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DepED
DEPARTMENT OF EDUCATION

Lesson Exemplar for Science

Quarter 4
Lesson
2

Lesson Exemplar for Science Grade 7
Quarter 4: Lesson 2 (Week 2)
SY 2024-2025

Development Team

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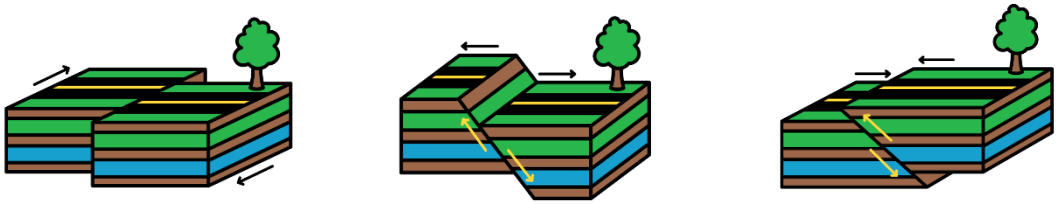
SCIENCE (EARTH AND SPACE SCIENCE) /QUARTER 4/ GRADE 7

I. CURRICULUM CONTENT, STANDARDS, AND LESSON COMPETENCIES	
A. Content Standards	The learners learn that the damage or effects on communities depend on the magnitude of and distance from an earthquake.
B. Performance Standards	By the end of the Quarter, learners will appreciate the value of using systems to analyze and explain natural phenomena and demonstrate their understanding of the dynamics of faults and earthquakes. They are confident in identifying and assessing the earthquake risk for their local communities using authentic and reliable secondary data. They use the country's disaster awareness and risk reduction management plans to identify and explain to others what to do in the event of an earthquake. Learners explain the cause and effects of secondary impacts that some coastal communities may experience should a tsunami be produced by either local or distant earthquake activity. Learners use reliable scientific information to identify and explain how solar energy influences the atmosphere and weather systems of the Earth and use such information to appreciate and explain the dominant processes that influence the climate of the Philippines.
C. Learning Competencies and Objectives	***Learning Competencies:*** *1. Describe how the effects of earthquakes on communities depend on their magnitude;* *2. Use the PHIVOLCS FaultFinder or other reliable information source to identify where the nearest fault system is located from their community and assess the risk of earthquakes to their local community* ***Learning Objectives:*** **1.** *Describe the effects of earthquake;* **2.** *Identify the relationship between earthquake magnitude and its effects on communities; and* **3.** *Recognize the use of PHIVOLCS FaultFinder or other reliable information source to assess the risk of earthquakes in their community.* ***Learning Competency:*** *Make models of fault scenarios to illustrate:* *a. the epicenter of an earthquake from its focus,* *b. the intensity of an earthquake from its magnitude, and* *c. how underwater earthquakes may or may not generate tsunamis;* ***Learning Objectives:*** **1.** Create a model to represent the anatomy of an earthquake; **2.** Relate the intensity of an earthquake, its magnitude, and the damage that they may cause. **3.** Deduce that underwater earthquakes may or may not generate tsunamis.

D. Content	Topic: Anatomy of Earthquake Sub Topics: **1.** Earthquakes **2.** Earthquake modeling
E. Integration	Safety and Resiliency; Impacts on society as well as the economic growth/ Society and Economic Impacts

II. LEARNING RESOURCES

- United States Geological Survey (USGS). (n.d.). Magnitude, intensity, and earthquake effects. In Earthquake Hazards Program. Retrieved from https://pubs.usgs.gov/gip/earthq3/magnitude.html
- Gomez, J., & Gomez, J. (2018, December 29). Tsunami alert in Philippines lifted hours after undersea quake. TheQuint. https://www.thequint.com/news/world/tsunami-alert-in-philippines-lifted-hours-after-undersea-quake

III. TEACHING AND LEARNING PROCEDURE		**NOTES TO TEACHERS**
A. Activating Prior Knowledge	• **Short Review (Day 1)** Matching the Faults Match the picture of the type of fault to their correct name and description.  Normal Fault Reverse Fault Strike-slip Fault	• Target time frames may change depending on the ability of the learners and the flow of discussion. • The teacher will prepare the different pictures that represents the 3 types of faults, along with its name and description and post it on the board.

