EMILIA AMBALADA POBLETE NATIONAL HIGH SCHOOL
Learner's Activity Sheet in Science 10

Name: _____ Grade & Section: _____

WEEK 1-2 – Distribution of Active Volcanoes, Earthquake Epicenters, and Major Mountain Belts

Introduction:

In this lesson, you shall know the distribution of active volcanoes, earthquake, epicenters, major mountain belts and further explain the plate tectonic theory after gaining a full understanding of the concepts embedded in the many activities on this lesson.

Our country is situated in the Pacific Ring of Fire where the oceanic plate and several smaller micro plates sub-ducting along the Philippine plate and several microplates along the Philippine Trench to the East and smaller trenches to the West. To date, as per report of the PHILVOCS (Philippine Institute of Volcanology and Seismology), there are 53 active volcanoes in the Philippines characterized by two major NS trending arcs – the Luzon and Mindanao Volcanic Arcs. This makes the country's tectonic setting complex aside from having a number of small plates squeezed between two convergent plate margins, separated by small subduction zones and major transform faults. Some volcanoes in the Philippines are active or dormant. We describe volcanoes as dormant and active based from their frequency of eruptions. Those that erupt regularly are called active and those that have erupted in the past and are inactive are called dormant.

Some Active and Dormant Volcanoes		**Location**
Name	**Coordinates**	**Province**
Banahaw	14°04'N 121°29'E	Laguna, Quezon
Bulusan	12°46'12"N 124°03'00"E	Sorsogon
Camiguin de Babuyanes	18°49'48"N 121°51'36"E	Cagayan
Hibok-Hibok	9°12'11"N 124°40'23"E	Camiguin
Iraya	20°28'08"N 122°00'36"E	Batanes
Iriga	13°27'25"N 123°27'25"E	Camarines Sur
Kanlaon	10°24'43"N 123°07'55"E	Negros Occidental/ Oriental
Makaturing	7°38'49"N 124°19'12"E	Lanao del Sur
Matutum	6°22'N 125°04'E	South Cotabato
Mayon	13°15'25"N 123°41'06"E	Albay
Pinatubo	15°08'N 120°21'E	Zam-bales,Tarlac, Pampanga

Taal	14°00'07"N 120°59'35"E	Batangas

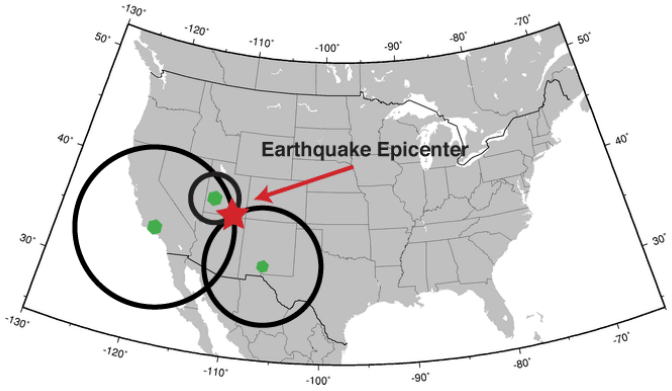
Taal, Pinatubo and Mayon volcanoes are the familiar volcanoes of the country in terms of their eruptions. They are formed when pieces of earths crusts called plates smash and buckle up through a process called plate tectonics. Some form mountain ranges or hill ranges arranged in a line and connected by high ground. A group of mountain ranges with similarity in form, structure and alignment is called a mountain belt.

There are mountain ranges closest to a certain volcano. Say for example, for Taal Volcano, they are Mount Macolod (3107 ft.) which is 7 miles away from Taal, Mt. Talamitan (2310 ft.), 17.3 miles away from Taal, Mount Panay (1,644 ft.) 22.2 miles from Taal and San Pablo Volcanic Field (3576 ft.) which is 22.2 miles away from Taal. Can you name the mountain ranges of other active volcanoes in the country?

