Getting Started with Education Research

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Session Outcomes

At the end of this session, you will be able to:

- Appraise the scope of possible topics
- Recognize variable constraints and challenges in the social sciences
- Locate relevant literature
- Differentiate methodological approaches between the social and biomedical sciences
- Recognize the role of theoretical frameworks, funding and IRBs
- Conceptualize validity from a social science framework
- Identify local resources to get started with an education research project

How This Will Work

- I will cover the “rules of the road” (as I see them).
- I generated a list of the most common questions I receive about education research.
- I will try to answer these questions, as well as any that you might have.
- I’ll present some brief exercises along the way to help you create some tangible ideas.

Common Questions

- “What kinds of things do education researchers study?”
- “Is the research process the same?”
- “What is a theoretical/conceptual framework?”
- “What’s the deal with ‘validity’ in education research?”
- “Why are there so few experimental studies?”
- “Where can I find education research?”
- “What is an Institutional Review Board (IRB), and does my research need approval?”
- “Can I do education research without funding?”
- “What do I need to do if I have a study idea in mind?”

"What kinds of things do education researchers study?"

- Everything!
- Some hypothetical examples might include:
  - What are the economic costs associated with constructing a single multiple-choice item for a medical school exam?
  - What impact will a change in academic policy (e.g., mandatory class attendance) have on a program, students' grades, etc.?
  - How does the design, structure, and culture of colleges/universities affect their practices and performance?
  - How do market forces affect educational curricula?
  - What psychological, social, economic, political and cultural factors influence students' choices and behaviors?

For example, a few things I study…

- Psychometrics (broad study of psychological measurement using theoretically-informed measurement and statistical models)
- Statistical methods to detect cheating
- Instrument validation with IRT models
- Methods and procedures for identifying and mitigating effects of rater biases
- Sources of measurement error (e.g., tests, surveys, performance assessments)
- Knowledge retention and decay over time
- Methods for defining and setting legally defensible standards
- Assessment policy (e.g., fairness issues)
- Instrument equating/common item linking

“Is the research process the same?”

Generally speaking, yes. Education research also involves the following steps:

Introduction → Question → Method → Results → Interpretation → Conclusions

You’ll need to…

1. Present a logical chain of reasoning from start to finish (Introduction to Conclusion) that is coherent, reasonable, methodologically-sound, and persuasive to a skeptical reader
2. Provide a detailed description of what you did (procedures and analyses)
3. Summarize what you found (results)
4. Summarize validity evidence to support your inferences
5. Identify limitations and biases, estimate uncertainty and error, and systematically rule out other plausible explanations in a rational, convincing way

Two Key Differences

- Social scientists like to utilize theoretical/conceptual frameworks.
- Social scientists may conceptualize validity a bit differently.

"What is a theoretical/conceptual framework?"

- A theoretical framework is the research from previous literature that defines a study's core theory and concepts.
- Education researchers use the theoretical framework to craft a logical argument for a need for their research.
- It can also serve as a means for narrowing down a research question.
  - For example, if I wanted to study what factors influence student success in veterinary medical school I would be taking on an enormous project.
  - However, if I focused more specifically on what motivational factors influence student success the project would be a bit more feasible.
  - If I used McClelland's Need Theory (a famous motivation theory) I would have a specific framework for analyzing and interpreting data.

“What’s the deal with ‘validity’ in education research?”

- Modern validity theory in the social sciences is defined as “the overall judgment of the degree to which theory and evidence support the interpretation of results for a specific purpose.”
- For example, if a veterinarian obtains a perfect score on a licensure or board certification exam that assesses one’s fund of medical knowledge, can we conclude the veterinarian is a good clinician?
- In education research, there is no such thing as a valid or invalid test/instrument; or “face validity”.
- Validity is a continuum, not a dichotomy.
- It is incumbent upon researchers to summarize all available validity evidence to support their inferences.

Let’s Get Started Fleshing Out an Education Research Project

Exercise #1

Step 1:

- Individually, take a minute to think about what interests you with respect to education.
- Perhaps there is…
  - a phenomenon(a) that you have observed that you would like to test?
  - Something you want to try in an educational setting?
- Don’t worry about methodology or any of the specifics of your potential study.
- For now, focus only on what you would like to study.

