Introduction

What is Educational Research?

Research that uses a systematic methodology to explain educational problems and issues.
Session Goals

- **Compare inductive and deductive approaches to research.**
  - Identify when to use an inductive versus an deductive approach.

- **Explain the term “causation”**
  - Describe why research designs that investigate causation are “confirmatory”.

- **Describe the common educational research designs.**
  - Discuss when it is appropriate to use the design and skills needed by the researcher to use the design.

- **For Projects Proposed by Med Ed Fellows:**
  - Identify the type of design needed and “why” the design is appropriate.
  - Identify attributes of effective curricular resources.

Approaches to Research

**Deductive**
- **Goal:** Identify irrefutable facts & universal truths
  - Make Predictions Based on General Principles
- Typical of Clinical/Laboratory Research

**Inductive**
- **Goal:** New insights from data collected/observations
  - Draw generalizations from a limited number of observations
- Common in Educational Research
How do you Know Whether to Use an Inductive or Deductive Approach?

**Deductive**

**Inductive**

Causation

Probable Cause

Independent Variables

Effect

Dependent Variables

Explained by one of the following:

- **Theory**: Connected hypotheses and variables identified by the authors. (Explains & Predicts)
- **Conceptual Framework**: Visual model described by other authors; structure from their “lens”
- **Theoretical Rationale**: Rationale proposed by other authors based on studies about relationships
- **Hunch**

Studies that evaluate “causation” are “confirmatory”
**Quantitative Research Designs**

- **Deductive**
  - Investigators ask a narrow, specific question, collects quantitative data, and uses statistics to analyze data.

**Qualitative Research Designs**

- **Inductive**
  - Investigators ask broad, general questions, rely on the views of participants, collects data consisting of “words”, and analyzes the data for “themes.”

**Combined Qualitative and Quantitative Designs**

- **Both**
  - Both quantitative and qualitative methods are used

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**Selecting An Appropriate Design**

1. **Is the research confirmatory?**
   - **Yes**
     - **Do you want to evaluate Causation?**
       - **Yes**
         - **Can you randomize?**
           - **Yes**
             - Use randomized experimental methods
           - **No**
             - Use quasi-experimental Methods*
       - **No**
         - Use correlational methods
     - **No**
       - Use Inductive/Qualitative methods
   - **No**
     - Example 1: Interviews; focus groups
     - Example 2: Observation
     - Example 3: Surveys – open ended questions

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*Note: If you want to use a quasi-experimental method, but cannot assign subjects to a control group, use “non-experimental methods” such as case-control, cross-sectional, time series, and cohort studies.

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**Example 1:**
- RCT
- Pre-test post-test
- Explanatory correlations

**Example 2:**
- Surveys
- Observation

**Example 3:**
- Surveys – open ended questions

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5/5/2009
Is the research confirmatory?

Do you want to evaluate causation?

Can you randomize?

Yes

Use randomized experimental methods

Example: RCT

No

Use correlational methods

Example 1: explanatory correlations

Example 1:: Examples

Interviews; focus groups

No

Use Inductive/ Qualitative methods

Example 2: Observation

Example 2: Surveys

Example 3: Surveys – open ended questions

Can you randomize?

No

Use quasi-experimental Methods*

Example: Pre-test post-test

Skills Needed by the Researcher:

- Quantitative Research Methods
- Statistics

The Randomized Controlled Trial

- “The Gold Standard” if you want to evaluate “causation”
  - Confirmatory
- When to Use:
  - You have a hypothesis to test (supported by a theory, etc).
  - You can randomize subjects to treatment and control groups.
- Note: If you want to use a quasi-experimental method, but cannot assign subjects to a control group, use “non-experimental methods” such as case-control, cross-sectional, time series, and cohort studies.

Note: If you want to use a quasi-experimental method, but cannot assign subjects to a control group, use “non-experimental methods” such as case-control, cross-sectional, time series, and cohort studies.
Quasi-experimental research

- **The Most Common Design in Education**
  - RCT not possible when there are logistic issues/not practical to randomize
  - Examples:
    - Non-equivalent control groups
    - Pre-test post-test design

- **When to Use:**
  - You have a hypothesis to test (supported by a theory, etc).
  - You can *NOT* randomize subjects to treatment and control groups.

