HOW TO DO EDUCATIONAL RESEARCH

David P. Yens, Ph.D.
Research Director
Touro College of Osteopathic Medicine, Middletown
Research Director
NYCOMEC

GOALS/OBJECTIVES

Upon completion of this presentation, you will be able to:

- Briefly describe the medical education research process
- Briefly identify different approaches to medical education research
- Briefly describe potential threats to the validity of a medical education project
- Identify an appropriate reference to the complete medical education research process

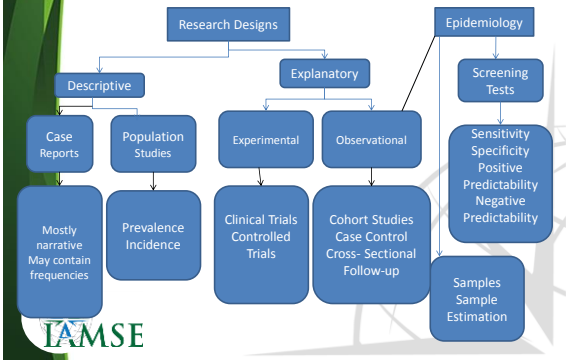
MEDICAL EDUCATION RESEARCH VS MEDICAL RESEARCH

- Purpose of medical education – produce competent caring physicians
- Difficult to use double blind
- More correlational
- More surveys
- Qualitative research

MEDICAL EDUCATION RESEARCH Typical Themes

- How medical students learn
  - Cognitive style [e.g., Myers-Briggs]
- Effectiveness of curriculum/clinical skills
  - Problem-based learning
- Teaching styles and methods
- Theoretical basis
  - Cognitivism
    - Cognitive load
  - Behaviorism

THE SPECTRUM OF RESEARCH



The (Experimental) Research Process in a Nutshell*

- Idea Development & Topic Selection
- Theory Identification
- Formulating the Research Question
- Conducting an Comprehensive Literature Review
- Setting the Objectives and Hypothesis
- Crafting the Methodology
  - Logistics: Assembling the Team
  - Sample size calculation
  - Establishing Data Collection Procedures

The (Experimental) Research Process in a Nutshell*

- Proposal Development
- Funding and Other Resources
- Obtaining Institutional Review Board (IRB) approval
- Collecting Data
- Statistical Analysis and Data Interpretation
- Dissemination

*Adapted from Grace Brannan

RESEARCH DEVELOPMENT

IDEA DEVELOPMENT AND TOPIC SELECTION

HOW DO YOU SELECT A TOPIC?

- Discussion groups on the Internet
- Attending faculty, other residents, etc.
  - Seek established clinical or research mentors for collaboration
- Reach out to researchers in other disciplines
- Observation that raises questions
- Research papers – suggestions for future research
- Replicate/extend prior research
- Treatment of older patients
- Conference presentations/abstracts
- Consider using secondary databases (CDC, NIH)

RESEARCH DEVELOPMENT

IDEA DEVELOPMENT AND TOPIC SELECTION

- Problem-based learning (PBL) is steadily gaining popularity, but its effectiveness has been questioned. Develop a research project to evaluate its effectiveness compared to lecture-based methods

RESEARCH DEVELOPMENT

THEORY IDENTIFICATION

- What learning theory might apply:

LEARNING THEORIES

- Behaviorist
- Cognitive
  - Information Processing
- Social Learning
- Psychodynamic
- Humanistic
- Neuropsychology

LEARNING THEORIES

- Adult learning principles (andragogy – Knowles)
- Social Cognitive theory
- Reflective Practice
- Transformative Learning
- Self-Directed Learning
- Experiential Learning

RESEARCH DEVELOPMENT

THEORY IDENTIFICATION

- PBL is derived from cognitive learning theory and constructivism in which students learn by processing and using/applying new information. New information is integrated with existing information.

RESEARCH DEVELOPMENT

FORMULATING THE RESEARCH QUESTION

- What factors must be considered when developing a research question?

CRITERIA FOR QUESTION*

- **FEASIBLE**
- **INTERESTING TO YOU**
- **NOVEL**
- **ANSWERS RESEARCH QUESTION**
- **CONFIRMS/REFUTES/EXENDS PREVIOUS FINDINGS?**
  - **Provides new findings?**
- **ETHICAL**
- **RELEVANT**
  - **To scientific knowledge**
  - **to clinical and health policy**
  - **To future research directions**

***Based on Hulley, et.al., 2013**

RESEARCH DEVELOPMENT

FORMULATING THE RESEARCH QUESTION

- Is there a difference in performance between PBL and lecture-based medical education?

RESEARCH DEVELOPMENT

CONDUCTING A COMPREHENSIVE LITERATURE REVIEW

- PubMed
- Cochran
- Medical Education Journals
- Google Scholar
- Books

RESEARCH DEVELOPMENT

SETTING THE OBJECTIVES AND HYPOTHESIS

- Objectives
- What outcome variables (independent variables) will we measure?
- Hypotheses
  - Null
  - Research

RESEARCH DEVELOPMENT

RESEARCH DESIGN

- Select research methodology

METHODS OF RESEARCH - TERMS

- Quantitative - Numbers
- Qualitative - Narrative

- Prospective - Future
- Retrospective - Past

Experimental / Interventional / Clinical Studies

- Studies where an experimental intervention is introduced to a group of subjects to determine the efficacy of certain procedures or treatments.
- Due to the nature of this study design, these are always prospective.

