Approaches to Conducting Social Science Research in STEM

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Rigorous Design, Administration, & Analysis

Seven Preliminary Steps:

1) Choose a topic
2) Review the literature
3) Determine the research question
4) Develop a hypothesis, logic model
5) Get IRB approval
6) Gain access to the research site(s) & participants
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Seven Preliminary Steps (continued):

7) **Operationalize** (i.e., determine how to accurately measure factors)
   - Institutional data
   - Ethnography
   - Qualitative research interviews
   - Surveys
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Next Steps:

8) Collect Data
9) Analyze Data
10) Report Findings
GAINING ACCESS TO THE RESEARCH SITE(S) AND PARTICIPANTS

Challenges
Responses to Challenges
Challenges

• Non-recognition of social/cultural aspects of science
  – “A culture of no culture.” (Traweek, 1986)
  – “Physicists believe science occurs separately from social forces.” (Ivie, 2007)
Challenges

• Disrespect for social science
  – Professor: “Philosophically I am opposed to education studies focusing on race or gender... I have doubts about your methodology, too.”
Challenges

• Protection of their field’s practices.
  – “Gender has nothing to do with it. If you’re the best, you’ll rise to the top.”

• The belief that anyone can do social science
  – “Some believe that social science is not science at all.” (Ivie, 2007)
Challenges

• Denial of institutional data
  – Citation of privacy rules
  – Lack of understanding about how data will be used
  – Fear that the data will make the institution “look bad”
  – “Not my job”
Responses to Challenges

• Pre-emptive strategies:
  – Get support & introduction by chair, senior staff
  – Meet one-on-one with people rather than large groups
  – Get input: What questions do natural scientists have for social scientists?

• Give them Jonas Salk’s preface in Laboratory Life
Responses to Challenges

• Pair up ‘natural’ & ‘social’ scientists

• Take the approach of “Everything is data.” (Traweek)
Responses to Challenges

• Show national data
  – “To change inequality in science… data are essential” (Ivie, 2007)
  – Statistics show what; social science explores why.
Demographics of the General U.S. Population vs. STEM Ph.D. Recipients, Selected Groups (2005)


- White Women

% STEM Doctoral Degrees Awarded (2005)

- White Women

*Note: Values are approximate and represent the percentage of each group that received STEM doctorates.*
Responses to Challenges

• Understand concerns, legal constraints of institutions
• Be considerate & appreciative
• Prepare clear description of how data will be used, how institution & members will be protected
• Minimize use of sensitive data.
• Can data be gathered another way? (e.g., via public databases; aggregated form; self report)
INTERVIEWS

Uses & Caveats
Setting up the Interview Protocol Design
Interviewing Techniques
Data Analysis & Tools
Uses & Caveats of Interviews

- Understand the world from interviewees’ points of view
- Discover & interpret the meaning of people’s experiences
- Time consuming & expensive
- A small sample

» Source: Kvale, 1996
Setting Up the Interview

• Individual vs. focus groups?
• In-person vs. telephone?
• How many interviewees?
• Who will conduct the interviews?
• Location of interview?
**Interview Protocol Design**

- Highly structured <-> Semi-structured <-> Unstructured
- **Limit** number of questions
- **Map** interview questions onto research questions
- **Balance** questions: positive/negative; similarities/differences
- Prepare **follow-up probes**
- Pre-test protocol
Interview Protocol Design

• Avoid:
  – Multiple questions
    How do you feel about the chair and the other faculty?
  – Leading questions
    What emotional problems have you had since joining the department?
  – Yes-or-No questions
    Do you like mentoring young women?