Seismologist can determine the difference in arrival times between the P-wave and the S-waves. Seismic waves are the waves of energy caused by the sudden breaking of rock within the earth or an explosion. They are the energy that travels through the earth and is recorded on seismographs. There are several different kinds of seismic waves. These waves move in different ways. Body waves can travel through the earth's inner layers while surface waves can only move along the surface of the planet like ripples on water. Earthquakes radiate seismic energy as both body and surface waves. Traveling through the interior of the earth, body waves arrive before the surface waves emitted by an earthquake. These waves are of a higher frequency than surface waves. The first kind of body wave is the P wave or primary wave. This is the fastest kind of seismic wave, and, consequently, the first to 'arrive' at a seismic station. The P wave can move through solid rock and fluids, like water or the liquid layers of the earth. It pushes and pulls the rock it moves through just like sound waves push and pull the air. P waves are also known as compressional waves, because of the pushing and pulling they do. Subjected to a P wave, particles move in the same direction that the wave is moving in, which is the direction that the energy is traveling in, and is sometimes called the direction of wave propagation.

Development:

Seismologists use two methods to find the epicenter of an earthquake. First is the **triangulation method,** where seismic data is collected from at least three different locations. This data includes the arrival time of P and S waves in each seismic station. The distance of the epicenter from each seismic station is then computed using the equation, d = time difference x 100 km / 8 seconds. The computed kilometer distance from each station is converted to centimeter using the scale 1cm: 100km. A circle is drawn around each station on the map using the computed distance in centimeter. The point where the three circles intersect is the location of the epicenter of the earthquake. Observe the figure below.



Source: https://www.usgs.gov/media/images/triangulation-locate-earthquak

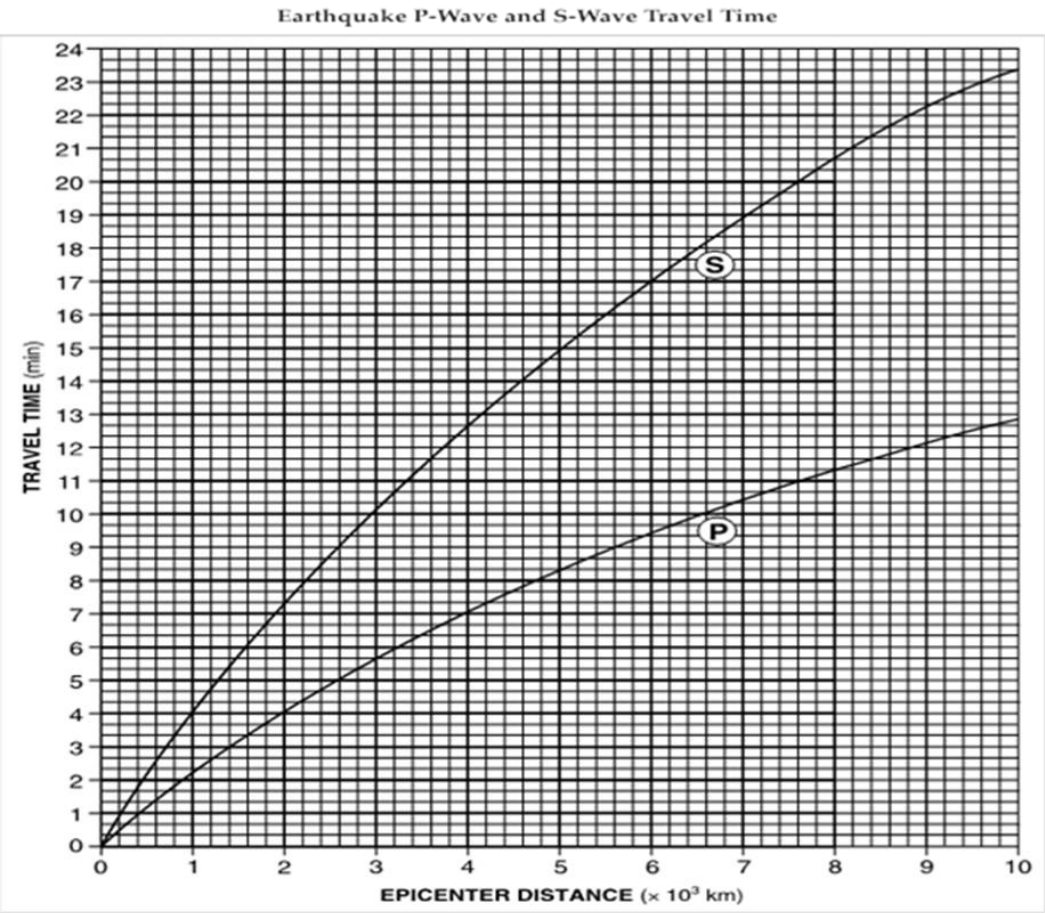
Another method of locating earthquake epicenter is the distance-time graph. Do the task below to learn about this method.

