

What New Question About Mateo Would You Investigate, and How?

What new question about Mateo's cleft is worth investigating, and how would you design a sound, ethical study to answer it?

CARRY FORWARD Transparent reporting lets others appraise and reproduce methods, but it cannot repair a weak design.	10-YEAR TAKEAWAY A defensible study plan aligns question, design, variables, sampling, analysis, ethics, reporting, and a claim ceiling.
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Cells differentiate	Development sculpts	Cells move	Development can go wrong
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1. Observe the analogy before naming the biology



Illustration: A blueprint board checks every connection before construction

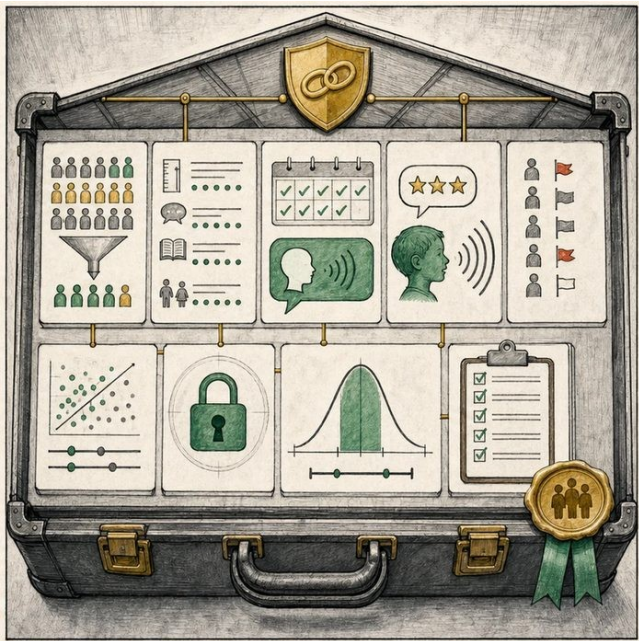
- 1. Which card determines the design?
- 2. Where could one broken connection invalidate the plan?
- 3. Which boundary stops the claim from outrunning evidence?

2. Turn observations into rules

- 1. Rule 1: Make every method trace back to the question. Explain it in your own words.
- 2. Rule 2: Supply data, safeguards, and decision rules before results are known. Explain it in your own words.
- 3. Rule 3: Write the strongest claim the design could support and no stronger. Explain it in your own words.

Where the analogy stops: Research plans must adapt to real participants, sites, data, and oversight after review begins.

3. Map the rules onto the biomedical example



Biomedical teaching illustration: Defend one complete Mateo-related study protocol

Analogy step	Biology step	How the relationship stays the same
Blueprint purpose	Research question and hypothesis	_____
Connected systems	Design, variables, sampling, and analysis	_____
Inspection boundary	Ethics, reporting, and claim ceiling	_____

4. Use the case evidence

ID	Finding supplied in the case	Why it matters
EXP20-E1	The question asks whether a structured speech follow-up program is associated with improved age-8 communication after palate repair.	The outcome and population are specific, but the program is not randomly assigned.
EXP20-E2	The supplied synthetic CSV contains 24 coded records with program group, center, baseline score, age-8 score, and missing-data flags.	Students can complete the design without outside recruitment or invented measurements.
EXP20-E3	The analysis compares adjusted estimates, reports intervals and missingness, protects coded data, and follows STROBE.	The strongest result is an adjusted association, not proof of cause.

5. Make the clinical decision

You are the principal investigator at the protocol defense. The board must select one complete plan from three proposals using only the supplied case file and dataset.

- A. Approve the aligned coded-records cohort with its observational claim ceiling.
- B. Approve a plan that recruits unnamed children and invents measurements.
- C. Call the program causal because the adjusted p-value is small.

Decision. Choose the defensible protocol and justify question, design, variables, sample, analysis, ethics, reporting, and claim ceiling.

Claim ceiling: You may defend an adjusted observational association using the supplied dataset. You may not claim causation or require outside data.

Claim. State the choice you can defend.

Evidence. Use these labeled IDs: EXP20-E1 + EXP20-E2.

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

6. Reduce the lesson to one lasting idea

Take-home. A defensible study plan aligns question, design, variables, sampling, analysis, ethics, reporting, and a claim ceiling.

1. Why can students finish this study inside the lesson package?
2. What is the strongest supported claim?

Glossary

Term	Plain-English definition
study protocol	The detailed written plan for a study that sets the question, methods, and steps before any data are collected.
primary outcome	The single main result a study is designed to measure, chosen ahead of time to answer its central question.
multifactorial	Caused by several genes acting together with environmental factors, not by a single gene alone.
nonsyndromic	Describing a condition, such as a cleft, that occurs on its own without a set of other linked birth differences.
convergent evidence	Support for a conclusion that comes from several independent methods or studies pointing to the same answer, which makes it more trustworthy.

Next lesson unlock

We answered the whole domain's question with this one: you can take a fresh question about Mateo's cleft and design a sound, ethical study, and you discovered his cleft is nonsyndromic and multifactorial by reasoning across the evidence, not by being told. The studies you read this year were designed by scientists years ago. The next generation of evidence about clefts like Mateo's will come from studies that students like you design. So the question that opens onto the rest of your life: what will you ask, and who will you become to answer it?

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.