Seminar 6: Research Design

Science, Scientific Discovery, and Statistics

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Today

1. The Scientific Method
2. How it maps onto real research practice
3. Group work: applying the steps to two research questions
4. Whole-class discussion

Reading anchors for today:

- Chalmers on observation/experiment as intervention (2014, chs. 2–3).
- SEP "Scientific Method" on pluralism, H-D, falsification, and practice (2021).

Questions:

What discipline within the social sciences do you think is most “scientific” and why?

What makes political science “scientific”?

Quantitative and Qualitative Research

> *"Qualitative work is expressed in natural language, whereas quantitative work is expressed in numbers and in statistical models. Qualitative work employs small samples, whereas quantitative work is based on large-N analysis. Qualitative work draws on cases chosen in an opportunistic or purposive fashion, whereas quantitative work employs systematic (random) sampling".*
>
> (Gerring, 2017)

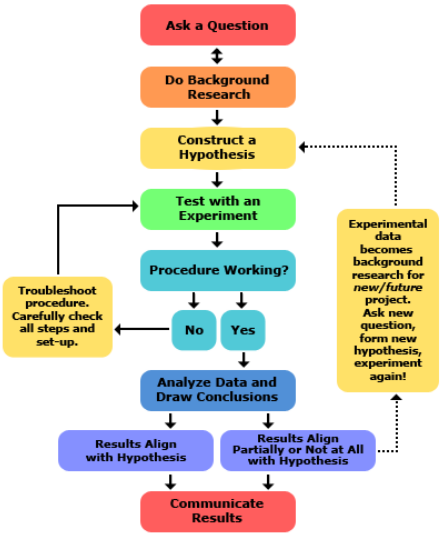
Both quantitative and qualitative research are **empirical** (rely on observation)—but note:

- "Observation" in science is often *active* and *public*, not passive/private (Chalmers, 2014, ch. 2).
- The goal is typically *inference* beyond what is directly observed (King, Keohane & Verba, 1994, ch. 1).

The Scientific Method

1. Ask an interesting question
2. Background Research
3. Construct a hypothesis
4. Data/Information Collection
5. Test the Hypothesis (Analyze Data)
6. Communicate Results

Note: this process is not necessarily linear (you may adapt RQ as you discover new things – see Skinner)



1. Ask an interesting question

- Recall that this should add value to scientific knowledge
- How will the answer to this question add to the existing knowledge/literature?
- Is this an important topic for society?
- What are the implications of potential findings?

Detail from the readings:

- There is no mechanical rule for generating "good" questions; early stages involve creativity and judgment (Skinner, 1955; KKV, 1994).
- In social science, "good" questions often balance (i) real-world importance and (ii) contribution to a scholarly literature (KKV, 1994, ch. 1).

2. Background Research

- What does the theoretical literature predict?
- What has past empirical evidence found?
- Is past evidence/research consistent?
- What data already exists?
- How was the data measured?
- What does existing data suggest?
- Is there a gap anywhere (theoretical or empirical)?

Detail from the readings:

- Background knowledge shapes what counts as a relevant "fact" to collect (Chalmers, 2014, ch. 3: we collect not just facts, but *relevant* facts).
- Theory and data are tightly linked via *observable implications* (KKV, 1994, ch. 1).

3. Construct a hypothesis

- Hypothesis should be testable and falsifiable (Popper)
- You should be able to feasibly test this hypothesis

Detail from the readings:

- SEP contrasts confirmation vs falsification traditions: hypotheses imply consequences for testing, but successful tests do not logically verify a theory (SEP, "Scientific Method", rev. 2021).
- Falsifiability is partly about *risk*: genuinely exposing claims to possible failure, not preserving them with ad hoc exceptions (SEP, rev. 2021).

4. Data/Information Collection

- Based on your research for step 2, what existing data can be used to test your hypothesis?
- Quantitative
- Qualitative
- Do you need to collect new information/data?
- How will you collect this data to ensure that it is not biased?
- What is the cost? What can you afford?

Detail from the readings:

- "Observation" often involves practical interventions to reduce subjectivity and make claims verifiable (Chalmers, 2014, ch. 2).
- Experiments help isolate processes by intervening, but experimental "facts" are hard-won and fallible (Chalmers, 2014, ch. 3).

5. Test the Hypothesis (Analyze Data/Information)

- What procedure will you use to test your hypothesis?
- Is the process transparent?
- Is the process replicable?
- Would any other researcher find the same results?
- Are there any constraints to your test (budget, complexity, missing data, etc.)

Detail from the readings:

- "Methods" are not one-size-fits-all: modern science emphasizes pluralism and the gap between abstract methods, rules, and actual practice.
- Transparency/replicability are central norms for public inference (KKV, 1994) even when perfect replication is hard.

6. Communicate Results

- There are several ways to communicate results but its always useful to clearly tell what is being claimed (and what is not)
- Results communication should include an overview of the method used to test the hypothesis
- Communication will also depend on the audience

Detail from the readings:

- Scientific knowledge is a public product: methods, reasoning, and limits should be reconstructible by others (KKV, 1994; SEP, rev. 2021).
- Practice-oriented accounts stress communication infrastructures: conventions, institutions, and audiences shape what gets accepted as "good" science (SEP, rev. 2021).

Seminar tasks (Group work)

We will look at the same questions as last week, and your group will take the question you did not work on last week:

- Is climate change associated with the onset of armed conflict?
- Does exposure to other ethnic groups moderate exclusionary perspectives?

Discussion (after group work): Does the scientific method resemble scientific research in practice? Does it matter?

Questions for group work task

- Background research: what type(s) of sources would you use for your literature review?
- Hypothesis: What is your main research hypothesis?
- Data / Methods: Would qualitative or quantitative data help test the hypothesis?
- Analysis: What are the specific measures you would use? Are these measures reliable?
- Communication: Who would your interested audience(s) be? How would you best communicate your findings to them?