

Fixing Mateo's Desert Notebook: Arrows, Energy and Matter

Learning target: I can find the errors in another student's food web, trophic pyramid and explanations, say what idea went wrong, and rewrite each statement so that it is scientifically accurate.

Error analysis

About 40 min

Individual

MS-LS2-3 · practice

writing

independent practice

Name _____

Date _____

Period _____

Directions

Mateo studied a Mojave Desert food web and wrote eight statements in his notebook. Some are right and some contain a common mistake. First read the desert facts. Then, for each numbered statement, decide whether it is correct, and if it is not, name the idea that went wrong in a few words. Finally rewrite the incorrect statements so they are accurate. Be specific: 'wrong' is not an explanation.

You will need: This worksheet, Pencil, Calculator (optional)

Desert facts Mateo was given — Creosote bushes and desert grasses are the producers. Kangaroo rats eat seeds. Darkling beetles eat dead leaves and seeds. Kit foxes eat kangaroo rats. Golden eagles eat kit foxes and kangaroo rats. Soil bacteria and fungi break down droppings and dead remains. In a teaching model of this web, the producers store 5,000 energy units each year.

Mateo's notebook page

1. I drew the arrow from the kit fox to the kangaroo rat, because the fox eats the rat and the arrow shows who does the eating.
2. Decomposers recycle the energy from dead animals back to the plants, so the desert never needs new energy from the sun.
3. The producers store 5,000 energy units, so using the 10 percent model the kangaroo rats get 500, the kit foxes get 50 and the eagles get 5. Exactly 10 percent is passed on every time in every ecosystem.
4. The 4,500 units of matter that did not pass from the plants to the kangaroo rats were destroyed; they just disappeared as heat.
5. The golden eagle is at the top of the pyramid, so it has the most energy of any organism in the desert.
6. The kit fox does not eat beetles, so a change in the number of kit foxes cannot affect the beetle population.
7. Soil bacteria make nutrients that plants need, so bacteria are producers.
8. A dry year meant fewer seeds, so there were fewer kangaroo rats, so the kit foxes had less to eat. The effect on the foxes is a direct effect of the seed shortage.

Part A: Diagnose

1. Complete the table for all eight statements. Some statements are partly right; mark those 'incorrect' and name only the part that is wrong.

Correct or incorrect?	If incorrect, the idea that went wrong (a few words)
Statement 1	
Statement 2	
Statement 3	
Statement 4	
Statement 5	
Statement 6	
Statement 7	
Statement 8	

Part B: Explain and rewrite

2. Statement 1: Explain what a food web arrow actually represents, then rewrite the statement so the arrow is drawn correctly.

3. Statement 2: Mateo has mixed up two different things. Name them, explain which one decomposers really recycle, and rewrite the statement.

4. Statement 3: Check Mateo's arithmetic by showing each step. Then rewrite the second sentence so it is accurate about the 10 percent figure.

5. Statement 4: Name two places the matter that did not become kangaroo rat actually went, and rewrite the statement. Use the words *matter* and *energy* correctly.

6. Statement 5: What is Mateo confusing about the pyramid? Rewrite the statement to say what the top level actually has.

7. Statement 6: Use the desert facts to trace one path by which a change in kit foxes could reach the beetles, then rewrite the statement.

8. Statement 7: Explain the difference between what bacteria do with nutrients and what producers do with carbon dioxide, water and sunlight. Rewrite the statement.

9. Statement 8: Is the effect on the foxes direct or indirect? Rewrite the last sentence correctly, and name one population whose change in that dry year **would** be a direct effect of the seed shortage.

Part C: The rule behind the mistakes

10. Several of Mateo's mistakes come from the same confusion. Name it, and write a two-sentence rule he could tape inside his notebook that would prevent statements 2, 4 and 5 at the same time.

Two questions for every statement

For each statement ask: (1) Is this about *matter* (atoms, mass, nutrients, carbon dioxide) or about *energy* (sunlight, stored energy, heat)? (2) Does it say something leaves the ecosystem, gets reused, or is destroyed? Matter can leave an organism and be reused, but it is never destroyed. Energy can be used and leaves as heat, and it is never reused by producers. If a statement breaks either rule, it is incorrect.

Write the next three

Write three new statements about the desert web that each contain a different mistake not already on Mateo's page (for example, about biomass, about what 'top predator' depends on, or about where producers get their matter). Trade with a partner, diagnose each other's statements, and rewrite them. Then decide together which of your six mistakes would be hardest for a seventh grader to notice, and why.