

TIME—how time has affected/influenced the major systems in our Earth

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This lesson plan is designed to be “taught” at the end of the school year—as a culmination of what we have taught and learned throughout the year. I predict this lesson to take 2 days, and a 3rd day for presentation; although it could perhaps be completed in 2 days.

I. Student knowledge needed to complete this lesson/activity:

- *ability to follow written and verbal instructions
- *completed previous lessons in 8th grade EarthComm curriculum
- *ability to work in cooperative groups
- *understanding of the CER (claim, evidence, reasoning) format
- *inquisitiveness for new learning and synthesizing prior learning

II. Vocabulary (a “bare bones” list—familiarity needed w/Earth Science vocab)

- Aquifer—porous rock which is permeable to conduct ground water and to provide an adequate supply of water from wells
- Climate—the long-term average of weather in a particular region of the Earth, over years, decades, or centuries
- Core—the solid, innermost part of the Earth, consisting mostly of iron
- Crust—the outermost layer of the Earth
- Earthquake—a sudden motion or shaking in the Earth
- Electric power—power associated with the generation and transmission of electricity
- Erosion—the wearing away of soil or rock by weathering, mass wasting, and the action of streams, glaciers, wind, waves, and underground water
- Fossil fuels—fuel derived from materials (ex. Coal, petroleum, and natural gas) that were generated from fossil organic matter, and stored in the Earth for geologically long times
- Glacier—a large mass of ice on the Earth’s surface
- Ground water—water that collects beneath the surface of the Earth, some of which feeds wells springs, etc.
- Hazard—a natural event, like an earthquake, that has potential to do damage or harm
- Hot spot—a fixed source of abundant rising magma that forms a volcanic center that has persisted for tens of millions of years
- Lava—magma that reaches the Earth’s surface from a volcano or fissure
- Magma—molten rock material under the Earth’s crust
- Mantle—the layer of the Earth below the crust and above the core
- Nonrenewable energy—an energy source that is powered by materials that exist in the Earth, and are not replaced nearly as fast as they are consumed
- Ocean current—a predominantly horizontal movement of ocean water
- Permeability—the ease with which a fluid can be forced to flow through a porous material
- Physical weathering—process of weathering by which rock is broken down by physical forces, including gravity, water, iced, wind and human actions
- Plate tectonics—the study of the movement and interactions of the Earth’s plates
- Precipitation—any form of water that condenses from the atmosphere and passes to the surface of the Earth, such as rain, snow, sleet, etc.
- Renewable energy source—an energy source that is powered by solar radiation at the present time rather than by fuels stored in the Earth
- Reservoir—a natural or artificial lake used as storage place for water
- Sediment—solid fragments or particles that are transported and deposited by wind, water, and ice
- Solar energy—energy from the Sun available to be absorbed by all of Earth’s systems

- Surface runoff—the part of the water that travels over the ground surface without passing beneath the surface
- Water power (hydroelectric power)—water used as a source of electricity
- Watershed—the land area from which rainfall collects to reach a given point along a river
- Weather—the atmospheric conditions at a particular time, day to day.
- Weathering—the destructive process by which rocks are changed on exposure to various agents at, or near the Earth’s surface
- Wind power—energy derived from the wind

III. Useful web links for information and resources

1. <http://apod.nasa.gov/>
2. www.schoolbox.com/science.aspx
3. www.agiweb.org
4. <http://fuelourfuturenow.com/?campaign=Prfofn>
5. <http://school.discoveryeducation.com>
6. www.uky.edu/KGS/education/activities.htm
7. www.earthscienceworld.org/images/
8. www.noaa.gov/om/reachout/kidspage.shtml
9. <http://scijinks.jpl.nasa.gov/noaa/spuzzled/index.shtml/>
10. <http://scijinks.jpl.nasa.gov/weather>
11. http://oceanservice.noaa.gov/education_new/seafloor-mapping
12. <http://www.nnvl.noaa.gov/>
13. www.noaa.gov/k12html/atmosphere.html
14. http://www.iris.edu/hq/programs/education_and_outreach/resources

IV. Goal of Lesson

Biggest Idea—TIME—how time has affected/influenced the major systems in our Earth, and how “our” time creates an interaction/responsibility/partnership with these Earth systems.

Other objectives/outcomes will also be met as a result of the big idea being met, and relative to the students’ choices for their projects. The possibilities for these learning outcomes are listed below, along with their coordinating GLCE.

Big Idea Concepts:

1. Earth Science literacy empowers us to understand our environment, make wise decisions that affect our quality of life, and manage resources, environments, and hazards.
2. In order to sustain the presence and quality of human life, humans and communities must understand their dependency on Earth’s resources and environments, realize how they influence Earth systems, appreciate Earth’s carrying capacity, manage and conserve nonrenewable resources and environments, develop alternate sources of energy and materials needed for human sustenance, and invent new technologies.

Learning Outcomes:

1. Identify and critique arguments about personal or societal issues based on scientific evidence. (E1.2B)
2. Develop an understanding of a scientific concept by accessing information from multiple sources. Evaluate the scientific accuracy and significance of the information. (E1.2C)
3. Evaluate scientific explanations in a peer review process or discussion format. (E1.2D)
4. Describe the effects of earthquakes and volcanic eruptions on humans. (E3.4C)
5. Explain, using specific examples, how a change in one system affects other Earth systems. (E2.1C)

6. Identify differences in the origin and use of renewable (solar, wind, water, biomass) and nonrenewable (fossil fuels, nuclear energy) sources of energy.
7. Identify and analyze the interactions between the major systems (geosphere, atmosphere, hydrosphere, and biosphere) that make up the Earth. (E2.1B)
8. Explain natural mechanisms that could result in significant changes in climate (major volcanic eruptions, changes in sunlight received by the Earth, and meteorite impacts, etc.). (E5.4B)

V. Materials/Technology

- *computers
- *EarthComm books
- *poster board if students desire to make presentation via poster form
- *rubric
- *group grading form

VI. Procedures/Instructions

1. ENGAGE (Teacher led)

Say to the class: "This school year we have learned about Earth Science, specifically focusing on volcanoes, earthquakes, astronomy, energy, water, and climate change. You have learned via our textbook, hands-on experiments, websites, and hopefully from me! I hope you have learned so much that you are inquisitive about learning more! I have made a movie that I want to share with you that hopefully ties your real world and Earth Science. I want to show it to you and hope you will be engaged by it!"

