

Fixing Jordan's Argument About the Pine Creek Dam

Learning target: I can find the errors in a fictional student's argument about an ecosystem change, explain why each is wrong, and rewrite the argument so that the evidence actually supports it.

Error analysis

About 40 min

Individual

MS-LS2-4 · practice

MS-LS2-1 · supports

writing

independent practice

Name _____

Date _____

Period _____

Directions

Jordan is a fictional seventh grader. Read Jordan's argument, the notes and the data table carefully. The table is a teaching dataset: in the story Jordan's class collected it, but the numbers were invented for this worksheet. In Part A, decide whether each numbered statement is correct. In Part B, explain each error and rewrite the statement. In Part C, rewrite the whole argument so that a scientist would accept it.

You will need: This worksheet, Pencil, Calculator

The situation

Pine Creek is a cold mountain stream. In the spring of 2015 a small dam was finished across it to store water for irrigation, and the stretch just above the dam became a slow, warm reservoir. Jordan's class has a survey reach in that stretch. Cedar Creek, 3 kilometers away, is similar in size, elevation and forest cover, and it has no dam. Every September since 2011, volunteers have counted rainbow trout in a reach of each creek, and every July they have recorded the water temperature.

1. Before the dam, Pine Creek was in perfect balance, and its trout population never changed.
2. In 2014 we counted 64 trout and in 2016 we counted 22. This proves that the dam caused the trout to decline.
3. The dam changed a living part of the ecosystem, because trout are living things.
4. The dam destroyed the Pine Creek ecosystem. Nothing lives there now.
5. Western pond turtles moved into the reservoir from a nearby pond after 2016, so they are an invasive species.
6. If the dam is removed, the creek will go back to exactly the way it was within a year.

Other notes from Jordan's class — Since the dam was built, the survey reach has had more dragonfly larvae and water striders, a few western pond turtles, and far fewer stonefly larvae. Western pond turtles are native to this region; these ones walked over on their own from a pond 400 meters away. Rainbow trout need cold water with plenty of dissolved oxygen, and warm water holds less dissolved oxygen than cold water.

Rainbow trout counts and July water temperature, 2011 to 2020 (teaching dataset)

Simulated teaching dataset: the numbers are invented to be realistic, not measured.

Year	Pine Creek trout	Pine Creek July water (°C)	Cedar Creek trout	Cedar Creek July water (°C)
2011	58	14	61	14
2012	71	15	66	14
2013	52	14	55	15
2014	64	15	63	14
2015	40	18	58	15
2016	22	21	49	15
2017	18	22	60	14
2018	15	22	57	15
2019	12	23	62	14
2020	14	22	59	15

Simulated data for teaching. The Pine Creek dam was finished in spring 2015. Cedar Creek has no dam. Trout are counts in the same reach of each creek every September.

Part A: Diagnose

1. Complete the table for all six of Jordan's statements. A statement that is partly right still counts as needing a fix; name the part that is wrong.

Correct, partly correct or incorrect?	What is wrong (or right) about it?
Statement 1	
Statement 2	
Statement 3	
Statement 4	
Statement 5	
Statement 6	

Part B: Explain and rewrite

2. Statement 1: Use the 2011 to 2014 rows to show that Pine Creek's trout numbers changed even before the dam. Then rewrite the statement using the term **dynamic system**.

3. Statement 2: Calculate the average trout count for 2011 to 2014 and for 2017 to 2020 in **both** creeks, and the percent decrease in each. Use $(\text{before} - \text{after}) \div \text{before} \times 100$. Show your work.

4. Statement 2, continued: Name two things Jordan's 2014-versus-2016 comparison was missing, and explain how the full table supplies them. Is 'proves' the right word? Suggest a better one.

5. Statement 3: Which components of the creek did the dam actually change? Use the temperature columns and the notes, and explain how that change could reach the trout population.

6. Statement 4: Use the class notes to rewrite this statement so that it is accurate.

7. Statement 5: Explain why the turtles are not an invasive species, using what the term actually means.

8. Statement 6: Explain why removing the dam would not return the creek to its old state within a year. Use the ideas of **succession** and **resilience**.

Part C: Rewrite the whole argument

9. Rewrite Jordan's argument so that a scientist would accept it. Include: a claim about what the dam changed and which populations responded; at least three pieces of evidence from the table, including Cedar Creek and more than two years; a mechanism that explains the trout change; and one thing that is still uncertain.

Four questions to ask of any argument

For each of Jordan's statements, ask: (1) Is there a comparison place without the change? (2) Are there enough years to see normal ups and downs? (3) Is there a reason, a mechanism, that explains how the change reaches the population? (4) Does every word fit the evidence, or does a word like 'never', 'proves', 'destroyed' or 'exactly' claim more than the data show? A statement that fails any of these needs a fix. For q3, add the four values and divide by 4, then subtract and divide by the 'before' average.

A real dam removal

Between 2011 and 2014, two large dams were removed from the Elwha River in Washington State, the largest dam removal project in the United States at the time. Find out what scientists measured afterward (salmon returning upstream, sediment moving down to the coast, plants growing on the old lake beds). Write a short paragraph explaining whether the Elwha's recovery supports or challenges your answer to q8, and name one kind of evidence the scientists used that Jordan's class could copy at Pine Creek.