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Plate Tectonic: Plates and Their Consequences [8th grade]

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UNDERSTANDING BY DESIGN

Unit Cover Page

Unit Title: **Plate Tectonic: Plates and Their Consequences**

Grade Level: **8**

Subject/Topic Area(s): **Earth Science**

Designed By: **Alexander Serna-Wallender**

Time Frame: **18 Days**

School District:

School:

School Address and Phone:

Brief Summary of Unit (Including curricular context and unit goals):

By the end of this unit students will be able to identify the various layers of the earth and their characteristics. Students will be able to describe the relationship between the lithosphere and the mantle. Using their knowledge of this relationship, students will then be engaged in exploring how tectonic plates work and their interactions along plate boundaries. Students will also be able to predict the resulting geologic activity given a specific plate boundary type. Lastly, students will be able describe the formation and consequences of three common geologic events: earthquakes, volcanoes, and mountain building.

Unit: Plate Tectonics – Plates and Their Consequences

Grade: 8th Grade

Stage 1: Desired Results

Established Goals (Standards)

NJCCCS -

5.4.8.D.1 - Earth is layered with a lithosphere, a hot, convecting mantle, and a dense, metallic core.

5.4.8.D.2 - Major geological events, such as earthquakes, volcanic eruptions, and mountain building, result from the motion of plates. Sea floor spreading, revealed in mapping of the Mid-Atlantic Ridge, and subduction zones are evidence for the theory of plate tectonics.

Understandings

Students will understand that...

- The Earth’s surface is not static but constantly changing because of tectonic plates.
- Most geologic activity occurs at the boundaries between plates.
- Geologic activity can have immediate and long term consequences.

Essential Questions

- Why does the earth’s surface change?
- How do we know there are tectonic plates?
- How do the earth’s plates interact?
- How do plate interactions affect humans and the environment?

Knowledge

Students will know...

- The earth’s layers and the composition of those layers.
- The relationship between the convecting mantle and the lithosphere.
- Alfred Wegner and the development of plate tectonic theory.
- The location and movement of the earth’s tectonic plates.
- The difference between convergent, divergent and transform plate boundaries and their results.
- Volcanoes develop from magma moving upward from deep within the Earth.
- Earthquakes are natural vibrations of the ground, some of which are caused by movements along fractures in Earth’s crust.
- Mountains form through dynamic processes which crumple, fold, and create faults in the Earth’s crust.

Skills

Students will be able to...

- Map the Earth’s Tectonic Plates
- Model the interactions between the layers of Earth.
- Identify and model the interactions between various plate boundaries.
- Predict where mountain building, earthquakes, and volcanic activity are likely to occur.
- Present evidence to support arguments for the theory of plate motion.

Stage 2: Assessment Evidence

Performance Task:

Students will be broken into groups of three or four. Each group of students will be assigned a country (United States, Peru, Ethiopia, India, Saudi Arabia, Japan, and Australia). That group will then research the tectonic plate on which that country rests, its plate boundaries and occurrences of geologic activity and then create a Google earth document with the following:

- Name and draw the boundary of the tectonic plate on which their country rests.
- Identify, label, and describe each type of plate boundary for their country's tectonic plate. Provide an appropriate key.
- For two of the plate boundaries identify at least two occurrences of mountain building, earthquakes, or volcanic activity. For each occurrence you will add a place marker with a picture, description, and explain why the occurrence happens along that boundary.
- Make a prediction, label and justify where you would find an occurrence of two of the following mountain building, earthquake, and volcanic activity.

Rubric Attached....

Other evidence:

(quizzes, tests, academic prompts, self-assessments, etc.

note – these are usually included where appropriate in Stage 3 as well)

- End of Unit Test
- Exit Slips
- Plate Boundary Activity
- Mini-Assessments

Stage 3: Learning Activities

(Steps taken to get students to answer Stage 1 questions and complete performance task)

Day 1: Layers of the Earth

Engage: [Layers of the Earth Song](#) – As a class we'll listen to the song twice. First time straight through and the second time looking at the lyrics and asking students to share on what they heard in the song.

