

Why We Trust Some Studies More Than Others

When two studies disagree, what about a study's design tells us which result to trust more?

CARRY FORWARD

A falsifiable hypothesis links a defined change to a defined outcome and states what would count against it.

10-YEAR TAKEAWAY

The strongest design is the one that fits the question and controls its main threats.

Cells differentiate	Development sculpts	Cells move	Development can go wrong
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1. Observe the analogy before naming the biology



Illustration: A tool wall has no single best tool for every job

- 1. Which tool measures length?
- 2. Which tool reveals a hidden structure?
- 3. Why would ranking every tool from weak to strong be misleading?

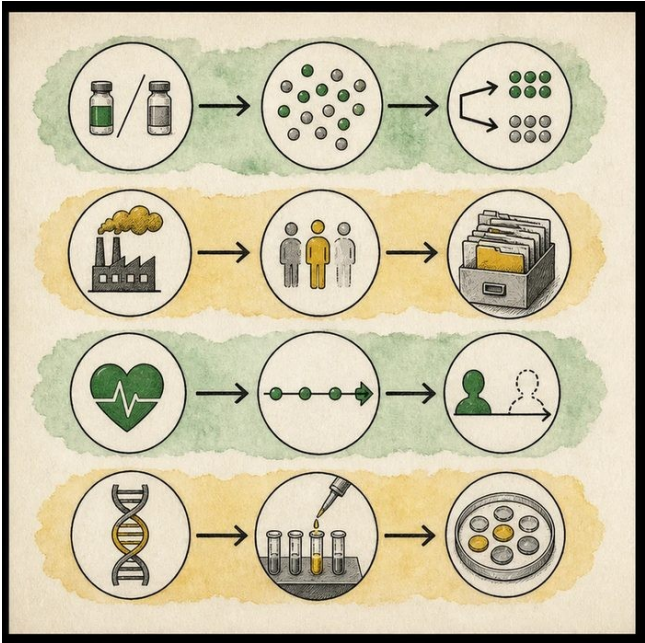
EXPERIMENTAL DESIGN LESSON 3 | RULES AND BIOLOGY MAPPING

2. Turn observations into rules

- 1. Rule 1: Name the question type first. Explain it in your own words.
- 2. Rule 2: Choose the design that can answer it ethically. Explain it in your own words.
- 3. Rule 3: Identify the main bias or alternative explanation the design must control. Explain it in your own words.

Where the analogy stops: Study designs involve people, biology, time, and uncertainty, not just tools with one fixed use.

3. Map the rules onto the biomedical example



Biomedical teaching illustration: Match four cleft questions to four study designs

Analogy step	Biology step	How the relationship stays the same
Ruler	Measurement or prognosis design	_____
Randomized lane	Assignable treatment comparison	_____
Microscope	Mechanism experiment	_____

EXPERIMENTAL DESIGN LESSON 3 | CASE FILE AND DECISION

4. Use the case evidence

ID	Finding supplied in the case	Why it matters
EXP03-E1	Repair timing is an assignable clinical choice when both options are acceptable.	A randomized trial can compare the treatment options under equipoise.
EXP03-E2	A suspected harmful pregnancy exposure cannot be assigned.	An observational design is required for that cause question.
EXP03-E3	A gene mechanism requires perturbation and molecular or tissue outcomes.	A bench experiment answers a different question than a treatment trial.

5. Make the clinical decision

You are chairing the design-selection meeting. A teammate declares that an RCT is always the best design for every cleft question.

- A. Match each design to the treatment, harm, prognosis, or mechanism question.
- B. Use an RCT even when it assigns suspected harm.
- C. Use a case report for every question because it is fastest.

Decision. Choose the design rule and match the three supplied questions to appropriate designs.

Claim ceiling: You may select a design family. You may not call any design free of bias or automatically decisive.

Claim. State the choice you can defend.

Evidence. Use these labeled IDs: EXP03-E1 + EXP03-E2.

Reasoning. Explain why the evidence supports the claim and stays inside the claim ceiling.

EXPERIMENTAL DESIGN LESSON 3 | REDUCE, REFLECT, AND PREPARE

6. Reduce the lesson to one lasting idea

Take-home. The strongest design is the one that fits the question and controls its main threats.

- 1. Why can a suspected harmful exposure not be randomized?
- 2. Which design family can test a gene mechanism directly?

Glossary

Term	Plain-English definition
evidence hierarchy	A ranking of research designs by how trustworthy their evidence is, placing systematic reviews and trials above observational studies and expert opinion.
levels of evidence	A ranking of how trustworthy a study's findings are, with reviews of many strong trials at the top and single expert opinions near the bottom.
randomized controlled trial	A study that randomly assigns participants to a treatment or a control group, the strongest design for showing a treatment truly works.
observational study	A study that watches and records what happens to groups without assigning any treatment, so it can show links but not prove cause.
case report	A detailed written account of one patient's diagnosis, treatment, and outcome, useful for sharing rare or unusual findings.
bias	A systematic error in how data is collected or interpreted that tilts results in one direction, making conclusions less accurate or unfair.
confounding	When a hidden third factor influences both the suspected cause and the outcome, making a link look real when it may be misleading.

Next lesson unlock

A randomized trial sits near the top because we can assign who gets the treatment. But we could never assign a baby to a harmful chemical in the womb. So how does science study a cause it is forbidden to hand out?

The journal links on the lesson page are optional. Everything required for this guided-notes set is already supplied here and in the case file.