Exercise #1

Step 2:

- Share your idea with a neighbor.
- Next, see if you can generate a research question that is testable.
- Do you have a theoretical/conceptual framework in mind?
- What did you come up with?
- For the remainder of this session, think about how some of what I cover might apply to your potential research project.

“Where can I find education research?”

- It’s important to see what has already been done.
- However, education research often resides in several places.
- It may be helpful to begin with PubMed to find education research articles published in clinical/veterinary science journals.
- However, most education research will be found outside of PubMed.
  - EBSCO; Academic Search Premiere; Social Science Citation Index (Web of Science); PsycINFO; Psychological Abstracts; ERIC; Serial Solutions Citation Index by Proquest; Higher Education Abstracts; etc.
  - You’ll need to search our university libraries online collection to access these repositories.

“Why are there so few experimental studies?”

- Fewer than 1% of education research studies involve a true experimental design; Less than 5% involve a quasi-experimental design
- Educational data are fundamentally different than biomedical science data, so we had to develop our own scientific standards.
- Educational data are complicated by data type and contexts, such as:
  - Legal and ethical considerations
  - Changing environments
  - Politics
  - Program variability
  - Person variability
  - Complexity of research problem
  - Methodological difficulties

Legal and ethical considerations

- Education research focuses primarily on humans.
- Researchers are ethically responsible for protecting the rights and welfare of the subjects who participate in a study.

Influences and Changing Landscapes

- Education is influenced by the external environment.
- Change is constant, making longitudinal and replication studies difficult to conduct.
- The ultimate effects of any changes may not be known until years later (outside the educational setting).

Politics

- The public nature of education influences what kinds of research questions are investigated.
  - Some topics may be too controversial or too divisive for a particular community.
  - Other studies may not be conducted because subsequent reactions may be detrimental to maintaining an educational organization/institution.

Program variability

- Wide variation across programs makes it difficult to generalize findings.
- Typically, researchers must specify the conditions under which their findings were produced.

Diversity and person variability

- Cultural diversity and individual differences may affect how people think, feel, behave, etc.
- Diverse people impacts our ability to generalize findings, so replication studies of different groups is necessary.
- Researchers must specify contextual factors under which their findings were produced.

Complexity of research problems

- The people involved (e.g., students, faculty, community, etc.) are affected by a wide range of influences.
- Different individuals process ideas differently.
- Behavior is determined by individual, environmental and situational characteristics.
- Within a single study, an education researcher must deal simultaneously with many variables and multiple situational elements.

Methodological difficulties

- Educational research measures complex human characteristics, latent traits, skills, etc.
- Measuring achievement, intelligence, leadership style, group interaction, etc. involves formulating conceptual definitions and deciding issues of validity.
- Some education research has become possible only as valid and reliable forms of measurement have been developed.

Exercise #2

Revisit your idea for a research study.

With your neighbor, identify…

1) Where you will search for relevant literature.
2) Some keywords you might use as part of your search.
3) What factors you anticipate might impact your ability to execute your study.

Methodology

- A key difference between biomedical research and education research is the role of methodology.
  - Biomedical research typically begins with an experimental design in mind, then a research question is created that fits the experiment's parameters.
  - Education research begins with a research question, then a methodology is selected based on what is most appropriate to answer the question.

Exercise #3

Again, with your neighbor, identify…

- What research design might be most appropriate/feasible?
  - Experiment, Case study, Causal, Cohort (retrospective or prospective), Correlational, Cross-sectional, Descriptive, Exploratory, Observational, Longitudinal, Archival, Meta-analysis, Simulation, Something else???
- What types of data will you need?
  - Quantitative, Qualitative, Mixed (both quantitative and qualitative)
- How might you collect data?
  - Survey, Test, Observation, Interview, Focus Group, Historical Records, etc.

"What is an Institutional Review Board (IRB), and will my research need approval?"