Inclined at an angle less than 45 degrees from the horizontal

Inclined at an angle greater than 45 degrees from the horizontal

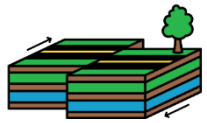
Nearly vertical with minimal inclination from the horizontal

Direction of Slip: Horizontal motion, where two tectonic plates slide past each other horizontally

Direction of Slip: Vertical motion, where hanging wall moves downward relative to the footwall that occurs from tensional tectonic settings.

Direction of Slip: Vertical motion, where hanging wall moves upward relative to the footwall that typically form in compressional tectonic settings.

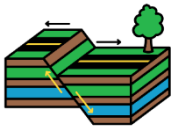
Answers:



Strike-slip Fault

Nearly vertical with minimal inclination from the horizontal

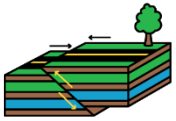
Direction of Slip: Horizontal motion, where two tectonic plates slide past each other horizontally



Normal Fault

Inclined at an angle less than 45 degrees from the horizontal

Direction of Slip: Vertical motion, where hanging wall moves downward relative to the footwall that occurs from tensional tectonic settings.



Reverse Fault

Inclined at an angle greater than 45 degrees from the horizontal

Direction of Slip: Vertical motion, where hanging wall moves upward relative to the footwall that typically form in compressional tectonic settings.

		To reinforce learning, ask students to explain the significance of understanding different types of faults and fault lines in geology and earthquake studies.
B. Establishing Lesson Purpose	• **Lesson Purpose** Play the news about the magnitude 7.4 earthquake that happened in Surigao Del Sur last December 2, 2023.  Video link: https://www.youtube.com/watch?v=3_x4gICJOXI&t=1s After watching the video clip, ask the learners the following questions: • What did you observe in the video? • Who among you have experienced an earthquake? • What are the things that can happen during an earthquake? • Are you familiar with the fault lines in the Philippines?	Emphasize the importance of discussing the lesson by eliciting answers from students about what happens during earthquakes. If television is not available, you may just ask the questions to learners relating to their experience. Expect varied answers. Allow learners to share their experiences during an earthquake.

	• **Unlocking Content Vocabulary** **Word Puzzle.** The learners will look for the following words inside the puzzle. It could be horizontal, vertical, diagonal, or reverse. 1. FOCUS 2. EPICENTER 3. MAGNITUDE 4. INTENSITY 5. WAVE O F W A V E A M I C A S E S O R A N E F U D G E T G T S U C O F R S N U N E E D S I E I R I N T E N S I T Y C T U I D K N U E E E R G A B R D D E P I C E N T E R 1. FOCUS. The point within Earth where rock under stress breaks, resulting in an earthquake. 2. EPICENTER. The point on the Earth's surface that is directly above the focus. 3. MAGNITUDE. Earthquake magnitude is a measure of the "size," or amplitude, of the seismic waves generated by an earthquake source and recorded by seismographs (instrument that makes a record of seismic waves caused by an earthquake, explosion, or other Earth-shaking phenomenon). 4. INTENSITY. It is a measure of the strength of shaking experienced in an earthquake. 5. SEISMIC WAVE. The vibration generated by an earthquake, explosion, or similar energetic source and propagated within the earth or along its surface.	The teacher can make a giant word puzzle and ask learners to look for the words in the puzzle, crossing it out using their fingers. After finding the words, define the terms.

C. Developing and Deepening Understanding	**(Day 2)** **SUB-TOPIC 1: Earthquakes** **1. Explicitation** Brainstorming Activity. What Causes an Earthquake? (10 minutes) With their groupmates, learners will use colored papers to list as many possible causes of earthquakes as they can think of and paste them in the manila paper. Encourage them to try to sort out their answer as to natural cause or human-induced cause. After brainstorming, they will present their answer to the class. **2. Worked Example** **I.** Activity No. 2.1: Assessing Earthquake Risk in Our Community **II.** Objective(s): At the end of the activity, you should be able to use the FaultFinder app to identify where the nearest fault system is and assess the risk of earthquakes to your local community **III.** Materials Needed: gadget with internet access, access to FaultFinder, **IV.** Instructions: 1. Use your gadget to access the FaultFinder app developed by DOST then fill in the table with the needed data, and answer the questions that follow. Your Location: _____ Nearest Active Fault Trace: _____ Fault Name: _____ Segment Name: _____ Year Mapped: _____ Mapping Scale Used: _____	Divide the class into small groups or pairs. In listing the cause and effect, encourage learners to consider geological processes such as plate tectonics, volcanic activity, and human-induced factors. Make sure to demonstrate how to use the FaultFinder app developed by DOST. If FaultFinder is not accessible due to location, the teacher may look for available data about the history of earthquake in their area.

