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A Lesson Design in Science

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Name of Student Interns

May 9, 2025
Date of Teaching

Isidro Max V. Alejandro
Mentor

G10, Thursday 12:00 NN - 1:30 PM
Section and Time

I. Intended Learning Outcomes

By the end of the lesson, the Grade 10 students with 75% proficiency must have:

a. Define plate tectonics
b. Describe the structures, movements, and events that occur at each type of plate boundary.
c. Recognize the importance of the plate movements and continental evolution account for the major surface features of Earth.
d. Demonstrate the different types of plate boundaries.

II. Learning Resources

Topic: Plate Tectonics
Concepts:

1. Plate Tectonics and its structures.
2. Types of boundaries and the movements of each type of boundaries.

Skills to be developed: Critical-thinking, teamwork, time management
Instructional Materials: Freedom wall board, tarpapel puzzle of the tectonic plate boundaries
References:

1) Acosta et al. (2015). Science – Grade 10: Learner's material (Unit 1, 1st ed.). Department of Education, Republic of the Philippines.
2) Republic of the Philippines, Department of Education. (n.d.). Science shaping paper. In MATATAG CURRICULUM.

3) Allison, M. A., DeGaetano, A. T., & Pasachoff, J. M. (n.d.). Holt Earth science. Holt, Rinehart and Winston.

Electronic Resources:

1) Plate tectonics. (n.d.). https://education.nationalgeographic.org/resource/plate-tectonics/
2) Wong, K. (2023, June 27). Evidence and implications of the continental drift theory. https://www.internationalscholarsjournals.com/articles/evidence-and-implications-of-the-continental-drift-theory-99377.html
3) Admin. (2021, September 20). *What is an example of oceanic continental convergence?* BYJUS. https://byjus.com/ias-questions/what-is-an-example-of-oceanic-continental-convergence/

III. Learning Experiences

A. Review (5 minutes)

1. The students are asked the following questions:
   a. What is plate tectonics?
      Answer: It's the idea that the Earth's surface is made of big pieces called plates that move.
   b. Do these plates move? What happens when they move?
      Answer: Yes! They can cause earthquakes, volcanoes, or form mountains.
   c. What happens at each type of plate boundary?
      Answer: Convergent (come together): Mountains form
      Divergent (move apart): New land forms
      Transform (slide past): Earthquakes happen
   d. How does plate movement change Earth?
      Answer: It makes mountains, volcanoes, and other land shapes.
   e. Why learn about plate tectonics?
      Answer: So we know why these changes happen and how to stay safe.

B. Elicit (5 minutes)

Activity: BUILD A PLATE: Plate Tectonic Puzzle
Materials: Cutout pictures in shape of a continental plate, scotch tape
Mechanism:

1. Group the students into four (3) groups.
2. Each group is given a riddle to decipher.
3. Once deciphered, the front person in the row will approach the teacher and say the deciphered riddle.
4. Then, the groups are given four (4) large pieces of the puzzle.
5. To form the puzzle, the groups must collaborate in forming the puzzle.
6. The formed puzzle is pasted on the board once done.

http://pubs.usgs.gov
Figure 2. Map of Plate boundaries

7. After pasting the puzzle on the board, the teacher will ask the class: (1) "Upon observing the puzzle you've formed, what do you think is our topic for today?"
   Possible Answer: Plate Tectonics.

Transition Point:

- The teacher will explain that the puzzle pieces represent the Earth's crust, which is made up of tectonic plates.
- These plates fit like a jigsaw puzzle and are always moving, causing natural events like earthquakes and volcanoes.
- Before continuing, the teacher will invite students to share their thoughts and ideas about these events by participating in a freedom wall activity.

C. Engage (5 minutes)

Activity: What's Beneath Our Feet?: Freedom Wall
Materials: Cartolina, paper strips, scotch tape
Mechanism:

1. This activity is done in 5 minutes time only.
2. The teacher has prepared a freedom wall on the board.

3. The teacher will give the students a strip of paper.
4. The teacher will ask this question:
    - When you hear the words 'earthquake,' 'volcano,' or 'mountain,' what comes to mind?
    - Why do you think these natural events or features occur?
    - What do you know about the Earth's crust or what lies beneath it?
5. Learners will be asked to write their answers on a piece of paper in 2-3 sentences of what they imagine is happening beneath the Earth's surface.
6. After writing their answers on a piece of paper, the students will be given a scotch tape and paste his/her paper containing his/her answer on the freedom wall.
7. When everyone's done, the teacher will select 2 students to share their answers.

