

Fixing Dani's Quiz: Eight Statements About Moving Plates

Learning target: I can find the errors in a student's explanations of plate tectonics, explain why each error is tempting, and rewrite each statement so it is scientifically accurate.

Error analysis

About 35 min

Individual

MS-ESS2-3 · practice

writing

independent practice

Name _____

Date _____

Period _____

Directions

Dani took a quiz on this chapter and wrote the eight statements below. Some are wrong, and at least one is right. Your job is to be the grader. First mark each statement correct or incorrect in the table. Then, for each incorrect one, explain what is wrong, why a reasonable person might think it, and rewrite it correctly in your own words. For the correct one, explain why it is correct so that Dani knows what to keep doing. Rewrite in full sentences; do not just add the word 'not'.

You will need: This worksheet, Pencil, Calculator

Dani's eight statements — **1.** The continents float on an ocean of liquid magma and push through the ocean floor like ships through water. **2.** Scientists ignored Wegener because he did not have any evidence for continental drift. **3.** The youngest rocks on the ocean floor are the ones farthest from the mid-ocean ridge, because the ridge is the oldest mountain chain in the ocean. **4.** The mid-ocean ridge forms where two plates push toward each other and crash, which pushes up the mountains. **5.** A plate moves 5 cm per year, so in 1 million years it moves $5 \text{ cm} \times 1,000,000 = 5,000,000 \text{ km}$. **6.** Plate tectonics is just a theory, which means scientists are not really sure about it. **7.** Earth is not getting bigger, even though new seafloor forms at ridges, because old seafloor sinks into the mantle at trenches. **8.** Earthquakes happen randomly all over the world, so they cannot tell us anything about where the plates are.

Part A: Grade the quiz

1. For each statement, write 'correct' or 'incorrect' and copy the single word, phrase or number in the statement that tells you.

Correct or incorrect?	The key word or number that gives it away
Statement 1	
Statement 2	
Statement 3	
Statement 4	
Statement 5	
Statement 6	
Statement 7	
Statement 8	

Part B: Diagnose and rewrite

For each item below, write three things: (a) what is wrong, (b) why Dani might have thought it, and (c) the corrected statement.

2. **Statement 1** (continents float on liquid magma and push through the ocean floor). Your rewrite must say what the mantle below the plates is actually like and what moves along with a continent.

3. **Statement 2** (Wegener had no evidence). Your rewrite must name at least two kinds of evidence he did have and the real reason his idea was set aside.

4. **Statement 3** (youngest rocks farthest from the ridge). Your rewrite must say where the youngest seafloor actually is and why.

5. **Statement 4** (the ridge forms where plates crash together). Your rewrite must name the correct type of plate boundary at a ridge and say what structure **does** form where an ocean plate meets another plate head-on.

6. **Statement 5** (5 cm per year for 1 million years = 5,000,000 km). Find the exact step where the calculation goes wrong, then redo it correctly with every unit shown. (1 km = 100,000 cm.)

7. **Statement 6** ('just a theory'). Your rewrite must explain what the word theory means in science and name at least two independent lines of evidence that support plate tectonics.

8. **Statement 8** (earthquakes are random). Your rewrite must describe the actual pattern of earthquakes and what that pattern told scientists.

Part C: The one Dani got right

9. Explain why **Statement 7** is correct. Name the process at the trench, and say why 'the seafloor gets destroyed' and 'the seafloor gets made' can both be true at the same time.

10. Look back over Dani's seven mistakes. Sort them into two groups: mistakes about **what Earth is like** (structures, materials, directions) and mistakes about **how science works** (evidence, theories, units). Which group would you help Dani with first, and what single idea from this chapter would fix the most statements at once?

Three sentence frames

For each diagnosis, use these frames and then smooth them into a paragraph. (a) 'The statement is wrong because it says _____, but actually _____.' (b) 'Dani may have thought this because _____ (a picture, a word that sounds like something else, an everyday meaning).' (c) 'A correct statement is: _____.' For the calculation in q6, write each quantity with its unit on its own line, and check that the unit of the answer is a distance.

Write the ninth statement

Write a ninth statement for Dani's quiz that is wrong in a **subtle** way: it should sound scientific and use correct vocabulary, but contain one error that a careful reader would catch. Good targets are the location of the oldest seafloor in the Atlantic, the difference between a plate and a continent, or the claim that the oldest seafloor is always at a trench. Then write the diagnosis and the corrected version, and explain why your error is harder to spot than Dani's.