- **Skills Needed by the Researcher:**
  - Quantitative Research Methods
  - Statistics

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**Selecting An Appropriate Design**

- **Is the research confirmatory?**
  - Yes: Use Inductive/Qualitative methods
  - No: Use correlational methods

- **Do you want to evaluate Causation?**
  - Yes: Use randomized experimental methods
  - No: Use quasi-experimental Methods* 

- Example 1: RCT
- Example 2: Pre-test post-test
- Example 3: Surveys

- Example 1: explanatory correlations
- Example 2: Observation
- Example 3: Surveys – open ended questions

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**Note:** If you want to use a quasi-experimental method, but can not assign subjects to a control group, use "non-experimental methods" such as case-control, cross-sectional, time series, and cohort studies.
Correlational Research

- **Examples:**
  - Frequently used to correlate academic success with admission criteria.
    - Does not involve an intervention

- **When to Use:**
  - You want a confirmatory approach but DO NOT want to prove causation
  - When you want to show how variables are “associated”

- **Skills Needed by the Researcher:**
  - Quantitative Research Methods
  - Statistics

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Selecting An Appropriate Design

1. **Is the research confirmatory?**
   - Yes: Do you want to evaluate Causation?
     - Yes: Use randomized experimental methods
       - Example: RCT
     - No: Use quasi-experimental Methods* 
       - Example: Pre-test post-test
   - No: Use correlational methods
     - Example 1: explanatory correlations
     - Example 2: Observation
     - Example 3: Surveys – open-ended questions

*Note: If you want to use a quasi-experimental method, but cannot assign subjects to a control group, use non-experimental methods* such as case-control, cross-sectional, time series, and cohort studies.
Survey Research

- **Use in Education:**
  - Frequently used in education; does not involve an intervention.
  - Usually hypothesizes variables

- **When to Use:**
  - When you DO NOT want to evaluate causation
  - When you want to document variables and their relationships
  - Surveys can also be “exploratory” – esp if open ended questions are used

- **Skills Needed by the Researcher:**
  - Survey Design – the survey is your “tool”; validity is essential
  - Quantitative Research Methods
  - Statistics

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A Few Words about Survey Methodology

- A survey involves more than giving subjects a “questionnaire”
  - See Recommended References and seek an expert on item writing
Selecting An Appropriate Design

Is the research confirmatory?

Yes

Do you want to evaluate Causation?

Yes

Use Inductive/Qualitative methods

No

Use correlational methods

Example 1: Interviews; focus groups

Example 2: Observation

Example 1: Explanatory correlations

Example 2: Surveys

Example 3: Surveys – open ended questions

Can you randomize?

Yes

Use randomized experimental methods

Example: RCT

No

Use quasi-experimental Methods*

Example: Pre-test post-test

Note: If you want to use a quasi-experimental method, but can not assign subjects to a control group, use “non-experimental methods” such as case-control, cross-sectional, time series, and cohort studies.

Inductive Research Methods

Use in Education:
A. Interviews (focus groups, individual interviews); observation; think aloud; and simulated recall are methods used to gather information or “observations” from individuals to identify related factors.
   A. Grounded theory research
   B. Ethnographic Research
   C. Narrative Research

When to Use:
A. Little is known about the problem – “Exploratory”
B. There is a need to understand what factors or variables contribute to the problem or issue.
C. Note: These are not confirmatory

Skills Needed by the Researcher:
• Qualitative research skills: In-depth recording, analysis of words using special software & triangulation of data; Inductive thinking abilities
**Inductive (Qualitative) Research Designs**

- **Biography**: Explore the life of an individual
- **Phenomenology**: Understand the essence of experiences about a phenomenon (e.g., learning)
- **Grounded Theory Research**: Develop a theory grounded in data from the field
- **Ethnographic Research**: Explore the shared culture of a group of people
- **Case Study**: Develop an in-depth analysis of a single case or multiple cases


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**Selecting An Appropriate Design**

**Sometimes Both Inductive and Deductive Methods are Used in the Same Project**

- **Is the research confirmatory?**
  - **Yes**: Use inductive methods
  - **No**: Use deductive methods

- **Do you want to evaluate causation?**
  - **Yes**: Use correlational methods
  - **No**: Use quasi-experimental methods

**Example 1**: Interviews; focus groups
**Example 2**: Observation
**Example 3**: Surveys – open-ended questions

Note: If you want to use a quasi-experimental method, but can assign subjects to a control group, use “non-experimental methods” such as case-control, cross-sectional, time series, and cohort studies.

