

Science: conflicting viewpoints and evidence that separates
models

Original skill preparation; versioned source scope

Method and conditions

Different predictions enable a discriminating test

Model	Same runtime; compare 15°C and 30°C
A: time only	Equal brightness
B: temperature rise	Lower brightness at 30°C

- Discriminating evidence is a result the competing models predict differently.
- Explicit model predictions; comparison conditions; uncertainty.

Worked method 1

Read and reason

Discriminating evidence is a result the competing models predict differently. If both predict cooling with greater thickness, observing that trend cannot select one. Hold thickness fixed and vary material to test their stated disagreement.

Original context 1

Read and reason

Original hypothetical research summary — A cooling sleeve A laboratory team tests sleeves intended to reduce a small sensor's temperature during operation. All sensors start at 22°C. Temperature is measured after ten minutes of use with the same power setting, room conditions and measuring instrument. Sleeve A costs 4 units, B costs 7 units, and an unsleeved sensor is the control.

Original context 2

Read and reason

The design brief requires a cost no greater than 5 units and a final temperature no greater than 35°C. Lower temperature alone is not the only design criterion. Experiment 1 uses identical sensors and records three independent trials per sleeve. Final temperatures in °C are: control 41,42,43; A 33,34,35; B 30,31,32.

Original context 3

Read and reason

The team resets the starting temperature and checks the sensor charge before each trial. They report the means and the full observed ranges. The ranges describe these trials, not every future result. The team has not yet measured sleeve durability. Experiment 2 investigates thickness for material A. Each sleeve has the same length and fit; thicknesses are 1,2,3 mm.

Original context 4

Read and reason

Mean final temperatures are 38,34,32°C respectively. All other stated conditions match Experiment 1. Changing thickness also changes material quantity, so a future design review must measure costs instead of assuming they stay at 4 units. A student proposes testing a 3-mm sleeve in material B against a 1-mm sleeve in material A to identify thickness's effect.

Original context 5

Read and reason

This comparison would change two factors at once. Two original models explain the observed temperature pattern. Model P says final temperature depends only on thickness, regardless of material. Model Q says both thickness and material matter; at equal thickness it predicts that material B produces a lower final temperature than A under the same conditions.

Original context 6

Read and reason

Both models predict lower final temperatures as thickness rises over the tested 1–3 mm interval. A decreasing trend alone therefore cannot separate them. Experiment 3 tests new A and B sleeves, each 2 mm thick, in matched conditions. Mean final temperatures are A 34°C and B 31°C.

Original context 7

Read and reason

The measuring instrument's stated resolution is 0.1°C , and the team checks its calibration with a reference. Repeated trials would still be needed to characterise variability and rule out other differences in manufacture. The result conflicts with P's material-independence prediction and is consistent with Q's direction; it is not proof that Q is the only possible explanation.

Original context 8

Read and reason

A separate time series for one sensor with sleeve A records temperatures 22,28,32,34°C at 0,2,4,6 minutes. These observations show warming with successively smaller two-minute increases. No measurements beyond six minutes are supplied in this series.

Original context 9

Read and reason

A proposal to continue the first interval's slope to twelve minutes is a model assumption that later measurements may contradict, not a reading from the table.

Attempt 1.1

Read and reason

State P's and Q's predictions for equal-thickness A and B sleeves. Explain how Experiment 3 bears on each.

Reasoning 1.1

Read and reason

P predicts the same final temperature because it says material is irrelevant. Q predicts B lower than A. The observed 31°C versus 34°C conflicts with P under matched conditions and agrees with Q's direction. Calibration supports a meaningful difference, but variability and manufacture still require investigation.

Attempt 2.1

Read and reason

Does Experiment 2's downward trend alone support Q over P? Propose a comparison that would separate them and name two controls.

Reasoning 2.1

Read and reason

No; both predict the trend. Compare A and B of equal thickness while holding starting temperature, runtime, power, fit and room conditions constant. Repeated matched trials should measure uncertainty. The separating variable is material, not the names of the models.

Attempt 3.1

Read and reason

A redesigned B sleeve now costs 5 units and ends at 33°C in repeated matched tests. Does this establish P, Q, or only a design decision under the brief?

Reasoning 3.1

Read and reason

It satisfies $\text{cost} \leq 5$ and $\text{final temperature} \leq 35$ in the stated tests. Without a matched A result it does not itself separate P and Q, and design feasibility is distinct from explaining the mechanism. Further durability and variation checks remain appropriate.

Transfer and limits

Read and reason

Explicit model predictions; comparison conditions; uncertainty.

Check yourself

Read and reason

Close the worked reasoning. Explain why the method fits the final transfer task, reconstruct its conclusion, and state a condition that would change your answer. Then check the full reasoning in the reference.