Learning Task 1

Directions: Study the graph below and answer the questions that follow. Make use of the four questions to learn more about the concepts of distance graph.

1. An epicenter station is 4,000 km away. How long after the first P-wave did the first S-wave arrive?
2. An epicenter station is 5,600 km away. How long after the first P-wave did the first S-wave arrive?
3. How far can an S-wave travel in 6 minutes 40 seconds?

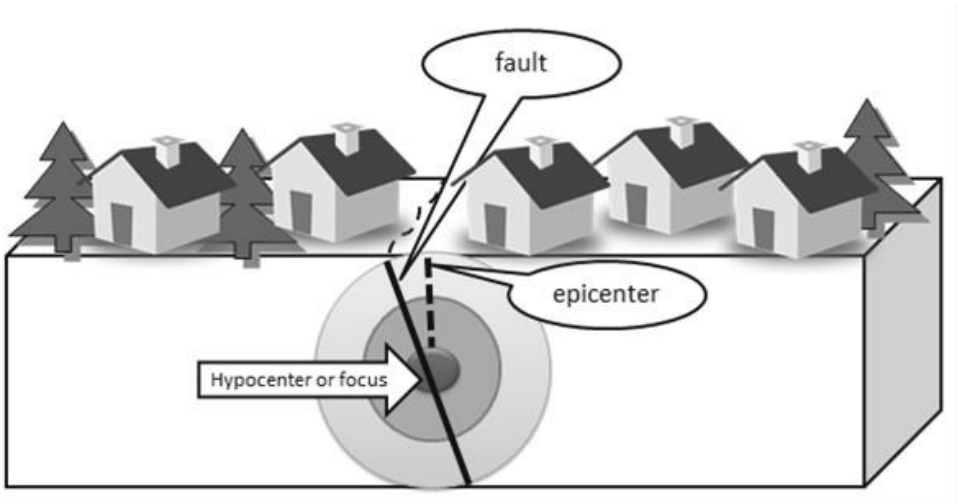
4. How far can a P-wave travel in 6 minutes 40 seconds?



Learning Task 2

Complete the table below. Using the picture to describe its observable or physical characteristics.

	Descriptions
A. Earthquake Epicenter	1. 2.
B. Hypocenter	1. 2.
C. Fault	1. 2.

