and ice. Students will understand the causes of geologic catastrophic events (earthquakes, volcanic eruptions, tsunamis, floods, landslides and sinkholes)**FOCUS LANGUAGE GOALS:*** Students will be able to *write an explanation* of how Earth’s surface has changed overtime
* Students will be able to *organize data and observations* to make a prediction on future catastrophic events.
* Students will be able to give *evidence to support their claims* in final product
* Students will be able to *discuss ideas* with others to plan and *carry out investigations*
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| Understandings* The planet’s systems interact over scales that range from local to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth’s history and will determine its future.
* Global movements of water and its changes in state are propelled by sunlight and gravity.
* Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events.
 | Essential QuestionsHow has Earth’s surface changed in the past and continues to change today?*Students will continue to consider...** What evidence supports that the Earth’s surface has changed?
* How do different agents of change shape the Earth’s surface?
* What causes the movement of water throughout the hydrosphere?
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| **Knowledge:** **Content:*****Students will know…**** Earth’s surface has changed over scales that range from microscopic to global in size and operate at times ranging from fractions of a second to billions of years
* Components of the water cycle and the driving forces behind it
* Causes of geologic catastrophic events (earthquakes, volcanic eruptions, tsunamis, floods, landslides and sinkholes)

**Language:**Students will become familiar with a variety of different text types in the four skills (reading, writing, listening and speaking) for such purposes as:* Describing how Earth’s surface has changed over time and will continue to change
* Classifying the different components of the water cycle and the driving forces behind it
* Cause and effect of geologic catastrophic events

Vocabulary: [(see definition of CCSS tiered vocabulary)](https://drive.google.com/open?id=0B1oO5U3iU008Q1ZGaEpFeFpLVnc)

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| **Tier 1** | **Tier 3** |  |
| EarthquakeVolcanoMagmaLava**Tier 2**AbrasionWeatheringStressTensionCompressionHot spotEruption | ErosionMechanical weatheringChemical weatheringFrost/ice wedgingOxidationShearingNormal faultReverse faultStrike-slip fault | EpicenterP-waveS-waveSurface waveFocusEpicenterDivergent BoundaryTransform BoundaryConvergent Boundary |

 | **Skills**: **Content:*****Students will be skilled at…*** * Developing a model to explain how the energy of the sun and Earth’s gravity drive the cycling of water.
* Analyzing evidence of surface changes and constructing an explanation for how Earth’s surface has changed and will continue to change
* Identifying, analyzing, and communicating patterns from past geologic events to forecast the location and likelihood of future catastrophic events

**Language:*** I can develop a model to show how energy of the sun and Earth’s gravity drive the cycling of water using cause and effect language.
* I can identify and analyze evidence that supports that Earth’s surface has changed over time and communicate my findings using technical language
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| Stage 2: Assessments |
| Assessments administered in this unit* Traditional computer based or paper and pencil teacher generated assessment
* Common district assessment questions (pending)
* Common district Pearson Quick Lab: [Where are volcanoes found on Earth?](https://drive.google.com/drive/folders/1NTCdBDrJA_IYeHhebOoJQ729cEV4TW1m) (link to folder in Middle School Science Team Drive)

Suggestions for Performance Assessment/Activity:**Local to Global Changes**National Parks Project: Describe and give examples of ways in which the Earth’s surface is built up and torn down by natural processes (Cameron and Fuller)* + Students choose their National Park ([Introductory Page Suggestion](https://docs.google.com/document/d/1DfaE-aL7yx_mvytEhllZPuuLHWudabKrsKENvY2T1Mg/edit))
	+ As you teach each content area, have the students do research on their national park ([Graphic Organizer](https://docs.google.com/document/d/1vgzZ_Ivf2WzazmZP5z6aqC19CzWt9Wh-ZNoyx7lOl-g/edit))
	+ In the end students can choose a way to display what they’ve learned. Suggested method: 3D Model
	+ [Exploring the Hidden Worlds of National Parks- Google Virtual Reality (VR) Field Trip](https://about.google/intl/en/main/cardboard-vr-explores-national-parks/) (Fuller)
	+ Suggested Resources: [National Park Service index](https://www.nps.gov/index.htm)

**Natural Disasters and Human Impact:** Suggestion: Research, design and construct a model that demonstrates human impact on natural disasters and phenomena. * Students should research how human activity has changed the occurrence of natural disasters on Earth.