CROSS-SECTIONAL DESIGN

- These studies analyze data collected on a group of subjects at a given point in time rather than over an extended period of time.
- Designed to determine what is happening presently, not what happened in the past.
- Frequently used for surveys.

CORRELATIONAL

- Relationship between 2 (or more) variables
- Partial correlation
- Not predictive

QUALITATIVE

- Text based
- WHY
- HOW
- PATTERNS
- VIGNETTES
- EXPLORE the totality of a phenomenon
- EXAMPLES:
  - Stalmeijer, et.al. Cognitive apprenticeship in clinical practice: can it stimulate learning in the opinion of students. 2009, *Adv. In Health Sci Educ.*, 14:535-546
  - Van den Eertwegh, et.al. Exploring resident's communication learning process in the workplace: a five-phase model, *Plos One*, May 22, 2015

RESEARCH DEVELOPMENT

CRAFTING THE METHODOLOGY

- **LOGISTICS: ASSEMBLING THE TEAM**
- **SAMPLE SIZE CALCULATION**
- **ESTABLISHING DATA COLLECTION PROCEDURES**

- Is a team needed?
  - PBL staff
- Sample size – based on dependent variables
- Data Collection
  - Board scores
  - Clinical rotation grades
  - Clinical rotation written reports
  - Other

RESEARCH DEVELOPMENT

PROPOSAL DEVELOPMENT

- IRB review required for human subjects
  - Probably exempt
- Proposal contents and format (follows the IRB)

RESEARCH DEVELOPMENT

FUNDING AND OTHER RESOURCES

- Is funding required to accomplish the project?
- Source of funds?
- To be addressed by the next webinar.

RESEARCH DEVELOPMENT

OBTAINING INSTITUTIONAL REVIEW BOARD (IRB) APPROVAL

- Prepare proposal in format required by IRB being used.
- IRB Protocols
  - Meeting frequency
  - Timing
  - Exempt/Expedited/Full

IRB PROPOSAL FORMAT

- 1) the goals of the research;
- 2) the source of subjects and the selection criteria;
- 3) the procedure;
- 4) the potential risks and benefits for subjects;
- 5) the methods by which confidentiality and anonymity will be protected;
- 6) the debriefing process and the actions that will be taken in adverse situations;
- 7) the consent form; and
- 8) any other information that might be relevant to the approval decision.
- This format is a simple, clear, concise way to describe your research to the IRB members.

RESEARCH DEVELOPMENT

COLLECTING DATA

- Forms/formats for recording data
- Security of data
- Who is responsible?

RESEARCH DEVELOPMENT

STATISTICAL ANALYSIS AND DATA INTERPRETATION

- Statistics to be used
  - Based on stated hypotheses
- Analysis by researcher or outsourced?
  - May depend on complexity of analysis
- Computer program being used
- Formatting data for analysis - EXCEL

RESEARCH DEVELOPMENT

DISSEMINATION

- Poster
- Journal article
  - Selection of journal
  - Proper format
  - Is there a publication charge?

MAKING SURE YOUR RESEARCH IS VALID

WHAT IS VALIDITY?

- How well the measurement represents the phenomena of interest
- Internal validity – Did, in fact, the experimental treatment make a difference in this specific experimental instance? The basic minimum without which any experiment in uninterpretable.
- External validity – the extent to which the results are generalizable or applicable to a particular target population

EXPERIMENTAL VALIDITY

Internal Validity

- **History**
- **Maturation**
- **Instrumentation**
- **Statistical Regression**
- **Selection**
- **Experimental mortality**
- **Expectancy**

EXPERIMENTAL VALIDITY

External Validity: Generalizability

- **Interaction of selection and treatment**
  - **Different populations**
- **Interaction of setting and treatment**
  - **Different environment**
- **Interaction of history and treatment**
  - **Different time periods**

EXPERIMENTAL VALIDITY CLASSICAL REFERENCE

CAMPBELL & STANLEY

ASSESSMENT OF

EXPERIMENTAL DESIGNS

Campbell, D.T. & Stanley, J.C. Experimental and Quasi-experimental Designs for Research. Chicago: Rand McNally, 1966

SELECTED REFERENCES

- Hulley, S.B., et.al. *Designing Clinical Research, 4th Ed.* Wolters Kluwer, 2013.
- *Gehlbach, S. Interpreting the Medical Literature, 5th Ed.,* McGraw-Hill, 2006
- Neutens, J.N. & Rubinson, L. *Research Techniques for the Health Sciences, 4th Ed.* Benjamin Cummings, 2010.
- Blessing, J.D. & Forister, J.G. *Introduction to Research and Medical Literature for Health Professionals.* : Jones & Bartlett, 2013

REVIEW

At this point you should be able to:

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THANK YOU!

ARE THERE ANY QUESTIONS?