» Source: Kvale, 1996
Interviewing Techniques

• Establish **rapport** / trust with interviewee
• Ask good questions
• Be **responsive**; actively listen, provide probing questions as needed
• Give **neutral** responses; but show **empathy** when needed

» Source: Denzin & Lincoln, 2005
Data Analysis & Tools

- Don’t confuse the tools with the techniques
  - Tools, e.g., Nvivo, ATLAS, highlighters
  - Techniques
    - Code (from existing theory; inductive methods); test for inter-rater reliability
    - Organize into themes, patterns, narratives, profiles, case studies
SURVEYS

Uses & Caveats
Sampling
Survey Question Design
Data Analysis & Tools
Uses & Caveats of Surveys

- Energetically quoted
- Used to inform
- Influence important decisions and policy
- Often poorly designed and administered
- Data are not very accurate

Source: Busha & Harter, 1980
Survey Sampling

• Issues to Consider
  – Representative Sample
  – Sample Size
  – Selection Bias
  – Ways to Counter or Minimize Selection Bias
Survey Sample & Sample Size

- **Representative Sample:** A sample that is an accurate proportional representation of the population under study

- **Sample Size:** How many people you need to get results that reflect the population under study

Sample size calculator: [http://www.surveysystem.com/sscalc.htm](http://www.surveysystem.com/sscalc.htm)
Survey Sampling

• Selection Bias
  Where and how you find your respondents may affect your responses

• Ways to Counter or Minimize Selection Bias
  Randomize (as much as possible): An equal chance of being chosen to participate in the survey (often computer generated)
Survey Sampling

• Ways to Counter or Minimize Selection Bias (continued)

• Stratification: Determine what subgroup categories of the population (“strata”) should be represented, e.g.: men and women; jr. and sr faculty
  – Determine respective percentages of each strata
  – Have computer generate randomized lists
Survey Question Design

• Keep It Short and Simple (K-I-S-S).
• Start with an introduction or welcome message. (who you are, why you want information)
• Use simple language. Avoid slang, jargon, and acronyms. Clearly define complex terms.
• For each question, ask only one clear thing.
Survey Question Design

Short items are best (so that they may be read, understood, and answered quickly).

- When possible, allow choices of: “Not sure,” “Not Applicable,” “None,” “Other,” “Decline to Answer.”
- Make questions as impersonal as possible.
- Ask questions the respondent can accurately answer.
Survey Question Design

• Ask questions about topics that are relevant. The respondent should have experience with the topic.

• Avoid biased items and terms (be sensitive to the effect of your wording).

• Order of questions matters! (completion, results)

• Pre-test your survey questions out first, using small focus groups.

Babbie, 1973; Busha & Harter, 1980; Creative Research Systems, 2004
Question Order Matters!

- Order questions from the general to the specific.

- Early questions should be pleasant and easy to answer.

- People tend to choose answers nearest the start of the list. When it makes sense, randomize the choices.
Question Order Matters!

• When it makes sense, order answer choices from positive to negative: agree → disagree; excellent → poor

• When possible, ask for more personal or sensitive information near the end. (e.g., Steele, 1997)
Question Order Matters!

• Mentioning a specific idea in one question might affect answers in later questions.
  • Randomize when possible
  • Separate related questions by unrelated questions

• Respondents become habituated when answering similar types of questions. Avoid this by asking only short series of similar questions, then different kinds of questions.
Data Analysis & Tools

• Admit to all possible biases in sampling and results
• Survey Web Sites
  – e.g., Survey Monkey: www.surveymonkey.com
• Statistical Methods
• Statistics Tools and Software
• Sample Courses Related to Survey Statistics
Data Analysis & Tools

• Common Statistical Methods
  – T-Tests
  – Chi Squares
  – Ratios
  – Regression (Simple and Multiple)

• Statistics Tools and Software
  – SPSS
  – PC SAS
  – SYSTAT
  – PC Carp
Sample Survey Statistics Courses (Iowa State University)

- **Statistics 421: Survey Sampling Techniques**  
  (2-2) Cr. 3. S. Prereq: 231 or 328 or 401. Methods of designing and analyzing survey investigations; simple random, stratified, and multistage sampling designs; methods of estimation including ratio and regression; construction and use of sample frames. Nonmajor graduate credit.

- **Statistics 521: Theory of Survey Sampling**  
Sources


Acknowledgments

• Sharon J. Traweek, UCLA
• Susan Silbey, MIT
• Nicole Deterding, Harvard
• The Evaluation Group, TERC
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