NRS Myth Busters: The Truth About Adult Education

American Institutes for Research
Welcome
OVAE and Project Team
Myth Busters Training Goals

- To help states use NRS and other data to better understand an issue that affects their programs

- To provide training to state teams to improve their capacity to conduct research and data analysis on their own

- To build a data-driven knowledge base in adult education
Agenda

Day 1
- Welcome, Overview, Icebreaker
- State Presentation of Topics and Plans
- Research Planning Model
- Introduction to Planning Tool
- Procedures
- Data Quality Issues and Threats to Validity
- Questions and Discussion
Agenda (cont’d)

Day 2
- Presentations and Discussion With ELC Participants
- Refining Your Research Question
- Research Design
- Analysis, Reporting, and Sample Size
- State Planning Time: Research Design
Agenda (cont’d)

Day 3
- Develop Your Data Analysis Approach
- State Presentations of Plans with Feedback
- State Development of Final Plan
- Developing Your Reporting Plan
- Discussion of AIR Support
- Adjourn
Outcomes

- Understand basic evaluation and research methodology as well as approaches to conducting research
- Select and refine a research question within a topic area (a myth to bust or other topic to explore)
- Work with other state teams to identify areas for collaboration in research, data collection, and/or reporting
- Develop data and analysis plans
- Begin analysis and develop reporting plans for a myth busting research project
Ice Breaker

Give us your name, state, role, and a hypothesis about the person coming after you.
Getting Started

See Guide pp. 2–9
Research Question

- State goal
- Bust a myth
- Measurable

Do students in classes taught by teachers who have more years of teaching experience have higher test scores?

Do students who use a new math curriculum gain an educational functioning level faster than students who do not use the new math curriculum?
Inputs and Outputs

- **Inputs**
  - Characteristics or activities of the program, teachers, or staff
  - Intervention or student/teacher factors studied
  - Could be contact hours or service program provides
  - Might affect what you find

Do students in classes taught by teachers who have more years of teaching experience have higher test scores?

Input: Teacher years of experience
Inputs and Outputs (cont’d)

- Outputs
  - The outcomes you’re interested in
  - What you are finding out

Do students in classes taught by teachers who have more years of teaching experience have higher test scores?

Output: Student test scores
Inputs and Outputs (cont’d)

Do students who use a new math curriculum gain an educational functioning level faster than students who do not use the new math curriculum?

Input:
Curriculum

Output:
Gaining an EFL
Data Needs

- What data do you need to answer the question?

Do students in classes taught by teachers who have more years of teaching experience have higher test scores?

Data Needs:
- Teacher experience
- Student enrollment
- Test scores
Data Needs (cont’d)

- What data do you need to answer the question?

Do students who use a new math curriculum gain an educational functioning level faster than students who do not use the new math curriculum?

Data Needs:
- Curriculum use
- Student enrollment
- EFL level, level advancement
Data Sources

- NRS Data in Program Database
  - EFL Level
  - Level advancement
  - Contact hours
  - Student ethnicity, gender, age, employment status

- Other Data Possibly in Program Database
  - Enrollment status
  - Test scores

- Data from Other Sources
  - Teacher education or years of experience
State Presentations
State Jigsaw

- Take jigsaw handout and collect the information requested
- Add your discoveries to the appropriate chart paper
- NRS team will summarize state plans
- States can revise as needed

All Participants: Consider overlap with your studies and where you might collaborate

See Handout 1: State Jigsaw and Handout 2: Identification of Collaboration Opportunities
Break
Evaluation Research Planning Model
Evaluation Research Planning Model

- Basic step-by-step model from idea to analysis
  - Three parts: Questions, design, and analysis and reporting
- Includes basic research design concepts, using nontechnical language and approach
- Guides our training model and activities and is the basis for the research plan you’ll develop here
Planning Model (cont’d)

- Questions
  - Identify Topics
  - Develop Questions
  - Refine Questions
    - Identify Alternative Factors and Explanations
    - Develop Research Design
      - types
      - sample size
    - Design Data Presentation and Analysis
  - Analyze, Interpret, and Report Data

- Design
  - Inputs/Outputs
    - Identify Data Sources
    - Evaluate Data Quality
  - Data Collection Needs
    - inputs
    - outputs
    - alternative factors

See Handout 3: Planning Model
Planning Tool

See Handout 4: Evaluation/Research Planner
Handout 4: Evaluation/Research Planner

This planner is designed for use while your state team plans an evaluation or research project. The planner should be revisited and modified, as needed, frequently. Use the first box below to maintain the status of your plan. You should fill out the next steps table each time you have completed an update of the plan. The Research Question and Evaluation Method sections is up front because teams should frequently check back to make sure the rest of their plan aligns with their research question and goal(s).

