research nest

LESSON 5 · RESEARCH NEST COURSE

Design the Study

> *You have a good question. If a classmate had to carry out your study tomorrow, could they do it from your plan alone?*

From “what I want to know” to “exactly what I will do”

Methods, samples, measurements, trial runs and ethics in practice

LEARNING OBJECTIVES

By the end of this lesson you can…

Output: a one-page research plan, piloted and ready for your supervisor to approve.

- Choose a method (or mix) that fits your question, field and resources
- Write a sampling plan: who or what, how many, how chosen, which biases to avoid
- Turn abstract concepts into things you can record consistently
- Plan a procedure and timeline, and pilot it before the real thing
- Put ethics into practice and write a one-page research plan

KEY IDEA

A menu of methods: what each one records

Pick the method by the evidence your question needs.

Building something? Design-build-test: requirements, prototype, test, improve.

Method	What you actually record	Example project
Survey	Fixed-question answers from many people	Psychology: Grade 10 sleep
Interviews	Reasons in a few people's own words	Sociology: quitting sports
Observation	Tallies or notes on a fixed sheet	Environment: litter by site
Experiment	Outcomes after changing one factor	Biology: light and duckweed
Documents / datasets	Coded text features or existing data rows	History: 1918 flu reports

Adapted from: USC Libraries; Purdue OWL, Conducting Primary Research

KEY IDEA

Your sampling plan: who, how many, how chosen

A sample is the part you study; the plan explains why it fairly represents the whole you care about.

Who or what (population)

The whole group your claim is about: Grade 9s here, 1918 issues of one paper, 40 seedlings.

How chosen

Random, stratified (some from each subgroup), systematic (every 5th) or purposive for interviews. Say which and why.

How many

Enough to compare groups, small enough to finish. Interviews: often 5–10. Surveys: aim for dozens per group.

Avoiding bias

Friends-only, volunteers-only and one-day-only samples skew results. Spread across groups, days and times.

Adapted from: OpenStax, Introductory Statistics 2e, 1.2 Data, Sampling, and Variation

KEY IDEA

From concept to something you can record

If two people followed your instructions, would they write down the same thing?

Operational definitions, coding schemes and measurement protocols

Field	Abstract idea	What you record, and how
Biology	Plant growth	Stem height in mm, soil to tip, same ruler, days 0, 7 and 14
History	“Fearful” coverage	Code each article: alarm words, death counts on page 1, yes/no
Psychology	Stress before tests	One 1–5 rating with labelled ends, asked at the same moment
Engineering	A “sturdy” phone stand	Survives 20 drops from 1 m with no crack or wobble
Economics	Price change	% change in shelf price of the same 10 items, same shop

WORKED EXAMPLE · STEP 1 INVENTED EXAMPLE

Noor’s sampling plan across three study spaces

Part of the plan	Noor’s decision	Why
Population	Students using the 3 main study spaces at lunchtime	Matches her research question
Sessions	Rotate spaces daily; each visited 3–4 times over 2 weeks	No space judged on one odd day
Who is invited	Everyone present in that space at the session	Avoids hand-picking friends
Target size	About 25–30 survey responses per space	Enough to compare; feasible in 2 weeks
Interviews	6 volunteers: 2 per space, mixed grades	Range of views (purposive sample)

WORKED EXAMPLE · STEP 2 INVENTED EXAMPLE

Noor’s measurement protocol and survey wording

WHAT GETS RECORDED IN EVERY SESSION

Noise: same phone and free sound-meter app, held at table height in the middle of the space; 3 readings in dB(A) at start, middle and end; record the average.[1] Concentration: one item at the end of the session, rated 1 (very poorly) to 5 (very well).[2] Context: space, date, start time; no names or student numbers.[3] Interview guide: 4 open questions, e.g. “What makes you choose where you study?”[4]

Fixed protocol; readings are approximate, not lab-grade

Operational definition with labelled endpoints

Only what the analysis needs

Same core questions; follow-ups allowed

WORKED EXAMPLE · STEP 3 INVENTED EXAMPLE

Pilot, fix, approve, then collect

Before: “How much did the noise affect your concentration today?”