Transition Point:

- The teacher will explain that the Earth's outer layer is made up of large pieces called tectonic plates, which are constantly moving.
- These movements cause natural events like earthquakes, volcanoes, and the formation of mountains.
- Just like how pieces of a jigsaw puzzle fit together to form a complete picture, these plates interact at different boundaries, creating different geological features.

D. Explore (10 minutes)

Activity: Mix and Match
Materials: Printed Cards, Scotch tape
Mechanism:

1. Divide the class into three groups.
2. Provide each group with a set of cards that include:
    - Names of plate boundaries (Convergent, Divergent, Transform)
    - Descriptions of their movements
    - Diagrams or illustrations of the boundaries
    - Real-life examples (e.g., Himalayas, Mid-Atlantic Ridge, San Andreas Fault)

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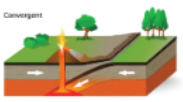
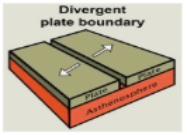
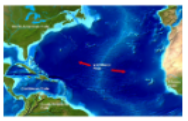
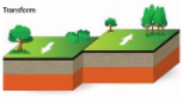
CONVERGENT PLATE BOUNDARY	**move toward each other**		
DIVERGENT PLATE BOUNDARY	**move away from each other**		
TRANSFORM BOUNDARY	**slide past each other horizontally**		

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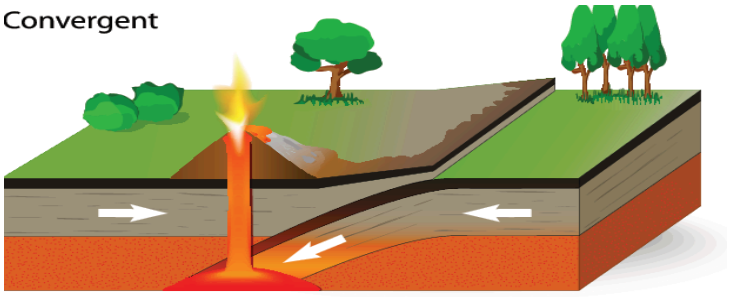
3. Students will match the cards correctly by identifying which type of plate boundary matches the corresponding pictures.
4. Once matched, the teacher will discuss the three types of plate boundaries.

E. Explain (20 minutes)

A. The teachers display the puzzle formed earlier for the students. The teacher will then proceed in discussing the lesson.

- The Earth's lithosphere, which is the outermost layer, is divided into several large pieces known as tectonic plates. These plates are constantly in motion, driven by the heat from the Earth's core. The movement of these plates occurs at the boundaries where they meet, and there are three primary types of plate boundaries: convergent, divergent, and transform.

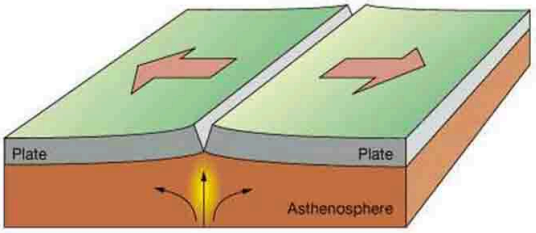
1. **Convergent Boundaries:**
   - At convergent boundaries, two plates move toward each other. When they collide, one plate can be forced beneath the other in a process known as subduction. This can lead to the formation of mountain ranges, deep ocean trenches, and even volcanic activity.



