Choosing and Defining a Research Problem

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Anatomy of Research

The Research Problem

Developing the Research Question and Study Plan

Picking a Research Project

Research Resources at Vanderbilt
Anatomy of Research

What is research made of?

- **Protocol** - The written plan of the study.

- **Research Question**
  - What will the study address.

- **Background and Significance**
  - What is known about the topic
  - Why is the research question important
  - What answers will your study provide
  - What will this study add to the scientific knowledge
Anatomy of Research

Protocol (cont’d)

- Design - type of study

- Study Subjects
  - Sample size
  - Inclusion and exclusion criteria

- Variables
  - Predictor (independent) variable(s)
  - Outcome (dependent) variable

- Statistical Issues
  - Descriptive statistics
  - Specifies the hypotheses (if applicable)
  - Describes methods used to test hypotheses (if applicable)
The first step in choosing a research problem is to understand what makes “good” research.

- **Characteristics of good research**
  - Feasible
  - Interesting
  - Novel
  - Ethical
  - Relevant

- These characteristics form the mnemonic **FINER**
Feasible

- Number of subjects
  - Are there ample subjects from which to draw a sample? If so,
  - Will you be able to enroll subjects in the time frame of the study?

- Technical expertise
  - A research team with the skills necessary for designing the study, recruiting subjects, measuring the variables, and managing and analyzing the data.
Feasible (cont’d)

- Cost - both time and money
  - Estimate the cost of each component of the study (keep in mind most studies will exceed the initial amounts projected).

- Scope of the project
  - Is it manageable?
  - Don’t try to accomplish too much.
  - Focus on the most important goals.
Interesting

- The study should interest not only the investigator but be of interest to their peers.

Novel

- Good research contributes new information.
- Novelty of a proposed study can be determined with a thorough literature review.
The Research Problem cont’d

Ethical

- A good research question must meet the ethical standard’s of the scientific community.
- The acceptable benefit/risk ratio varies with the topic being studied.
- All studies require review and approval by the institutional review board (IRB).
The Research Problem cont’d

Relevant

- Good research contributes new information that will advance scientific knowledge.
- The study may lay the foundation for further research in an area or be expanded to a related area.
Developing the Research Question and Study Plan

- Write down the research question and a brief outline of the study plan.

- The research problem can be stated as either a question or statement.
  - The research problem should lead to analytical thinking.
  - Should lead to possible solutions.
  - Divide the research into manageable parts.
Developing the Research Question and Study Plan

- Primary and Secondary Questions
  - Establish a single primary research question
    - Focus study plan and sample size on this question
  - Add secondary research questions about other predictors or outcomes.
Ten Commandements for Picking a Research Project

I. Anticipate the results before doing the first study
   - First and foremost, think of the results you might obtain.

II. Pick an area on the basis of interest of the outcome
   - Pick something that is not only of interest to you but to a large part of the scientific community.

III. Look for an underoccupied niche that has potential
   - There are often important aspects in a field that are not being studied.
IV. Go to talks and read papers outside your area of interest.
   - Good ideas come from listening to talks and reading papers outside your area of interest.

V. Build on a theme
   - Seminal or important discoveries create the need for further research.

VI. Find a balance between low-risk and high-risk projects.
   - Higher-risk, higher-interest projects allow you to make seminal observations.

VII. Be prepared to pursue a project to any depth necessary.
   - To be recognized for important research accomplishments often requires a researcher to acquire new skills, call in a consultant, whatever it takes to complete the project.
VIII. Differentiate yourself
- Being recognized as an expert in some area.

IX. Do not assume that outstanding, or even good, clinical research is easier than outstanding basic research.
- Outstanding clinical research is not easy.
  - It is more difficult to design well-controlled and informative studies.
  - All procedures needed for an optimal design cannot always be performed in a given population.
  - The studies usually take longer and are more complicated.

X. Focus, Focus, Focus
- Do not forget the need to focus. Trying to make an impact in three or more different areas is extremely difficult.
Starbrite:
https://www.mc.vanderbilt.edu/starbrite/index.html
- Research Planning
- Studios
- Educational Resources

Biostatistics Clinics:
http://biostat.mc.vanderbilt.edu/wiki/Main/Clinics
References