Pre-Assessment: Students will be given a pre-assessment on the layers of the earth, three main types of plate boundaries, the cause and effects of mountain building, volcanoes, and earthquakes.

Explore: [Side by Side Comparison](#) – Layers of the Earth to Milky way Candy Bar – Students will be given a snack size Milky Way bar which they will cut in half with their table partner. They will have a couple of minutes to make observations about each layer in side of the candy bar. They will share out their observations. Then using their background knowledge students and a word bank, students will try to match each layer of the candy bar to a layer of the earth.

Explain: [Layers of the Earth Foldable](#) – After the previous activity student's will then take the paper they picked up at the door fold it so it creates a water fall effect. On the front they will draw a cross-section of the earth so that each tab corresponds to a different layer. Inside of the tabs students will takes notes on various characteristics of each layers, including size, composition and unique features.

Evaluate: [3-2-1 Exit Slip](#): Students will identify three of the earth's layers, describe two of them, and ask one question they still have.

Day 2: Lithosphere & Mantle

Engage: [Structure of the Earth](#) - Students will engage in a short online demo exploring each layer of the earth and the unique characteristics of them.

Explore: [Traveling Rice](#) – Class will start with a whole group demo watching how rice travels in boiling water. Students will observe rice move in a circular (convecting fashion). Students will be asked to make observations about what they are observing.

Explain: [BBC Earth's Moving Plates](#) – Students will watch the following clip demonstrating the relationship between the core, mantle, asthenosphere, and the lithosphere.

[Science Journal – Mantle & Lithosphere](#) – In their science journals students will make a new entry, drawing the boundary between the lithosphere and upper mantle and take notes on how and why convection currents occur and how the convection current affect the lithosphere.

Day 3: Plate Tectonic Theory

Engage: [Plate Tectonic Song](#)

Explore: [Building Pangaea Gizmo](#) (ExploreLearning.com): Using the computer simulation students will explore various pieces of data (fossil records, rock types, etc.) that scientists have collected to form the theory of plate tectonics.

Explain: [On Solid Ground](#) – Students will read the passage on their own and then with their table partner answer a series of questions related to the development of Wegener's theory of plate tectonics.

Day 4: Tectonic Plates

Engage: [Earth 100 Million Years from now Video](#)

[Plate Tectonic Puzzle](#) – With their table partners students will try to reconstruct the map of earth divided along plate boundaries.

Explore: [Discovering Plate Boundaries](#) – Students will be assigned two different groups. Their first group will be looking at making specific observations about one map of the earth (Seismology, Geochronology, Volcanology, or Geography). They will then draw hypothesis different type of boundaries between each of the earth's plates. Once they are finished in their map specific group they will get into their plate specific group. This group will take a closer look at the data gathered by the individual group members in their previous groups and compile the data about their plate's specific boundaries trying to determine and discover any patterns that they might notice. They will then create a new map as a group.

Day 5: Tectonic Plates

Explore: Finish [Discovering Plate Boundaries](#) activity from the previous day.

Explain: [Tectonic Plate Maps](#) – Students will be given a blank plate tectonic map. They will then color and label the specific plates.

Evaluate: [Mini-Assessment](#) - Students will answer a short, 5 questions assessment to evaluate their understanding of the layers of the earth and plate tectonics.

Day 6: Tectonic Plate Boundaries

Explore: [Plate Tectonics Gizmo](#) (ExploreLearning.com): Using the computer simulation students will explore various types of plate boundaries and their resulting consequences.

Day 7: Tectonic Plate Boundaries

Engage/Explore: [Tasty Tectonics](#) – In groups of four students will be given a series of edible supplies. They will use these supplies as instructed by their teacher to model the different type of plate boundaries and their results.

Explain: [Plate Boundaries Foldbook](#) - Using their book students will create a four door fold book describing the four common types of plate boundaries (Convergent – Subducting, Convergent- Colliding, Divergent, Transform) and their results.