- An IRB is an administrative body established to protect the rights and welfare of human research subjects recruited to participate in research activities conducted under the auspices of the institution with which it is affiliated.
- The IRB is charged with the responsibility of reviewing, prior to its initiation, all research (whether funded or not) involving human participants.
- The IRB has the authority to approve, disapprove, monitor, and require modifications in all research activities that fall within its jurisdiction as specified by both the federal regulations and institutional policy.
- So, if your research involves human subjects, then yes, you will need IRB approval. Sorry.
- (*Note*: Most projects here at NCSU currently take about 6 weeks to get reviewed/approved)

“Can I do education research without funding?”

- YES!!!
- Unlike medical research in which funding typically is necessary to purchase equipment, hire individuals to assist with your studies, etc., education research typically requires relatively little funding provided you are willing to do it yourself.
- Expenses typically involve things such as:
  - Using commercially available instruments (surveys)
  - Designing a simulation (e.g., 3D model, game, etc.)
  - Hiring a graduate student to conduct a literature review
  - Hiring a statistician to analyze data

Tying It all Together

Summary of the Specifics Steps You Should Follow When Conducting Your Education Research Project

Specific Steps

- Start with a research question.
- Then, conduct a literature review.
  - If the study hasn't been done before, it has immediate value.
  - If the study has been done before, you might replicate it with a different sample or perform it in a different context.
- Next, determine an appropriate methodology that most directly answers your research question.
- Thoroughly investigate the methodological approach.
  - Make sure you're aware of any assumptions or potential violations if using a statistical approach;
  - Follow best practices for recording, transcribing and coding data, defining categories, triangulating data, etc. if using a qualitative approach.

Cont.

- Submit an IRB application, if necessary, and wait for approval.
- Collect data (if necessary), and analyze it carefully and responsibly.
- Report your results in a clear, straight-forward manner.
- In the Discussion section of your paper, you will provide your interpretation of the findings. You'll need to justify why you believe what you believe and why other potential explanations aren't likely or plausible.
- Next, you'll address any limitations and biases that might affect your inferences.
- Then, you'll need to propose areas for future research.
- You'll summarize your Discussion by accumulating your validity evidence and making your final argument as to why your findings are accurate and your inferences appropriate given the intended purpose of your study.
- Finally, you'll conclude by summarizing what you did and what you found.

“Can you show me some examples of education research studies?”

1. Research Investigating Faculty Research Collaboration Networks

- **Purpose:** Understand the faculty research networks within a medical school
- **Theoretical/Conceptual frameworks:** Faculty share a common interest/goal in producing scholarship for promotion, tenure and other merit decisions; Faculty routinely collaborate on research; Social networks may provide insights about who is successful/unsuccessful.
- **RQs:** What do faculty research collaboration networks look like? Are faculty collaborating with members of the same department? Faculty in different departments with the college? Faculty outside the college, but elsewhere at the university? Individuals outside the institution (e.g., academia, government, industry)?
- **Methods:** Social network analysis (SNA) and Bibliometric analyses

2. Research Measuring Students' Stress Immediately Prior to Performing Surgery

- **Purpose:** Determine students' stress immediately prior to performing surgery, and determine if a mindfulness intervention might reduce stress.
- **Theoretical/Conceptual frameworks:**
  - Students sometimes are reluctant to admit they feel stressed, thus potentially jeopardizing the integrity of self-reported scores.
  - Students experiencing less stress may be less likely to commit a medical error and negatively impact patient health.
- **RQ:** Can a 5-minute breathing exercise conducted immediately prior to performing surgery reduce students' stress?
- **Methods:** Control and treatment groups; Comparison of salivary biomarker (Salivary cortisol and sAA) results between groups.

3. Readability Evaluations of Veterinary Client Handout and Materials

- **Purpose:** evaluate the readability levels of infographics posted on DVM360.com for public consumption.
- **Theoretical/Conceptual frameworks:** Literature should be written at a 6th grade reading level. Clients who can successfully read/comprehend handout materials are more likely to adhere to veterinarian recommendations, and ultimately improve pet health.
- **RQ:** What is the readability levels of published materials on DVM360 website?
- **Methods:** Acquire “Top 10 Most Downloaded Infographics in 2017”; Perform readability analysis using 8 different readability formulas.

Questions?

Please contact me (kdroyal2@ncsu.edu) if you would like assistance with your education research project.