State:

Team members:

Date last updated: [Click to select a date]

Status:

<table>
<thead>
<tr>
<th>Next Step</th>
<th>Person Responsible</th>
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SECTION A: Research Question

Research question:

Goal of research question (e.g., debunking a myth, connected to organizational goal):

SECTION B: Variables:

Inputs (What is being provided? Example: hours of instruction, teacher experience, curriculum):

Outputs (What changes are you measuring? Example: attendance, test scores, educational levels):

Go back to your research question. Does it reflect your inputs/outputs? If not, readjust.
SECTION C: Data Sources

<table>
<thead>
<tr>
<th>Data Needs (e.g., student ethnicity, test scores, contact hours)</th>
<th>Data Sources (e.g., NRS Data, other data in program database)</th>
<th>Data Available</th>
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SECTION D: Data Collection

What kind of study is this?

Sample size:

Data collection tools:

Data collection process:

Data collection begin date: [Click to select a date]

Data collection end date: [Click to select a date]

Person/people responsible for data collection:

SECTION E: Data Quality

Data quality issues to address:

How we will address data quality issues:
SECTION F: Data Analysis

Are you conducting secondary data analysis or exploratory analyses?

Descriptive statistics we want to run:

Other analyses:

Person/people responsible for data analysis:

SECTION G: Threats to Validity

<table>
<thead>
<tr>
<th>Potential Threat to Validity</th>
<th>How Threat Will Be Addressed</th>
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SECTION H: Reporting Plan

Plan for report:

Format(s) for final report:

Timeframe to create, review, disseminate final report:

Person/people responsible for final report:

Dissemination plan (include target audience):

Person/people responsible for dissemination:
Using the Planner

Using your webinar worksheet and any additions or edits, complete sections A–C in your Evaluation/Research Planner.

See Handout 4: Evaluation/Research Planner Sections A–C
Procedures: Your Method for Research

See Handout 5: Operationalization and Planning
Procedures & Operationalization

- **Operationalization**: How will you define variables and what will you do?

- **Procedures**: List out the activities you will perform to collect and analyze data
Operationalize Your Measures

- Translates concepts into practical definitions
- Identify key variables from research question
- Conceptually represents the measures
- Defined in terms of procedures and data
Operationalize Measures: Examples

- **Online and classroom–based instruction**
  - Online: Moodle classroom, nonfacilitated, 6 hours per week
  - Classroom based: Face–to–face classroom, 6 hours per week
Operationalize Measures: Examples (cont’d)

- Professional development
  - Teacher attends 8 hours of training on specific topics related to teaching

- Student learning gains
  - Scaled pre–posttest scores on TABE total battery
General Guidelines for Planning Procedures

- Work with staff to identify all steps
- Consult prior studies for guidance

Include:
- Staffing and resources
- Schedule and timeline – then double it (at least)
- Anticipate problems

- Be flexible – change according to needs
Procedures for Data Collection and Analysis

- Your recipe or road map for conducting the study

- Critical to guide you and others for interpretation and replication

- Varies by type of study but guided by research question
Procedures for Data Collection and Analysis (cont’d)

- General commonalities by type of design, but many procedures are specific to project

- Includes ways to develop operational definitions
Exploratory Studies: Secondary Data Analyses

- Identify the variables you need.
  - Don’t forget control variables.

- Determine sample sizes: number of programs, classes, and students (more later).

- Do data definitions and codes match needs for the research question?

- Obtain data use permission and meet confidentiality needs.
Secondary Data Analyses (cont’d)

- Evaluate technical issues and needs
- Clean data
- Recode, eliminate data, programs or classes, as needed
- Plan analytic approach
- Reconsider, finalize approach
New Data Collection

- Needed when design requires additional data—quantitative or qualitative—to:
  - Fill in data that does not exist or is difficult to quantify
  - Complement other types of data
  - Provide an understanding of what, how, when and where (e.g., implementation study)
New Data Collection (cont’d)

- Develop data collection instruments
  - Surveys, observation, focus groups, document review guides

- Determine operational definitions, procedures

- Resources, time, validity issues for development
Planning New Data Collection

- Decide on approach, based on design (e.g., observation guide of classroom activities, survey, assessment of teacher or student knowledge)

- Develop items, informed by:
  - Research questions
  - Research
  - Validity, controls, contextual data
Planning New Data Collection

- Pilot test and revise

- Train staff
  - Administration
  - Reliability for subjective ratings and observations
Procedures for New Data Collection

- Select respondents
- Determine sample size
- Data collection
- Identify staff and resources needed
Data Issues—New Data Collection

- Quantitative data
  - Put data in electronic form. Code categories, if needed

- Clean data
  - Run frequencies, correct errors
  - Check for missing data

- Determine analysis approach and software

- Provide sufficient resources (staff time, funds)
What does it look like in your state?