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Mixed Methods

**Use in Education:**
- A combination of inductive and deductive methods are used such as:
  - Begin with an inductive design and then do a deductive design
  - Begin with a deductive design and then do an inductive design

**When to Use:**
- Methods are usually not used for evaluating “causation”
- Used when you want to identify and document variables and their relationships
- Surveys can also be “exploratory” – esp if open ended questions are used

**Skills Needed by the Researcher:**
- Survey Design – the survey is your “tool”; validity is essential
- Quantitative Research Methods
- Statistics

Potential Biases in Research & Evaluation
(Confounding Variables)

**Study Design**
- Issues related to **Internal validity**
- Issues related to **External validity**

**Instrument Design**
- Issues related to **Construct validity**

**Data Analysis**
- Issues related to **Statistical Conclusion validity**

Potential “**Threats to validity**” in Educational Research include:
- History
- Maturation
- Mortality
- Selection

Instrument Design is very important in educational research
Educational Research & IRB

- **Notes about IRB Approval:**
  - Always safer to submit – even if it will be “exempt”
  - Go the easy road…..Many institutions with a Health Science Center have an IRB office that handles medical research and another that handles “other research.”
    - At UF, submit to IRB2 if your project does not involve data that falls under HIPAA: [http://irb.ufl.edu/irb02/](http://irb.ufl.edu/irb02/)

Advice.....

- **Envision, Plan, Implement, and Write your project so that it will be accepted by Editors.**
  - Start now…….“Do it the right way”
Reasons Why Editors Reject/Accept Manuscripts

Common reasons for rejection in RIME proceedings:

- Problem statement - 17%
- Relevance – 5%
- Research Design – 6%
- Sample and Sampling – 10%
- Instrumentation and Data Collection – 14%
- Results – 20%
- Discussion and Conclusion – 3%
- Title – 3%
- Abstract – 2%
- Writing/Presentation – 9%


Let’s Apply
Developing Curricular Resources
(Important if your Intervention involves Curricular Resources)

- Develop resources based on “How People Learn”
  
  - Good URL to start: http://www.vanderbilt.edu/cft/resources/teaching_resources/theory/HPL.htm
  
  - Other URL: http://www.newhorizons.org/neuro/neu_review_bransford.htm
  
  - See Instructional Design Guides at: http://ets.tlt.psu.edu/learningdesign/

Your Next Step:
Finalize Your Project Proposal
Proposal (4-5 Pages plus Appendix)

1. Title Page with Abstract (150 words)
   - Abstract should succinctly outline: specific aim (research question and hypothesis), background/significance, experimental design and methods.

2. Specific Aims

3. Background
   - Literature review that provides the background and convinces the reader that the project is important/addresses a relevant problem.

4. Preliminary work – if applicable
   - If you have already done work in this area, describe it.
   See Next Slide…. 
   
   Due – June 1

Proposal (4-5 Pages plus Appendix)

Continued from Prior Slide

5. Experimental Design/Methods
   - Research design, population & sample, power calculation – if possible, intervention, procedures, measurable outcomes, instrumentation (include validity & reliability), data collection & quality control, data analysis

6. Timeline for Proposed Activities

7. Literature Citations

8. Appendix
   - IRB approval - Documents for IRB submission

Due – June 1
Summary

- Establish a “conceptual framework” and determine whether inductive and/or deductive approaches are most appropriate.

- Select the best design given practical considerations; if using confirmatory designs, anticipate “threats to validity.”

- Instruments (eg. exams, surveys) are your “tools”….make sure they have evidence of “validity.”

- Before You Begin….Learn reasons why reviewers accept/reject educational manuscripts.
  - Essential Reading: Academic Medicine 2001 Issue

Educational Research References

1. **Core Reference:**

2. **More In-depth References:**
3. Survey Research:

4. What Editors Look for:
   A. Review Academic Medicine, September 2001 Issue (free access):

5. Development of a Conceptual Framework is “key to success”: