

Fix Mateo's Rock Cycle: Finding and Repairing Six Errors

Learning target: I can find the errors in another student's explanation of the rock cycle, explain the thinking behind each error, and rewrite each statement so that it is scientifically correct.

Error analysis

About 40 min

Individual

MS-ESS2-1 · practice

writing

independent practice

Name _____

Date _____

Period _____

Directions

Mateo is a seventh grader who wrote a summary of the rock cycle and drew a diagram. Some of his sentences are correct and some contain a science error. Read all eight sentences and the description of his diagram first. Then find the errors, explain what Mateo was probably thinking when he made each one, and rewrite each wrong sentence so that it is correct. Rewriting means keeping his idea's topic but fixing the science, not deleting the sentence.

You will need: This worksheet, Pencil, Colored pencil for marking errors (optional)

Mateo's summary (numbered sentences)

What Mateo wrote — **S1.** Rocks move through the rock cycle in a fixed order: igneous rock becomes sedimentary rock, sedimentary rock becomes metamorphic rock, and metamorphic rock melts to make igneous rock again. **S2.** Igneous rock forms when magma or lava cools and its minerals crystallize. **S3.** Granite has big crystals because it cooled quickly at the surface, where there was plenty of room for the crystals to spread out. **S4.** Sand turns into sandstone when it dries out in the sun and hardens, the way mud dries into a crust. **S5.** Metamorphic rock forms when a rock gets so hot that it melts partway and then re-hardens with a new texture. **S6.** Weathering breaks rock down where it sits, and erosion carries the pieces away. **S7.** The Sun's heat is what melts rock deep underground into magma, because the Sun is Earth's main energy source. **S8.** Once a rock has become metamorphic, it has reached the end of the cycle and cannot change into anything else.

Mateo's diagram (described) — A single circle with three boxes spaced around it: Igneous rock, Sedimentary rock, Metamorphic rock. Three arrows run clockwise: Igneous to Sedimentary, labeled 'weathering'; Sedimentary to Metamorphic, labeled 'heat and pressure'; Metamorphic to Igneous, labeled 'melting'. There are no other boxes and no other arrows.

Part A: Find the errors

1. Write the numbers of the sentences that contain a science error: _____. (Two sentences are correct as written.)

Part B: Explain and repair

For each sentence below, write two things: (a) what Mateo was probably thinking, and why it seems reasonable but is wrong; (b) a corrected sentence.

2. **S1** (the fixed order).

3. **S3** (granite's big crystals).

4. **S4** (sand drying into sandstone).

5. **S5** (metamorphic rock melting partway).

6. **S7** (the Sun melting rock underground).

7. **S8** (metamorphic rock as the end of the cycle).

Part C: Repair the diagram and look back

8. Mateo's diagram has the same problem as S1, plus two missing boxes. Name the two boxes he should add, and list **three** arrows (with their process labels) that his diagram is missing.

9. Which everyday experience most likely led Mateo to the error in S5?

- ☐ **A.** Seeing ice melt and refreeze into a different shape, and assuming rock changes the same way
- ☐ **B.** Noticing that sand on a beach is made of tiny grains
- ☐ **C.** Watching a river carry mud after a storm
- ☐ **D.** Finding that a rock feels warm after sitting in the sun

10. Write a replacement summary for Mateo in four to six sentences that keeps his two correct sentences and fixes every error. It must say that any rock can become any other, and it must name the energy source behind surface processes and the energy source behind deep processes.

Three questions to test any sentence

Run each sentence through these tests. Test 1, order: does the sentence force rock to follow one path? Real rock can take any route. Test 2, melting: does the sentence say rock melts when the process does not involve melting? Only the route into magma involves melting; metamorphic change happens in solid rock. Test 3, energy: does the sentence put the Sun underground or Earth's interior at the surface? The Sun drives weathering, erosion and deposition at the surface; Earth's interior drives melting, metamorphism and uplift below it. Also check the crystal rule: slow cooling underground makes big crystals, fast cooling at the surface makes small ones.

Write the trap

Write your own eight-sentence rock-cycle summary that contains exactly three errors, each of a different kind (one about order, one about energy, one about a process). Make the errors sound reasonable, the way Mateo's do, by building each on a real everyday experience. Trade with a partner and see whether they can find and repair all three. Afterwards, write two sentences about which of your errors was hardest to spot and why that kind of error is easy for people to believe.