Data Centers teacher pack

Follow information, electricity, heat and local effects through the same facility.

For learners around age 14 and curious adults. Three 40-minute sessions. Use with the current AHA Data Centers manuscript. References use chapter titles so they work in both print and ebook.

Learning goals

Follow information, electricity, heat and local effects through the same facility.

Use the terms server; power; energy; PUE; radiator; latency. Show the reasoning behind an answer and identify where the example stops applying.

Reading route

1. Electricity for an hour

2. The whole-building energy ratio

3. 38 Why not put the cloud above the clouds?

Teaching plan

Session 1: Ask the opening question before reading (5 minutes). Read the first selected chapter together (15). Draw the mechanism or compare two possible explanations (15). End with a one-sentence explanation (5).

Session 2: Read the remaining selected material (10 minutes). Complete the worksheet individually, then compare reasoning in pairs (20). Discuss the common wrong turn (10).

Session 3: Revisit one uncertain answer (10 minutes). Try the extension (15). Give a two-minute explanation without the book (10). Use the exit question (5).

Materials and access

Paper, pencil, the book and an optional calculator. Read diagrams aloud, allow spoken or drawn responses, and give extra time for vocabulary. No real accounts or specialist equipment are needed.

Data Centers learner worksheet

Opening question

If space is cold, can an orbiting computer simply stop needing cooling equipment?

Investigation

Consider a fictional hall whose IT equipment draws 100 kW continuously. Its total facility draw is 130 kW. Treat these as constant averages over 24 hours. Sketch the path from electricity to computer work and heat.

1. How much IT electricity is used each day?

Show your reasoning, label units or evidence, and state any assumptions.

2. What is the daily facility electricity and its PUE?

Show your reasoning, label units or evidence, and state any assumptions.

3. How must an orbital facility ultimately reject its waste heat?

Show your reasoning, label units or evidence, and state any assumptions.

Transfer question

If both energy totals double, PUE stays 1.30. Explain why the ratio alone cannot tell a town the project's total electricity demand.

Exit question

What would you now check before accepting a claim about this topic? Name one specific check and explain why.

Data Centers answers and teaching notes

Answer 1

100 kW × 24 h = 2,400 kWh.

Answer 2

130 × 24 = 3,120 kWh. PUE is total facility energy divided by IT energy: 3,120/2,400 = 1.30.

Answer 3

It must move heat to surfaces that radiate it into space. Vacuum provides no ambient air for convective cooling.

Common wrong turn

PUE is not a water-use or carbon-emissions score, and cold surroundings do not remove a spacecraft's thermal-design problem.

Extension discussion

If both energy totals double, PUE stays 1.30. Explain why the ratio alone cannot tell a town the project's total electricity demand.

Assess the explanation

Give one point each for a correct conclusion, visible reasoning, correct units or evidence, and a relevant limitation. A correct number with no explanation is not a complete answer. Accept equivalent wording and well-supported alternative interpretations where the question allows them.

If the learner gets stuck

Return to the diagram or the smallest example. Ask what is being counted, compared or transferred. Let the learner revise the answer after explaining the mistake; do not reward speed over understanding.

Family connection

Draw the journey of a movie request. Add the wires, cooling system and people affected near the building. For space, add radiators, launch and debris questions.