After: “During this study session, how well could you concentrate? 1 = very poorly, 5 = very well”

1. **Draft reviewed**
   Ms Rahman reads the plan and agrees to a trial run
2. **Pilot with 5 members**
   Club members try the survey; answers are discarded
3. **Fix the problem**
   One question confused testers, so Noor rewrites it
4. **Approval and consent**
   Sign-off; info sheet, assent, parental permission if required
5. **Collect (2 weeks)**
   Surveys in Weeks 1–2; 6 interviews in Week 2

FRAMEWORK

The planning loop: design, test, revise

Most plans go round this loop two or three times before approval. That is normal research, not failure.

If the pilot shows the question cannot be answered this way, loop back to the method, or even the question.

1. Choose method(s)
2. Plan the sample
3. Define and set protocol
4. Set procedure + timeline
5. Pilot (trial run)
6. Fix, then get approval

↺ One-page research plan

COMMON MISTAKES

Common planning mistakes and how to fix them

Mistake	Fix
Surveying only friends or one class	Invite everyone in a defined group, across days and times
Leading or double questions (“How much did noise hurt…”)	Ask about one thing in neutral words; label scale ends
Measuring differently each time	Write the protocol down and follow it; log any changes
Skipping the pilot	Trial run with 3–5 people outside the sample; then revise
Collecting names or extra data “just in case”	Collect only what you need; store it securely; delete it later

GUIDED PRACTICE

Guided practice: plan a mini-study

20 minutes in pairs. Plan only: do not collect any data from people today.

1. **Pick a scenario (2 min)**
   A: recycling bins; B: 1950s flood in a local paper; C: phone stand
2. **Method + sample (5 min)**
   Which method? Who or what, how many, how chosen, which bias?
3. **Define it (5 min)**
   One operational definition or coding rule; one tool or sheet
4. **Procedure + pilot (5 min)**
   Three numbered steps; how you would trial-run it
5. **Ethics + safety (3 min)**
   Who must approve? Any people, privacy or safety issues?

MODEL RESPONSE INVENTED EXAMPLE

Model response: Scenario A, the recycling bins

QUESTION: ARE THE RECYCLING BINS AT OUR SCHOOL USED CORRECTLY?

Method and sample: structured observation of bin contents (not people). All 6 recycling bins, checked at 3:30 pm on Mon, Wed and Fri for 2 weeks.[1] Definition: an item is "contaminated" if it is not on the council's accepted-items list. Record counts per bin on a tally sheet.[2] Pilot: two of us tally one bin separately, compare totals, then sharpen unclear categories.[3] Ethics and safety: caretaker and teacher approval; gloves and tongs; no photos of people.[4]

Whole population of bins; fixed days and time

Operational definition anyone could apply

Checks that coders agree

Low risk, still approved first

TEMPLATE

Template: your one-page research plan

Expect version 2 or 3 before approval. Check your school's and any competition's own rules.

- [ ] Question and design type, in one or two lines
- [ ] Method(s): what you will record, and why it fits the question
- [ ] Sample: who or what, how many, how chosen, likely biases
- [ ] Definitions: operational definitions, coding scheme or test criteria; tools used
- [ ] Procedure and timeline: numbered steps and a week-by-week schedule
- [ ] Pilot: who trial-runs it, what you will check, what you changed
- [ ] Ethics: info sheet, assent/consent, parental permission if needed, anonymity, storage, approval

KNOWLEDGE CHECK

Knowledge check and next step

Next: finish your plan, pilot it with 3–5 people outside your sample, revise, get approval.

To learn how much the school reads, a student surveys only her friends. Main problem?

A Surveys cannot measure reading **B** Convenience sampling bias **C** She needs a hypothesis **D** Too random

Which is an operational definition of “plant growth”?

A How healthy it looks **B** Growing well **C** Stem height in mm, days 0, 7, 14 **D** Overall progress

What is the main purpose of a pilot study?

A Early results to publish **B** Find and fix problems first **C** Replace approval **D** Enlarge the sample

Name three things an information sheet should tell possible participants.

SOURCES & FURTHER READING

Sources and further reading

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