Examples - * National Geographic Article: [Fracking increases earthquake activity and pollutes water sources which later causes acid rain.](https://news.nationalgeographic.com/news/energy/2013/07/130711-fracking-wastewater-injection-earthquakes/)

NEWSELA Article: [Pumping water for thirsty crops may cause some California earthquakes](https://newsela.com/read/groundwater-earthquakes/id/4076)* Human MitigationRubric link - this is an example of what could be used for a [baseline rubric](https://docs.google.com/document/d/1nDIKZwUMtO5XsQhh-iLnC_H97fFHbo1-73FtHB7wDcI/edit).
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| Stage 3: Learning Plan |
| Summary of Key Learning Events and Instructions:Engage (potential anchoring phenomenon) students by presenting an initial lesson on changes that occur on local scales and timeframes (**7.MS-ESS2-2)*** Potential Hook: Introduce with video of a natural disaster (earthquake, tsunami, volcanic eruption, sinkhole) What is happening in the video? How is the land or environment changed?

Resources for Lesson (pick one)* + National Geographic Article on [human impact on earthquakes](http://news.nationalgeographic.com/2016/03/160328-earthquakes-map-risks-usgs-science/)
	+ YouTube Video: [California Sinkholes](https://www.youtube.com/watch?v=AX0W76vwzN0)

**Spatial Scales with relation to the change of Earth’s surface over time.*** Engage students to ensure the ability to differentiate between global scales and local scales along with an awareness that events occur rapidly in some cases and extraordinarily slowly in other cases.
	+ Global (formation of mountains and ocean basin, ice ages)
	+ local (earthquakes and seasonal weathering and erosion)
	+ Suggested activity: Sorting Activity

**Small Scale Changes to Earth’s Surface*** Challenge students to identify examples of the different processes of weathering, erosion, and deposition
	+ Weathering (both chemical and mechanical)
	+ Erosion, agents of erosion, and examples of landforms/features created by erosion
	+ Deposition and examples of lanforms/features created by deposition
	+ Throughout this, if you are doing the National Parks project, students should take a day to research each type of small scale change in their National Park

**Global movements of water and its changes in form are propelled by sunlight and gravity** * Ensure student understanding of the water cycle, its driving forces, and the processes by which water moves throughout Earth’s hydrosphere. (7.MS-ESS2-4)
	+ The sun’s impact on water and water’s movement through the Earth
	+ Gravity’s pull on groundwater creates watersheds
	+ Link the movement of water to the creation of various landforms through weathering, erosion, and deposition

SuggestedResources for Lesson * + [Exploring the Water Cycle](https://pmm.nasa.gov/education/lesson-plans/exploring-water-cycle)
	+ <http://has.concord.org/index.html#interactives>

**Large Scale Changes to Earth’s Surface** * Challenge students to identify global changes created by plate tectonics and natural disasters (7.MS-ESS2-2)
	+ Identify the types of plate boundaries and the global landforms/features that are created at each one
		- Focusing on mountain building and the process of ocean creation
	+ Identify landforms/features created by different types of natural disasters

Suggested tasks:* + - Task Cards: [Modeling Plate Tectonics](https://docs.google.com/document/d/10vDv0col016AZ-_0qPLbXgtTnAeLp-oOSkhtEh8VpTE/edit)
		- link large scale and small scale changes: Have students “scale” various pictures of landforms/features. Have students debate/discuss why they placed items where they did, defending their position on it being a smaller scale versus a larger scale change.
		- Have students do research on global changes that impact their National Park (if you are doing the National Park Project)

**Natural Disasters: Floods, Sinkholes and Landslides (Link to Weathering / Erosion)** * Help students discover the causes, dangers, and relative frequency of floods, sinkholes, and landslides, along with the role of weathering and erosion in these catastrophes. (7.MS-ESS3-2)
	+ Mechanical and Chemical Weathering
	+ Examples / identification of types of weathering
	+ Removal and transport of sediment through erosional processes (i.e. wind, water, waves, glaciers, and gravity)
	+ Formation of rock layers through compaction and cementation
	+ Erosion’s affects on the landscape
		- Resources for Lesson
			* Pearson Textbook: Chapter 1: Weathering and Soil
			* [CK12 - Weathering & Erosion Practice](http://www.ck12.org/assessment/ui/browse/practice/earth-science/?topic=SCI.ESC.100&backUrl=http://www.ck12.org/student/) see Earth’s Surface Processes → Weathering and Erosion
			* TEDed Video : [How North America got its shape](http://ed.ted.com/lessons/how-north-america-got-its-shape-peter-j-haproff)

