Operationalizing a research question

MIDFIELD INSTITUTE

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MIDFIELD
Multiple-Institution Database For Investigating Engineering Longitudinal Development

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Scientific Research in Education - Guiding Principles

- **Pose significant questions that can be investigated empirically.**
- Link research to relevant theory.
- **Use methods that permit direct investigation of the question.**
- Provide a coherent and explicit chain of reasoning.
- Replicate and generalize across studies.
- Disclose research to encourage professional scrutiny and critique.

Operationalizing your MIDFIELD question

1. Write out your question in broad terms.
2. Define everything
3. Consider intersectionality
4. Rewrite the question
5. Identify variables and their sources
6. Choose appropriate filters

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1 Write out your question in broad terms

How does the academic performance of international students differ from that of domestic students in computing-related fields in the US?

◦ Share your question in the chat!

2 | Define everything

How does the academic performance of international students differ from that of domestic students in computing-related fields?

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2 | Define everything

How does the <u>academic performance</u> of international students differ from that of domestic students in computing-related fields?

- Academic performance ->   GPA -> GPA in math courses

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2 | Define everything

How does the academic performance of <u>international</u> students differ from that of <u>domestic</u> students in computing-related fields?

- Academic performance -> GPA -> GPA in math courses
- International/domestic -> as indicated in the race variable

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2 | Define everything

How does the academic performance of international <u>students</u> differ from that of domestic <u>students</u> in computing-related fields?

- Academic performance -> GPA -> GPA in math courses
- International/domestic -> as indicated in the race variable
- Students -> undergraduate students in the US

2 — Define everything

How does the academic performance of international students differ from that of domestic students in <u>computing-related</u> fields?

- Academic performance -> GPA -> GPA in math courses
- International/domestic -> as indicated in the race variable
- Students -> undergraduate students in the US
- Computing-related fields -> Computer Science, Computer Engineering, or Electrical Engineering

2 — Define everything

How does the academic performance of international students differ from that of domestic students <u>in </u>computing-related <u>fields</u>?

- Academic performance -> GPA -> GPA in math courses
- International/domestic -> as indicated in the race variable
- Students -> undergraduate students in the US
- Computing-related -> Computer Science, Computer Engineering, or Electrical Engineering
- In …. fields -> Ever in the major

3 — Consider intersectionality

How does the academic performance of international students differ from that of domestic students in computing-related fields?

- The size of MIDFIELD allows us to disaggregate the data in many ways that smaller datasets can't. For this study, let's include the intersection of sex and international status.

4 — Rewrite the question

How does the academic performance of international students differ from that of domestic students in computing-related fields?

Is the intersection of international status and sex related to grades in undergraduate math courses for students who ever major in Computer Science, Computer Engineering, or Electrical Engineering in the US?

Identify variables and their sources

- Independent variables:
  - Origin_sex - origin (international/domestic) will be crossed with sex (Male/Female). Derived from *race* and *sex* variables in **student**
- Grouping variables:
  - Ever_csi - (Yes/No) whether the student ever majored in Computer Science (CIPs: 11XX or 11YY). Derived from *cip6* in **term**
  - Ever_cpe - (Yes/No) whether the student ever majored in Computer Engineering (CIP 1409)
  - Ever_ele - (Yes/No) whether the student ever majored in Electrical Engineering (CIP 1410)
- Dependent variable:
  - Math_gpa - grade point average of all math classes completed. Derived from *grade* and *hours_course* in **course**

Choose appropriate filters

- Determine the span of data you will examine for each student
  - If you use 6-year graduation, you need students who have six years of data available: `add_data_sufficiency()`
- Should you include transfer students, or only FTIC?
  - Does your metric need to be adjusted to accommodate them?
- What about part-time students?
  - What will be your criteria?

Get started!

- Continue to refine your research question. We encourage you to work in groups.

- Find the case study or vignette(s) that most closely represents your question for a place to start from

- We are here to answer questions about the MIDFIELD or R or *midfieldr* or just help you find the best way to get started.

- Please check in with us before leaving the virtual meeting and let us know where you are at.