Elaborate: [Big Picture Boundary Types](#) - Using their Tectonic plate maps from day 5 students will add in data about what type of plate boundaries, each boundary on their map are.

Day 8: Sea Floor Spreading

Engage: [Greatest Discoveries – Seafloor Spreading Video](#)

Explore: [Making a Model of Sea Floor Spreading](#) – With their table partners students will create and working model of sea floor spreading looking at how the ocean floor is created and then and later subducts. Using their model they will then answer some analysis questions.

Explain: [Science Journal – Seafloors Spreading](#) – In their science journals students will make a new entry, drawing on a map where sea floor spreading occurs, taking notes about its discovery, why it happens, and what are its consequences.

Evaluate: [Three Sentence Summary Exit Slip](#) – In three sentences students will summarize what they learned that day about seafloor spreading and turn it in as they leave.

Day 9: Mountain Building

Engage: [Can you Find the Mountains](#) – Given a relief map table partners will be challenged to find and name as many mountain ranges as possible. They will then share out with the class and see how many ranges we can find and name. We will then over lay a plate tectonic map and

Explore: [Folded Mountains](#) - In their investigation groups students will use play dough and model the different ways mountain are able to form

Explain: [Mountain Building Foldbook](#) – Students will create a four door fold book comparing the different ways that mountains can be formed.

Day 10: Mountain Building

Engage: [Mountain Building Animations](#) - Class will begin by examining different types of mountain formations. Students will be asked to report their observations after each clip.

Explain: [Many Faces of the Mountain Article](#) – Students will read the article and answer a series of critical thinking questions about what they have read.

Explain: [Science Journal – Mountain Building](#) – In their science journals students will make a new entry,

drawing on a map where mountain building occurs, taking notes about the different types, why it happens, and what are its consequences.

Evaluate: [Name that Formation](#) – Shown a series of pictures students will have to decide what mountain forming process caused t

Day 11: Volcanoes

Engage: [Volcano Song](#)

Explore: [Eruption Comparison](#) – Students will be shown an in class demo of a volcanic eruption and then be asked to compare their observations of that model to a video clip of an actual volcanic eruption.

Explain: [A Survivors Tale Article](#) - Students will read the article and answer a series of critical thinking questions about what they have read.

Explain: [Science Journal - Volcanoes](#) – In their science journals students will make a new entry, drawing on a map where volcanoes form, taking notes about the process, the different types, why it happens, and what are their consequences.

Day12: Volcanoes

Explain/Elaborate: [Volcanoes Webquest](#) – Students will be guided through exploring the formation, types, and consequences of volcanoes through a series of questions that challenge them to find and analyze information.

Evaluate: [Mini-Assessment](#) - Students will answer a short, 10 questions assessment to evaluate their understanding of mountain building and volcanoes.

Day 13: Earthquakes:

Engage: [Earthquakes Song](#)

[Earthquake Video Clips](#) - As a class, students will watch a series of clips showing the destructive power of earthquakes. Students will be asked about their reactions to the videos and what they observed.

Explore: [Earthquake Jell-O Simulation](#) – Students will be broken up into groups of four. They will be given a square of Jell-O, marshmallows, and toothpicks and be asked to construct a building as tall and stable as possible to survive an earthquake simulation.

Explain: [Science Journal – Earthquakes](#) – In their science journals students will make a new entry, drawing on a map where mountain building occurs, taking notes about the different types, why it happens, and what are its consequences.

Elaborate: [Earthquake News Articles](#) – Students will be broken up into groups of four. Each group will be assigned an article about recent occurrences of earthquakes. As a group they will read the article and then using poster paper summarizes and present what they read in their article to the class.

Day 14: Earthquakes/Faults:

Engage: [Fault Hand Models](#) – Students will be introduced to the different types of faults through kinesthetic hand movements.