**Natural Disasters: Volcanoes / Earthquakes/Tsunamis*** Help students to discover the causes, dangers, and relative frequency of volcanoes, earthquakes, and tsunamis along with the role of plate tectonics in these catastrophes. (7.MS-ESS3-2)
	+ Students can map locations of earthquakes and volcanoes
		- Suggested Resources:
			* Pearson Textbook: Chapter 2 Earthquakes
			* TEDed Video:[Tsunami explanation](http://ed.ted.com/lessons/how-tsunamis-work-alex-gendler)
			* Intro to volcanoes with F. Gregorio - <https://www.youtube.com/watch?v=Be7o6BYVOzA>
			* Where are they and why? Ex - Ring of Fire
			* Intro to earthquakes with Frank Gregorio - <https://www.youtube.com/watch?v=JrBaiPN6AW8>
			* Where do they occur and why? Earthquake tracker - [Iris Seismic Tracker](http://ds.iris.edu/seismon/)
			* National Geographic “[Earthquakes 101](https://video.nationalgeographic.com/video/animals-source/101-videos/0000016c-0195-dbf3-ab7f-839744690000?source=relatedvideo)”
			* Designing for Disaster Activity- [Teach Engineering](http://content.teachengineering.org/content/csm_/activities/csm_designingfordisaster/csm_designingfordisaster_activity1_worksheet_v3_tedl_dwc.pdf)
			* Pearson Quick Lab: [Where are volcanoes found on Earth?](https://drive.google.com/drive/folders/1NTCdBDrJA_IYeHhebOoJQ729cEV4TW1m)
			* [Earthquake Mapping Task Card](https://docs.google.com/document/d/1xiXWuV_5pKanOMAITXLnWZdi6w6AaSxruh9iiIeV1r0/edit)

**Mitigation of Human Impacts on the Environment (7.MS.-ESS3-4)*** Drive students to research ways in which humans negatively affect their environment and thereby increase the prevalence of natural disasters. After gaining this information, have students research ways in which humans are attempting to mitigate their negative influences.
	+ Resources for Lesson
	+ [BBC Fracking Article](http://www.bbc.com/news/science-environment-39032748)
	+ [pch](http://www.yellowmaps.com/usgs/topomaps/drg24/30p/o36121b6.jpg)
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| Instructional Notes:**Sociocultural implications*** The tier 2 vocabulary words in this unit can be misleading and cause confusion with many students. Pre-teaching or calling attention to these words and how they may be used in everyday language vs. science class may be helpful
* Utilize the diverse community of students within the classroom to share experiences of catastrophic events and be sensitive to those experiences as well (i.e. Port Au Prince, Haiti earthquake 2010, Hurricane Maria, Puerto Rico, 2017 etc.)

**Connections to Prior Knowledge*** Sedimentary rock layers serve as a timeline of past geologic events
* Plate tectonics
* Sea floor spreading
* Wegener’s Theory of Continental Drift and associated evidence (fossil record, continent borders, mountain ranges, etc.)
* Water cycle
* Forms of energy

**Connections to Future Knowledge** (Source: MA STE 2016 Frameworks, [Appendix III Disciplinary Core Idea Progression Matrix](http://www.doe.mass.edu/frameworks/scitech/2016-04/AppendixIII.pdf))* Feedback effects exist within and among Earth’s systems
* Radioactive decay and residual heat of formation within Earth’s interior contribute to thermal convection in the mantle.
* The planet’s dynamics are greatly influenced by water’s unique chemical and physical properties.

**Common Misconceptions*** [Common Misconceptions about Weathering, Erosion, Volcanoes, and Earthquakes](http://beyondpenguins.ehe.osu.edu/issue/earths-changing-surface/common-misconceptions-about-weathering-erosion-volcanoes-and-earthquakes)
* The water cycle is an immediate process; water vapor disappears
* There is a fluctuating amount of water on earth
* Human actions do not impact geologic catastrophic events
* Geologic catastrophic events can not be predicted

**Instructional Strategies*** Actively monitor for understanding of Earth’s changing surface concepts.
* Utilize frequent check-ins/checkpoints with students to encourage good documentation in the notebook/notes. Students should be using specific content vocabulary and technical writing
* Support students in checking and refining their writing of their process. Actively encourage revision of their writing so that they develop a clear technical description of their process.
* Consider peer review. Other students should be able to read their process and be able to follow it. Not every student will have the same process as it depends on how they go about their design and testing.
* Allow students may make minor adjustments and/or retest their designs
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| Resources:**Texts:*** Pearson Textbook: Chapters 1-3 (sections within each chapter)

**Websites:*** [Teacher-Friendly Guide to the Earth Science of the Northeastern U.S.](http://geology.teacherfriendlyguide.org/index.php/over-ne)

CDSM Curriculum Documents : [CDSM G7 U5 Earth's Ever-changing Surface](https://docs.google.com/document/d/1xB2neri_IUHfEVxPJKQUv3zMaCGQPoMFmZ8GUFklZfg/edit)OUSD NGSS-aligned Curriculum Scope and Sequence: [Grade 7 Unit 4: Natural Processes and Human Activities](https://sites.google.com/ousd.k12.ca.us/science/secondary/curriculum) |