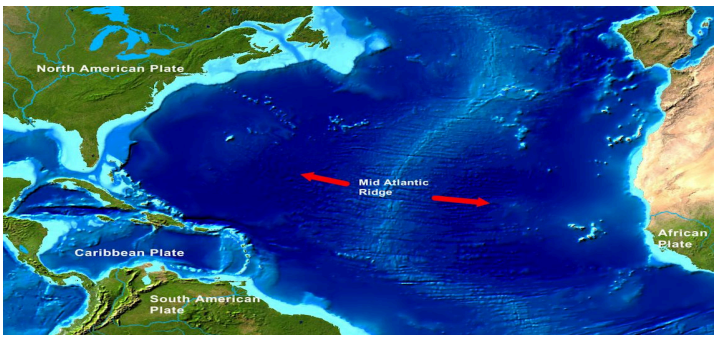
- Three types of Convergent Boundaries:
  - **Oceanic-Oceanic:** The denser plate subducts, forming an ocean trench and a volcanic island arc.
  - **Oceanic-Continental:** The denser oceanic plate subducts, forming a volcanic arc and a mountain range on the continental side.
  - **Continental-Continental:** Plates collide, causing the crust to buckle and fold, forming mountain ranges.
- **Example:** The Himalayas, where the Indian plate is colliding with the Eurasian plate, creating one of the tallest mountain ranges in the world.

2. Divergent Boundaries:

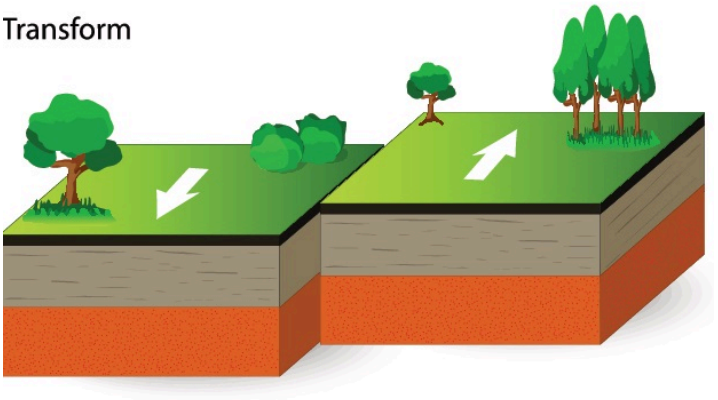
- Divergent boundaries occur when two plates move apart from each other. As the plates separate, magma from the mantle rises to fill the gap, forming a new crust. This process is responsible for creating features like mid-ocean ridges and rift valleys.



Divergent boundary

- **Example:** The Mid-Atlantic Ridge, where the North American plate and the Eurasian plate are moving apart, forming a new oceanic crust.
- 

3. Transform Boundaries:

- At transform boundaries, two plates slide past each other horizontally. As they move, the friction between the plates can cause earthquakes. Unlike convergent and divergent boundaries, transform boundaries don't create or destroy crust; they simply slide past each other.
- 

- **Example:** The San Andreas Fault in California, where the Pacific plate is sliding past the North American plate, causing frequent earthquakes in the region.

- 
- These plate movements and interactions are responsible for many of the Earth's geological features, including mountains, volcanoes, and earthquakes. Understanding these movements helps explain the dynamic nature of the Earth's surface and how it continues to change over time.

B. Activity: Gallery Walk

Materials: Printed portraits, scotch tape

Mechanism:

1. The groups will stay within their designated groups of 3.
2. The teacher will paste the portraits in the different corners of the room.
3. The teacher in front will assign the other three teachers to facilitate in each portrait.
4. The role of the remaining teacher will be a tour guide who will guide the students while touring the gallery.
5. They will discuss these individuals and will provide details of their discoveries:

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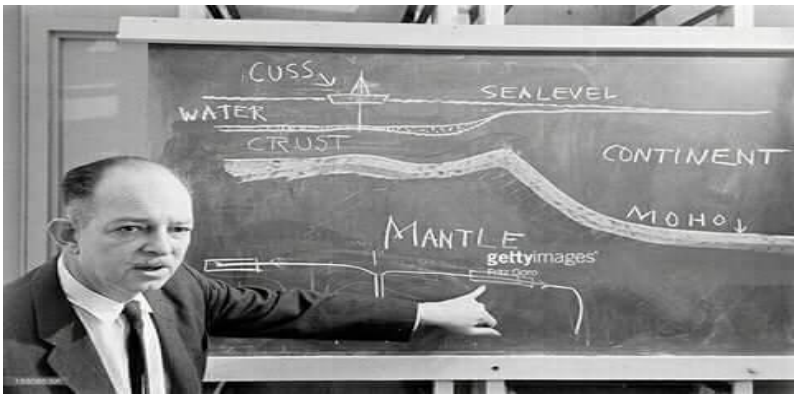
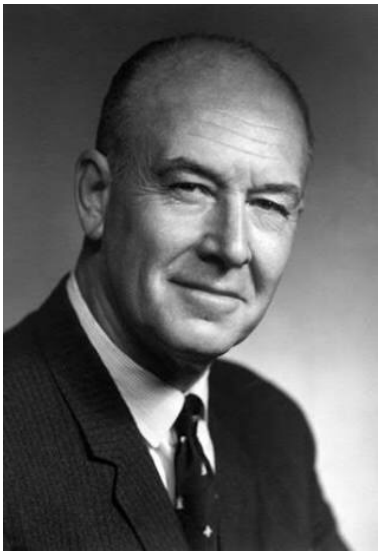
- **Alfred Wegener** postulates that 200 million years ago, a supercontinent he called Pangaea began to break into pieces, its parts moving away from one another. The continents we see today are fragments of that supercontinent.
- How does this happen?
    1. In plate tectonics, Earth's outermost layer, or lithosphere—made up of the crust and upper mantle—is broken into large rocky plates. These plates lie on top of a partially molten layer of rock called the asthenosphere.
    2. Due to the convection of the asthenosphere and lithosphere, the plates move relative to each other at different rates, from two to 15 centimeters (one to six inches) per year.



- **Harry Hess,** an American geologist, proposed that these ridges were the result of molten rock rising from the asthenosphere. As it came to the surface, the rock cooled, making a new crust and spreading the seafloor away from the ridge in a conveyer-belt motion.
- He is also a proponent of the **Seafloor spreading** wherein it is a geologic process in which tectonic plates—large slabs of Earth's lithosphere—split apart from each other. Seafloor spreading and other tectonic activity processes are the result of mantle

convection. Mantle convection is the slow, churning motion of Earth's mantle. Convection currents carry heat from the lower mantle and core to the lithosphere. Convection currents also "recycle" lithospheric materials back to the mantle



John Tuzo Wilson, a Canadian geophysicist, contributed significantly to the theory of plate tectonics by introducing the concept of transform faults—boundaries where tectonic plates slide past each other. This explained the movement along faults like the San Andreas Fault in California, which could not be explained by earlier models.

He also proposed the Hot Spot Theory, which explains how volcanoes can form in the middle of tectonic plates. According to Wilson, hot spots are stationary areas of intense heat in the mantle. As a tectonic plate moves over a hot spot, a chain of volcanoes forms, such as the Hawaiian Islands. These discoveries helped complete and strengthen the theory of plate tectonics by explaining volcanic activity and lateral plate movement.

F. Elaborate (minutes)

Activity: Scientists Fast Talk

Materials: N/A

Mechanism:

1. Divide the class into 3 groups.
2. Each group is assigned one scientist: Alfred Wegener, Harry Hess, and John Tuzo Wilson
3. Each group has 3 minutes to prepare a 30-second script introducing their scientist's major contribution to plate tectonics.
4. Rotation begins:
5. Group 1 presents as Wegener, followed by Groups 2 (Hess), and 3 (Wilson).
6. Each "scientist" speaks quickly, explaining their theory like they're pitching it in a science fair.
7. The Teacher connects all 3 after the quick chats, summarizing: Wegener started it with continental drift, Hess explained seafloor spreading, and Wilson tied it all with the theory of plate tectonics and transform faults.

IV. Assessment/Evaluate (10 minutes)

Name: Date:

Gr. & Sec.: Score:

Test I. Multiple choice (5 items)
Instruction: Read each question carefully before answering. Encircle the letter of the best answer.

1. Which of the following best defines the theory of plate tectonics?
   a. The theory that the Earth's lithosphere is divided into several large and small plates that are constantly moving.
   b. The idea that the Earth's core is made of solid iron and nickel.
   c. The study of how mountains are formed on Earth's surface.
   d. The measurement of earthquake waves to understand Earth's interior.
2. At a convergent plate boundary where two continental plates collide, which of the following geological features is most likely to form?

a. A mid-ocean ridge with volcanic activity.
b. A deep ocean trench and a volcanic island arc.
c. A rift valley with volcanic eruptions.
d. High mountain ranges with folding and faulting.