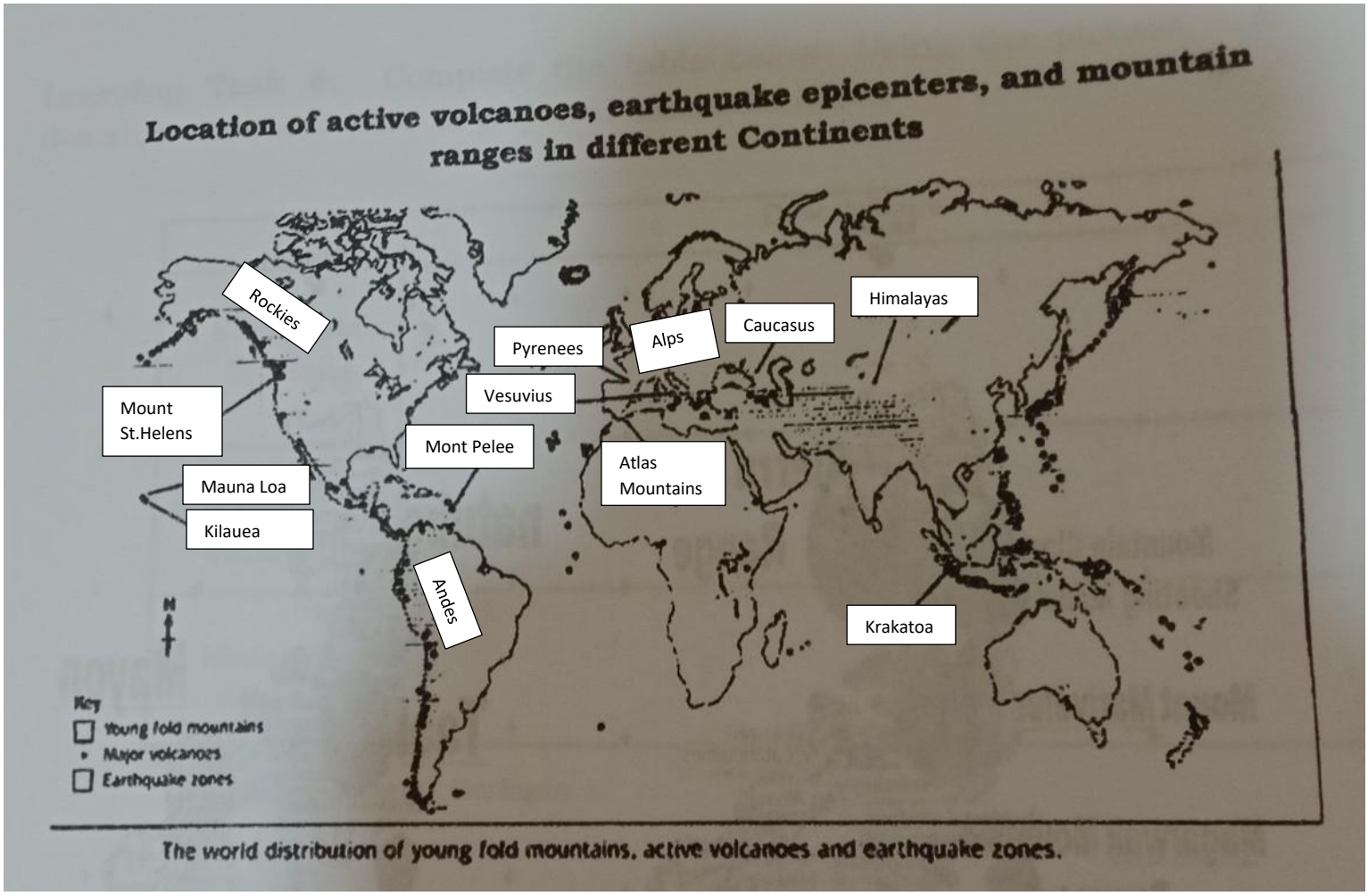


ENGAGEMENT

Learning Task 3: Carefully study the maps below of the mountain ranges (LEFT) and active volcanoes (RIGHT) in the Philippines. Complete the table below by listing down what is asked in each column. For earthquake prone areas, give 2 to for each only. For earthquake prone areas, you may search for answers from any online or texts references since they are included in the map.

	Mountain Ranges	Active Volcanoes	Earthquake Prone Areas
Luzon			
Visayas			
Mindanao			

Learning Task 4: Using the world map, locate and list down the location of active volcanoes, earthquake zones and mountain ranges in the world.



Questions:

1. Based on the map, list down the places where you can find the following:
   a. volcanoes
   b. earthquake epicenters
   c. mountain ranges
2. Why do active volcanoes, mountain ranges/folded mountains, and earthquake zone are located in the same place?
3. Explain why those places in the map have active volcanoes, earthquake epicenters and mountain ranges.

Assimilation:

Learning Task 5: Draw a simple map and describe the distribution of active volcanoes, earthquake epicenter and major mountain belts in CALABARZON. Label your map correctly. Write the names of volcanoes, mountain belts, and earthquake epicenters in each province in CALABARZON.