Guide Questions:

1. When is the most recent record of an earthquake in your community? _____
2. Does your community have old buildings? _____
3. Does your community have a big population in one area? _____
4. Do you think your community is prepared for an earthquake? Why? Why not? _____
_____

Allow learners to search for the data of the recent record of earthquake in their community.

Rubric or Score Guide

Advanced (5 points)	Proficient (4)	Nearly Proficient (3)	Emerging (2)	Needs Improvement (1)
All of the required fields were answered, and the answers to guide questions were well-organized and completely explained in detail.	All of the required fields were answered, and the answers were well-organized and completely explained, but not in detail.	Some of the required fields were answered, and the answers were somewhat organized and explained but not in detail.	Some of the required fields were answered, but the answers were not organized and not explained in detail.	Few of the required fields were answered, and the answers were not organized and not explained in detail.

World's Historical Earthquake

To further reinforce the concepts learned, students can conduct additional research on specific earthquakes from history, including their location, date, magnitude, and significant impacts (e.g., the San Francisco earthquake of 1906, the Japan earthquake and tsunami of 2011) and analyze how tectonic plate movements contributed to these events. You may use the template below for your answer.

Name: _____ Date Submitted: _____
Section: _____

World's Historical Earthquake

Location: _____
Date: _____
Magnitude: _____
Significant Impacts: _____
_____
_____
_____
_____
_____
_____
_____

3. Lesson Activity

Picture analysis. The learners will analyze the pictures and answer the processing questions.

Huge boulders block a highway at Cortes township, Bohol on October 16, 2013, a day after a 7.2-magnitude quake struck
The Philippine Institute of Volcanology and Seismology (Phivolcs) traced the epicenter of the earthquake 6 kilometers southwest of Sagbayan, Bohol.

Image retrieved at: https://cdn.theatlantic.com/thumbor/9vNbc55AN1f8Y6ihNW6abHgPs1Q=/1200x777/media/img/photo/2013/10/powerful-earthquake-strikes-the-philippines/p21_28466487/original.jpg lifted: 02/26/2024

Ask the learners to analyze the posted pictures.

A view of a portion of a damaged highway in Getafe, Bohol, central Philippines, on October 16, 2013

Image retrieved at: https://cdn.theatlantic.com/thumbor/qG8iMOC3_sw3K3ALIUQzKGzNBMo=/900x571/media/img/photo/2013/10/powerful-earthquake-strikes-the-philippines/p03_RTX14DJN/original.jpg lifted on 02/26/2024

A strong undersea earthquake struck off the southern Philippines on Saturday, 29 December, 2018.

Image retrieved at: *https://images.thequint.com/thequint/2018-09/058c1e8f-ca2b-4d69-bb59-6a70b8966729/AP18256690161647.jpg?rect=0%2C0%2C5760%2C3024&w=1200&auto=format%2Ccompress&ogImage=true* lifted on 02/26/2024

Process Questions:

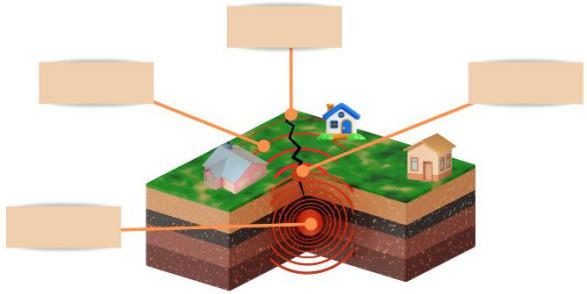
1. What are the possible risks brought by an earthquake?
2. Is an earthquake's magnitude connected to the amount of damage it causes in a location?
3. Will the distance from the epicenter affect the damage that it may cause?
4. How would the economy of the area be affected if the roads were destroyed, as seen in the picture?

- The learners' answers must be directed to the different effects of earthquakes both on land and undersea.
- Yes, an earthquake's magnitude is connected to the amount of damage it can cause in a location, but it's not the only factor that determines the extent of damage.
- Yes, the distance from the epicenter of an earthquake can significantly affect the

damage it may cause in a particular location.
- The destruction of roads in an area can have far-reaching consequences for the local economy, affecting trade and commerce, employment, tourism, and overall economic productivity.