Movie consists of: pictures taken during Deur-Vis' MITEP experiences, various computer images of volcano and earthquake damage, tsunami damage, Plate Tectonics, various rock formations, solar system, sundial, mining sites, minerals, waterfalls, Grand River, bottled water company, wind turbine, etc. and coupled with pictures of each student with their kindergarten picture and 8th grade picture side-by-side made into a movie presentation---show this as excerpts from the songs entitled "One Day At A Time", "Time Keeps On Slipping", "The Galaxy Song", and "Day by Day" are being played.

2. EXPLORE (Whole class and teacher via accountable talk)

After the movie, have these questions displayed on the ELMO:

- *Time---What is time? How is it measured?
- *What changes have taken place in our Earth systems over time?
- *What has influenced these changes?
- *What are some responsible choices we can make in response to these changes?
- *What changes have you noticed in you over time? (um, yeah, like ones that you can talk about!)
- *How is Earth Science related to you?

Spend 10-15 minutes in accountable talk with entire class.

3. EXPLORE/EXPAND (Hands-on Connection via partner/group work, teacher circulates and guides)

Present options for students to work in pairs or groups of 3-4.

Next, present each pair/group with a sheet of activity options, rubric for evaluation and group evaluation. Instruct class they will have the rest of this day and the next to prepare a Power Point presentation or poster, to present to the class. Each pair or group will have 10 minutes to present findings, discuss their process, and take questions/feedback.

Play the music and PowerPoint as the students first get started on their projects.

4. EVALUATION (Students to submit group rubric evaluations, teacher to evaluate projects according to rubric.)

After each pair/group presents their project, collect their group evaluations. Teacher evaluates the project as it has been worked on and presented, assigns the grade for the project and presents their grade the next day.

ACTIVITY OPTIONS

Select one of the following options. Research/Discuss your choice of activity option. Create a PowerPoint or poster to 1.) present to the class your findings; 2.) discuss the path you and your partner(s) took from beginning to end; and 3.) relate this info to your life. Be ready to present this verbally, and take questions/feedback from your peers following your presentation.

1. Write/Create a story for a 6th grade audience to help them understand volcanoes. Specifically, the audience needs to learn about volcanic hazards, and how volcanoes affect ALL communities in some way.
2. How great is the possibility of an earthquake in our community? Compare this possibility with California. Research/Present ways to reduce the damage of an earthquake. Present this info and ideas in a mini-billboard form (poster) or via PowerPoint presentation.
3. Use the CER (claim, evidence, reasoning) format we learned to answer the question in the following scenario: Suddenly, all water in the Earth's oceans stop circulating. There are no more ocean currents of any kind. Will life on Earth change?
4. Use the CER format for this scenario: It is the year 2050. (You are just over 50 years old! Just as I am just over 50 right now!) All of the fossil fuels on Earth have been depleted. What impact will that have on daily life? (for you, your children and grandchildren) You must choose at least ONE aspect of daily life, but feel free to do more!—transportation, businesses, schools, environment.
5. A large beverage company wants to move into this area and build a plant for producing and selling bottled water. Should the company be able to extract groundwater from underneath Grand Rapids? What affects/implications will this have for our environment, health, water resources, etc.
6. How is the Sun the energy of everything?
7. One morning you wake up and come to school. It usually starts getting light out during 1st hour, but today it remains totally dark! Your science teacher tells you that the Earth is experiencing a MYSTERIOUS, PERMANENT total eclipse of the Sun. Will life on Earth be affected? If so, how? (extra kudos to integrate the song "Total Eclipse of the Heart" into your work!)
8. This past summer the Grand Rapids Press ran a series of newspapers articles on global warming. What? You didn't read them!! Well, find them via computer, read them, and then write your own article/presentation of global warming for our school newsletter. Include a letter that can be sent to the editor (called an editorial!) of the Grand Rapids Press.
9. Create a timeline relating major events in the history of the Earth to the geological time scale.
10. Create a lesson on Plate Tectonics for 6th graders—via PowerPoint, including visuals, information/description, and possible websites for them to go to for further knowledge and understanding.

EVALUATION RUBRIC

	4	3	2	1
Researched Information	Well organized information; excellent detail; presented clearly	Organized information; quite detailed; mostly clear in presentation	Somewhat organized; some details, but more needed; some clarity in presentation	Mostly disorganized; not enough details; lack of clarity in given information
Scientific Concepts	Excellent organization; well thought out; thorough; scientific vocabulary used correctly; excellent reasoning	Organized; complete thoughts; most scientific vocabulary used correctly; good reasoning	Somewhat organized, mostly complete thoughts, some reasoning; some scientific vocabulary used correctly	Not much organization, thoughts are scattered; little solid reasoning; very little correctly used scientific vocabulary
Implications To Your Life	Impact and relevance related to your life clearly explained	Some impact and relevance given	Little impact and relevance stated	No impact or relevance stated