

# Fixing Mateo's Poster: Nine Claims About How Water Moves

**Learning target:** I can find the errors in a student's explanation of the water cycle, explain what went wrong in each one, and rewrite the explanation correctly.

Error analysis

About 40 min

Individual

MS-ESS2-4 · practice

writing

independent practice

discussion

Name \_\_\_\_\_

Date \_\_\_\_\_

Period \_\_\_\_\_

## Directions

Mateo made a poster for the science fair. Some of his claims are correct, some are wrong, and one is only partly right. Part A: judge every claim. Part B: for the claims you marked wrong, explain what went wrong, using the idea Mateo mixed up. Part C: rewrite his summary paragraph so that every sentence is accurate. Part D: write the rules that would have saved him. Work alone first; you will compare with a partner in Part D.

**You will need:** This worksheet, Pencil, A partner for Part D

**Mateo's poster: 'How Water Travels' — Claim 1.** Water vapor is the white mist you see rising from a hot shower or a boiling pot. **Claim 2.** Water can only evaporate when it is heated to 100 °C, so lakes and puddles evaporate only on days hotter than that. **Claim 3.** The sun pulls water up into the sky the same way gravity pulls rain down. **Claim 4.** Clouds form when water vapor rises, cools, and condenses onto tiny particles of dust and salt. **Claim 5.** The water cycle starts at the ocean. Water goes ocean, cloud, rain, river, ocean, in that order, every time. **Claim 6.** Groundwater is an underground river flowing through big open caves. **Claim 7.** Rain falls because gravity pulls on droplets that have grown heavy enough; the air pushing up on a falling drop can flatten it or break a big one apart. **Claim 8.** Plants transpire by drinking water in through their leaves and storing it there. **Claim 9.** Frost on a car window is dew that froze overnight.

**Mateo's summary paragraph (for Part C):** 'The water cycle begins when the sun pulls water out of the ocean as steam you can see. The steam rises until it warms up and turns into clouds. When clouds get full, the rain falls. Rain runs into underground rivers and flows back to the ocean, where the cycle starts again.'

Part A: Diagnose every claim

1. For each claim, write *correct*, *wrong* or *partly right* in the first column. In the second column, write the idea he mixed up (for correct claims, write 'none').

| Correct, wrong, or partly right? | The idea Mateo mixed up (a few words) |
|----------------------------------|---------------------------------------|
| Claim 1                          |                                       |
| Claim 2                          |                                       |
| Claim 3                          |                                       |
| Claim 4                          |                                       |
| Claim 5                          |                                       |
| Claim 6                          |                                       |
| Claim 7                          |                                       |
| Claim 8                          |                                       |
| Claim 9                          |                                       |

Part B: Explain what went wrong

2. Claims 1 and 2 are both about evaporation and vapor. Explain what water vapor actually is, what the white mist actually is, and why a puddle can disappear on a 15 °C day. Use the word *molecules* at least once.

3. Claim 3 treats the sun like a force that pulls. Explain what the sun really does to water at the surface, and what actually carries water vapor upward into the sky. Then say why gravity, unlike the sun, really is a pull.

4. Claim 5 gives the water cycle a starting point and a fixed order. Give two real pathways water can take that break Mateo's order (for example, a route that skips the river, or one that never reaches the ocean), and state what is true about the cycle's starting point.

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5. Claims 6 and 8 are both about where water is stored. Describe where groundwater really is and how water really enters and leaves a plant.

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6. Claim 9 is partly right. Explain the case where Mateo is right and the case where he is wrong, naming the change of state in each case.

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### Part C: Rewrite the summary

7. Rewrite Mateo's summary paragraph so that every sentence is scientifically accurate. Keep it to five or six sentences. It must (a) say what the sun actually does, (b) say what has to happen to vapor for a cloud to form, (c) explain what makes rain fall, (d) describe groundwater correctly, and (e) avoid giving the cycle a starting point.

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## Part D: The rules that would have saved him

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8. Write two short rules Mateo could tape to his desk so he never makes errors like Claims 1, 2 and 3 again. Each rule should be one sentence and should start with *If you can see it...* or *Evaporation happens...* or *The sun supplies....* After comparing with a partner, add one rule your partner wrote that you like.

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### Three test questions for any claim

When you are not sure whether a claim is right, ask: (1) Can I see it? If yes, it is not water vapor, because vapor is invisible. (2) Does the claim need water to be at a special temperature? Evaporation needs only energy at the surface, not boiling; condensation needs cooling (or air that is full of vapor), not warming. (3) Who is doing the moving? The sun supplies energy; gravity pulls. If a claim has the sun pulling, or gravity lifting water into the air, something is mixed up.

### Write the trap

Write three new claims about the water cycle for a classmate to judge: one correct, one wrong in a way that is tempting (it should sound right at first), and one partly right. Each claim must involve a different process (choose from transpiration, infiltration, crystallization, runoff, melting). Below each claim, write the key: the verdict, the idea it tests, and the corrected version. Trade with a partner and grade each other's reasoning.