3. The San Andreas Fault in California is a significant geological feature. What type of plate boundary is responsible for its formation and the frequent earthquakes in the region?
   a. Divergent boundary
   b. Transform boundary
   c. Convergent boundary (continental-continental)
   d. Convergent boundary (oceanic-continental)
4. The formation of the Hawaiian Islands, a chain of volcanic islands in the middle of the Pacific Ocean, is primarily associated with:
   a. A divergent plate boundary where a new crust is being formed.
   b. A convergent plate boundary where one plate is subducting beneath another.
   c. A hot spot, which is an area of volcanic activity caused by a plume of magma rising from deep within the mantle, independent of plate boundaries.
   d. A transform plate boundary where plates are sliding past each other.
5. Which of the following best demonstrates the concept of seafloor spreading and the creation of new oceanic crust?
   a. The formation of deep ocean trenches along subduction zones.
   b. The upwelling of magma at divergent plate boundaries, particularly at mid-ocean ridges.
   c. The folding and faulting of rock layers in the formation of mountain ranges.
   d. The sliding of tectonic plates past each other along major fault lines.

Test II. Modified True or False (5 items)
Instructions: Write TRUE if the statement is correct. If the statement is FALSE, underline the incorrect word/phrase and write the correct answer on the space provided.

_____1. Convergent boundaries occur when tectonic plates move away from each other.

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_____2. Sea-floor spreading happens at convergent plate boundaries.
_____3. Continental drift theory was first proposed by Alfred Wegener.
_____ 4. The Himalayas were formed due to a collision between the Indian and Eurasian plates.
_____5. The Philippine Trench was formed due to the subduction of the Eurasian Plate beneath the Philippine Sea Plate.

Test III. Essay (5 items)

1. How does the movement of tectonic plates explain the distribution of earthquakes and volcanoes around the world?

2. How do the three main types of plate boundaries (convergent, divergent, transform) influence the topography of Earth?

3. How can plate tectonics control climate over geologic time?

4. Compare and contrast oceanic and continental plates based on their properties and behaviors when they are being subducted.

5. Why do certain areas have more tectonic activity than others?

Answer Key:

I.
1. A.

2. D.
3. B.
4. C.
5. B.

II.
1. False - move towards each other
2. False - divergent plate boundaries
3. True
4. True
5. False - Philippine Sea Plate beneath the Eurasian Plate

III.
1. Possible answer: Earthquakes and volcanoes mostly occur along plate boundaries, where plates interact. Convergent boundaries cause subduction, leading to volcanoes. Transform and convergent boundaries cause earthquakes due to stress buildup and release.
2. Possible answer: Convergent boundaries create mountains and trenches; divergent boundaries form mid-ocean ridges and rift valleys; transform boundaries create faults and linear valleys.
3. Possible answer: Plate movements affect ocean currents, volcanic activity (which can release gases that influence climate), and mountain formation, all of which can alter Earth's climate over millions of years.
4. Possible answer: Oceanic plates are denser and thinner, so they usually subduct beneath lighter continental plates. Continental plates are thicker and less dense, making them less likely to be subducted.
5. Possible answer: Regions near active plate boundaries experience more tectonic activity due to constant interactions between plates, such as subduction, collision, and sliding past one another.

V. Extend

Use Case 1: Students can conduct an interview with a family member or community elder regarding their experience with an earthquake or volcanic eruption. They will collect the information gathered and connect the event to what they have learned

about plate tectonics and present their findings in front of the class. This helps in connecting classroom learning to actual events.

Use Case 2: Students can design a basic awareness campaign (poster, infographic, or short video) on the hazards of residing around plate boundaries and ways on how to be safe. This encourages civic responsibility and enhances their knowledge of tectonic processes.

Assignment

1. Create a reflective essay on the impact of plate tectonics in the Philippines and how learning about the topic enables you and your community to prepare for natural disasters. Support your arguments using concrete examples from class discussions and actual cases.