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Lesson Title: Divergent Plate Boundaries: The Earth is Tearing Itself Apart
Grade Level: 8th
Essential Question: How might understanding the different plate boundaries help prepare us for future geological events?

Lesson Foundations

Content Standards	**8.ESS.2** Earth's lithosphere consists of major and minor tectonic plates that move relative to each other.		
Learning Objective(s)	1. SWBAT explain divergent boundaries and their features. 2. SWBAT identify features of divergent boundaries.	Assessment(s)	1. Divergent Boundary Model 2. Check for Understanding 3. Divergent Boundaries of Earth
Materials & Resources	A Postcard from Reykjavik: Iceland's Volcanic History: http://origins.osu.edu/connecting-history/postcard-reykjavik-iceland-s-volcanic-history Whiteboards, Whiteboard markers, computer paper, poster board, colored pencils, post it notes, Individual technology learning devices, headphones		

Instructional Procedures/Steps

Opening	**Opener: Whiteboard Review!** 1. As students enter the room, hand them a pairing card based on a variety of sports. 2. Have students sit with their partner and review notes from the previous day; whiteboards have been placed at each table (one per student). Instruct them to not touch the whiteboards until it is time to do so. 3. Once class has started, begin the whiteboard review. Ask the questions on the PowerPoint and allow students to write the answer on their boards (they may use their notes, but not their partner). Once everyone appears to have written an answer, have them show their boards to you. Make a note of common wrong answers and discuss if necessary. 4. Questions asked: a. At convergent boundaries, Earth's plates are _____: b. When two plates collide, the heavier of the two is pulled under the lighter plate in a process called _____:

	c. What are the three types of subduction zones found on Earth? d. What is the gravity-controlled process where a cold, denser oceanic slab sinks into a subduction zone? e. What other process depicted on this image do scientists believe aid in the movement of Earth's plates? f. Based on your knowledge of what a Convergent Boundary is, what do you think happens at a Divergent Boundary? 5. Explain that today, they will be investigating and observing Divergent Boundaries, their features, and where we can find them on Earth. **Agenda and LO's:** 1. Have students reach under their chairs; three lucky people will have 2 LO's and 1 Agenda taped underneath. Have these students read them out loud, starting with the Agenda. 2. As students are reading out the Agenda and LO's, hand out one pre-cut poster board piece and two strips of paper to each pair of students.
Instruction 40 Minutes	**Divergent Boundary Model** 1. Instructions on how to create the model is included with the materials. 2. Instruct students to take their two strips of paper and feed them through the middle cut of the poster board piece. They will then take one slip to feed through the right cut and the second slip will feed through the left. They will then tape the slips of paper to themselves to create a loop. Image is shown on the PowerPoint and materials page. 3. As students are creating their model, pass out the Activity Worksheet. 4. Once students have created their models, have them answer the questions on the Activity Worksheet. Float and ask additional questions as needed: a. We have talked before about limitations of scientific models; what sort of limitations might exist in this model of Earth's crust? b. How might your model differ from the actual movement of the Earth's crust? c. What does this model show about the creation and destruction of Earth's crust? Is it ever actually "destroyed"? d. At the divergent boundary, do you think the material coming out of it is solid, liquid, or something else? Why?

	e. If divergent boundaries cause plates to move away from each other, then we have magma flowing out of this gap; what might happen when that magma hits cold ocean water? What might happen if it's on land? f. Think of the features associated with convergent boundaries and what you are observing with your model; what kind of features would you guess are associated with divergent boundaries? 5. If students finish early, allow them to add some features to their convergent boundaries (allow them to choose as a check for understanding for convergent plate boundary features). Provide color pencils or art supplies as needed. 6. Once time has ended, have students put their names on the cardboard pieces and place them in a safe space like a counter/table away from student workspace (dismiss by row); they will be using these for a future activity. 7. Collect the students' worksheets. **Mini Lecture and Check for Understanding** 1. Begin Mini Lecture by going over the model activity: a. Slide 20: What did the middle of your model represent? b. What did the cuts on the sides of your model represent? c. What geological process happened at those convergent boundaries? 2. Slide 21: Point out the convergent boundary shown in the diagram and the related features. Next, point out the divergent boundary and make connections from the students' models to the depiction. Make note to document the slab pull happening at the convergent boundary that helps pull the plates away from the divergent boundary. a. Based on this image, what might you say is one feature of a divergent boundary? 3. Explain that divergent boundaries within our oceans have ridges as features. 4. Slide 22: These ridges are the result of the rising convection current that lifts the lithosphere. a. What would be the result if there was a divergent boundary beneath a continental plate? 5. Slide 23: The pull apart on continental plates is not as strong to create a single, clean break. Rather, the plate is arched upwards from the convection current and fractured into rifts. A second feature of divergent boundaries when between continental plates are ridges. 6. Do a quick Thumbs Up/Thumbs Down Check for Understanding using True-False statements (questions on slides). For any False items, have students provide an answer to change the statement to True.

	Where in the World are Divergent Plate Boundaries? 1. Hand out the Tectonic Plates Map and the Stations Worksheet. Students will work with their partners at the different stations. a. Note: There are three stations. You can have several of the same station depending on how many students there are, or you may have students stay in their same seats to work with their partners on the stations. 2. Briefly explain how the students will use the map and the resources on their handouts to answer the questions. Make a note to point out the arrows on the map and the legend; explain how these arrows do not correspond to the exact points of plate boundaries, but rather overall movement at that point. Lastly, mention how the plates are massive on the Earth's surface and that the movement of the plates is not a singular direction. Plates tend to pivot in different places so movement will not be the same. Focus on the map's description of the actual boundaries. 3. Give the students 6 minutes at each station and allow them to begin with the first. Float and ask questions as needed: a. What are the features of divergent boundaries we have talked about? b. What would happen to a divergent continental rift if it was close enough to a large body of water? c. Should we expect another Pangea moment within our lifetime? Why or why not? 4. Once time is up and all stations have been visited, have students pass in their maps and handouts. Move into the exit ticket and closure of the lesson plan. **Wrap-Up** 1. Bring class together and clarify any points of confusion from the stations. 2. Lead whole class discussion about essential question for the lesson: How might understanding the different plate boundaries help prepare us for future geological events?
Closure 2 Minutes	**Parking Lot Exit Ticket** 1. Explain that they will pick up tomorrow with a more in depth look at the ocean floor and the process of ocean spreading. a. The Earth's plates are moving away from each other, but how fast are they actually moving? Probably pretty slow, right? We also all know that there's a North and a South pole that magnetizes the Earth. But those poles haven't always been where they are today. Tomorrow, we are going to look at how fast seafloor spreading occurs and the Earth's changing poles and how we can use the ocean floor to determine how Earth's polarity has changed.

	2. Have students write down on a post-it note 3: key learning points from today's lesson; 2: key vocabulary terms they learned today; 1: conclusion they can draw from today's lesson. Have them sign their name and place the post it note on the class parking lot as they leave the room.
Accommodations/ Enrichment	• Extension activity added to the divergent boundary activity. • Paper directions (page 6 of materials) can be handed to students who need additional aid in creating the model. • To differentiate, you can begin by having the boundaries already labeled on the model and have students focus more on what is happening to the paper as it is being moved.

References:

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