SUB-TOPIC 2: Earthquake Modeling (Day 3)

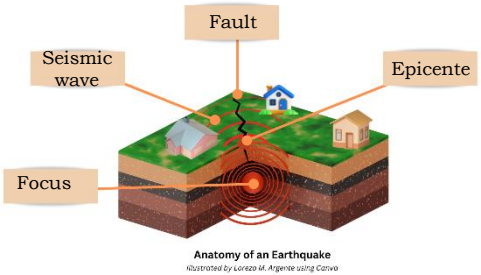
1. **Explicitation**
   The learners will label the anatomy of the earthquake by choosing the answer from the pool of words below the picture.



Epicenter	Fault	Focus	Magnitude	Seismic wave

The teacher can print the picture or draw the anatomy of an earthquake on the board.

Answer:



- Instruct each group to use the modeling clay or playdough to create a cross-section model of the Earth's surface, representing the layers of the Earth.

	2. Worked Examples The learners will perform the activity that follows. **I. Activity No. 2.2: Modeling Earthquake Scenarios (30 mins)** **II. Objective(s):** At the end of the activity, you should be able to understand the concepts of earthquake epicenter and focus, earthquake magnitude, and intensity. **III. Materials Needed:** Modeling clay or playdough (different colors if possible), toothpicks, large shallow tray, sand or gravel, plastic syringe **IV. Instructions:** 1. Use the modeling clay or playdough to create a big cross-section model of the Earth's surface. 2. Use a different color of clay to represent the focus of the earthquake within the Earth's crust. You can place this clay at varying depths to simulate earthquakes of different magnitudes. 3. Use the toothpick to create structures on the surface of your model representing buildings, roads, and other infrastructure. 4. Simulate various earthquake magnitudes by pressing down on the focal clay with increasing force, from the smallest force to the highest force, generating variable amounts of shaking and devastation on the surface. 5. Fill the large shallow container with sand or gravel to represent the ocean floor. 6. Add a layer of water to the container to simulate the ocean. 7. Use the plastic syringe to create underwater disturbance representing earthquakes.	• Have them use a different color of clay to represent the focus of the earthquake within the Earth's crust. They can place this clay at varying depths to simulate earthquakes of different magnitudes. *Modeling Earthquake Magnitude and Intensity* • Explain to the students that earthquake magnitude is a measure of the energy released during an earthquake, while intensity refers to the effects of the earthquake at a particular location. • If the syringe is not available, you may use a dropper as an alternative. • Discuss how the models demonstrated the concepts of earthquake epicenter, focus, magnitude, intensity • The amount of damage in the infrastructure increases as you increase the force on the focus. • Waves in the water will be generated leading to the formation of tsunami.

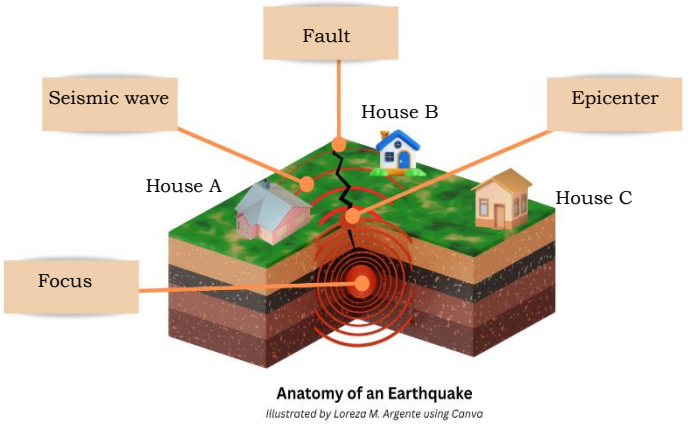
Guide Questions:

1. What happens to the amount of damage in the infrastructure as you increase the force on the focus?
2. If the clay represents the ocean plate and water surrounds the plate, how do you think the water will react with each force that you apply?

Rubric or Score Guide

Advanced (5 points)	Proficient (4)	Nearly Proficient (3)	Emerging (2)	Needs Improvement (1)
The model represents the anatomy of an earthquake, and the answers to guide questions were well-organized and completely explained in detail.	The model represents the anatomy of an earthquake, and the answers were well-organized and completely explained, but not in detail.	Some of the required parts in the anatomy of an earthquake is missing, and the answers were somewhat organized and explained but not in detail.	Some of the required parts in the anatomy of an earthquake is missing, but the answers were not organized and not explained in detail.	Most of the required parts in the anatomy of an earthquake is missing, and the answers were not organized and not explained in detail.