Explore/Explain: [A Model of Three Faults](#) – In their investigation groups students will construct a fault model that they will then be able to use to explore the three common fault types, their differences, and

their resulting consequences.

Elaborate/Evaluate: [Seven Factors that Determine the Destructiveness of an Earthquake](#) – Students will read through the article describing the factors that contribute to an earthquake’s destructiveness. They will then need to decide and justify which factor they think is the most important.

Day 15: Performance Assessment

Explain: Introduce Performance Assessment – The teacher will guide students through their performance assessment instructions, go over the rubric, and review the need skills in using Google Earth.

Evaluate: Performance Assessment - Students will have time to work on their performance assessment in class.

Day 16: Performance Assessment

Evaluate: Performance Assessment - Students will have time to work on their performance assessment in class.

Day 17: Performance Assessment and Review

Evaluate: Performance Assessment - Students will have time to work on their performance assessment in class.

Review: “Numbered Heads” – Students will then be divided into groups of four and we will play numbered heads to review key topics for the exam.

Day 18: Unit Test

	Excellent	Good	Below Expectations	Needs Improvement
Tectonic Plate	Student correctly identifies and draws the boundary of the tectonic plate. (10pts)	Student correctly identifies and the tectonic plate and gets 90% of the border correct. (8pts)	Student correctly identifies and the tectonic plate and gets 80% of the border correct. (6pts)	Student correctly identifies and the tectonic plate and gets 60% of the border correct. (4pts)
Plate Boundary	Student identifies and labels all of the plate boundaries correctly. Student thoroughly describes the interactions at each boundary. (20pts)	Student identifies and labels all of the plate boundaries correctly. Student describes the interactions at each boundary. (15pts)	Student identifies and labels 75% of the plate boundaries correctly. Student describes the interactions at each boundary. (10pts)	Student identifies and labels 50% of the plate boundaries correctly. Student does not describe the interactions at each boundary. (5pts)
Geologic Occurrences - Boundary One	Student correctly identifies two occurrences of geologic activity along one of the plate boundaries. Comprehensively describes and explains each occurrence. (20pts)	Student correctly identifies two occurrences of geologic activity along one of the plate boundaries. Adequately describes and explains each occurrence. (15pts)	Student correctly identifies one occurrence of geologic activity along one of the plate boundaries. Adequately describes and explains each occurrence. (10pts)	Student correctly identifies one occurrence of geologic activity along one of the plate boundaries. Lacks adequate description and explanation of the occurrence. (5pts)
Geologic Occurrences - Boundary Two	Student correctly identifies two occurrences of geologic activity along one of the plate boundaries. Comprehensively describes and explains each occurrence. (20pts)	Student correctly identifies two occurrences of geologic activity along one of the plate boundaries. Adequately describes and explains each occurrence. (15pts)	Student correctly identifies one occurrence of geologic activity along one of the plate boundaries. Adequately describes and explains each occurrence. (10pts)	Student correctly identifies one occurrence of geologic activity along one of the plate boundaries. Lacks adequate description and explanation of the occurrence. (5pts)
Prediction	Student correctly predicts and explains the location of two geologic occurrences. (15pts)	Student correctly predicts and attempts to explain the location of two geologic occurrences. (11pts)	Student correctly predicts and attempts to explain the location of one geologic occurrence. (7pts)	Student predicts the location of two geologic occurrences. (4pts)
Neatness/Accuracy	The map is complete, neatly organized, functions correctly and all the information is accurately cited. (7pts)	The map is 90% complete, organized, functions correctly and all the information is accurately cited. (5pts)	The map is 80% complete, somewhat organized, functions and all the information is mostly cited. (3pts)	The map is 60% complete, not organized, and the information is not accurately cited. (2pts)
Group Effort	Every member of the group was active, participating, and on task the entire time. (8pts)	Every member of the group was active, participating, and on task the 90% of the time. (5pts)	Every member of the group was active, participating, and on task the 80% of the time. (3pts)	Every member of the group was active, participating, and on task the 60% of the time. (2pts)