- Modeling the Epicenter and Focus
- Explain to the students that the focus of an earthquake is the point within the Earth where the seismic energy is released, while the epicenter is the point on the Earth's surface directly above the focus.

	3. Lesson Activity Let the learners analyze the illustration and answer the questions that follow.  **Anatomy of an Earthquake** *Illustrated by Loreza M. Argente using Canva* **Process Questions:** 1. Which among the houses will experience the greatest damage? Explain your answer. 2. What are the things that you will consider in finding the safest location for you dream house?	
D. Making Generalizations	• **Learners' Takeaways (Day 4)** *Earthquake Takeaway Gallery* Using colored papers, reflect on the knowledge you have acquired throughout the lesson or unit, including concepts, facts, and real-world implications of earthquakes. You can also use drawings, diagrams, symbols, or written statements to convey your understanding of earthquakes. Once you have completed your creation, share your takeaways by placing them on the "Earthquake Takeaway Gallery."	The teacher may prepare the strips of paper ahead of time or ask them to bring one before the session. A manila paper or a designed cartolina may be used

- **Reflection on Learning**

How Well Did You Know?

Place a check in the column that represents your answer:

I know the…	I know it well	I know it but still have questions	I did not understand it
1. anatomy of an earthquake			
2. use of FaultFinder to identify where the nearest fault system is located from my community.			
3. assessment of the risk of earthquakes to my local community			
4. relationship between magnitude and effect of earthquake in the infrastructure.			
5. importance of knowing the cause and effect of earthquakes			

as the "Earthquake Takeaway Gallery."

IV. EVALUATING LEARNING: FORMATIVE ASSESSMENT AND TEACHER'S REFLECTION		**NOTES TO TEACHERS**
A. Evaluating Learning	**1. Formative Assessment** 1. Which of the following best describes the epicenter of an earthquake? A. The point on the Earth's surface directly above the focus. B. The deepest point within the Earth where the seismic energy is released. C. The point within the Earth where the fault rupture begins. D. The area where the ground shaking is most intense.	Answers: 1. A. The point on the Earth's surface directly above the focus.

	2. What is the primary factor that determines the magnitude of an earthquake? A. The depth of the earthquake's focus. B. The distance from the epicenter to the affected area. C. The amount of energy released by the seismic event. D. The type of fault responsible for the earthquake. 3. How does earthquake intensity differ from earthquake magnitude? A. Magnitude measures the energy released, while intensity measures the damage caused. B. Magnitude measures the depth of the focus, while intensity measures the distance from the epicenter. C. Magnitude measures the ground shaking, while intensity measures the duration of the earthquake. D. Magnitude measures the area affected, while intensity measures the frequency of aftershocks. 4. Which of the following is a potential effect of an earthquake on a community? A. Increased rainfall and flooding. B. Growth of vegetation and wildlife. C. Displacement of tectonic plates. D. Damage to buildings, infrastructure, and loss of life. 5. What role does the focus of an earthquake play in determining its effects on the Earth's surface? A. The deeper the focus, the more severe the ground shaking. B. The shallower the focus, the greater the potential for tsunamis. C. The focus determines the direction of the seismic waves. D. The focus has no direct impact on the effects of the earthquake.			2. C. The amount of energy released by the seismic event. 3. A. Magnitude measures the energy released, while intensity measures the damage caused. 4. D. Damage to buildings, infrastructure, and loss of life. 5. B. The shallower the focus, the greater the potential for tsunamis.
3. Teacher's Remarks	*Note observations on any of the following areas:*	**Effective Practices**	**Problems Encountered**	
	strategies explored			

	materials used			
	learner engagement/ interaction			
	others			
4. Teacher's Reflection	*Reflection guide or prompt can be on:* ▪ *<u>principles behind the teaching</u>* *What principles and beliefs informed my lesson?* *Why did I teach the lesson the way I did?* ▪ *<u>students</u>* *What roles did my students play in my lesson?* *What did my students learn? How did they learn?* ▪ *<u>ways forward</u>* *What could I have done differently?* *What can I explore in the next lesson?*			