- Complete the Planning Section of Handout 5
- Revisit Section B of your Evaluation/Research Planner as a State
  - Have you operationalized your variables (inputs/outputs)?
  - Do you need to adjust?
- Complete Section D of your Planner as a State:
  - What kind of study are you implementing?
  - How will you collect data?

See Handout 5: Operationalizing & Planning (Planning Section) and Handout 4: Evaluation/Research Planner Sections B & D
Share at Your Tables

- What are your variables (inputs/outputs)?
- What kind of study are you implementing?
- What kind of data collection will you do?
Working Lunch
Evaluation/Research Planner Sharing Session
Data Quality Issues: What you don’t know about your data can mess you up!

See Handout 6: Data Quality Challenges
Why should we care about data quality?

(http://youtu.be/k4gj_RdtKCw)
Data Quality...What Data Do You Really have?

- Results only as good as the data
- Affects usable variables, sample size, analyses
- Can vary even within a single data set
- Affects validity of analyses, conclusions — introduces biases
- Won’t really represent the concept being researched
Data Quality Problems

- **Existing data**: assess quality and access
  - Definitions and codes
  - Coverage
  - Data collection procedures, errors
  - Technical issues

- **New data collection**: ensure quality through design and data collection
Data Definitions

- Measure definitions
  - Consistent definition and interpretation across programs
  - Consistent across databases
  - Same over time
  - Matches research needs
Data Definitions

- Coding of measures
  - Categories or continuous
  - Categories match needs
Examples of Definition Issues

- NRS Race and Ethnicity Definitions
  - Changed in 2010

- Attendance
  - Reported daily, weekly, monthly, or less frequently?

- Test Scores
  - Scales, raw scores, or EFLs only
Examples of Definition Issues (cont’d)

- **Student Age**
  - NRS reports categories, but actual age may be preferable

- **Teachers’ Years of Experience**
  - Total years? Year in program? Years teaching subject?

What issues do you see arising from these differences?
Data Coverage

- **Coverage**: whether you have enough data, data of sufficient depth, or data from enough of your subjects

- **Possible coverage issues:**
  - Missing test data
  - Different tests used
  - No data available
  - Longitudinal data
  - NRS follow-up measures not collected or missing
  - Data availability across local programs
Data Collection Issues

- Data entry errors
- Incorrect administration (tests, survey items)
- Missing and incomplete data
  - Ideally, 20% or fewer cases missing but...
  - 50% or more may be missing
  - Consider whether it’s too large to use
Technical Issues

- Different database formats across databases
- Database relationships
- Changes in databases over time
- Confidentiality and privacy concerns
Some Ways to Resolve Data Quality Problems

- **General**
  - Review error checks in data system
  - Look at tables to gauge missing data and identify errors

- **Definitions and Coding Issues**
  - Recode by combining or creating categories
  - Separate analyses for incompatible variables
Some Ways to Resolve Data Quality Problems (cont’d)

- **Missing data**
  - Obtain data from another source
  - Use classes, programs that have the data
  - Use statistical correction (complicated!)

- **Coverage**
  - Use proxy measures

- **If all else fails:**
  - Collect new data
  - Revise your research question
New Data Collection

- Build in quality by design

- Consider same quality considerations as with existing data
  - Definitions and coding
  - Coverage
  - Data collection procedures
  - Technical issues
Designing New Measures

- Definitions: clearly identify concepts and variables to measure
- Design coding categories and rating scales
- Evaluate for biases
- Pilot test and evaluate
Data Collection Needs

- Coverage: sample
  - Who will provide the data?
  - Sample size
- Develop methodology
- Determine time, staff, and resources needed
- Train staff
  - Procedures, consistent interpretation
  - Inter-rater reliability
- Quality control–data checks
Planning Activity

Refer to Handout 6 and Planner Section E.

In your state teams, identify any potential data quality challenges and ways to resolve them. Add challenges to your planning guide.

See Handout 6: Data Quality Challenges and Handout 4: Evaluation/Research Planner Section E
Break
Threats to Validity

See Handout 7: Threats to Validity
Glossary
What Are “Threats to Validity”?

- What you can and can’t say on the basis of your study
- Why is this important?
  - Can make your findings inaccurate and untrustworthy; conclusions are not valid

You think you found something, but not really because...
Global Average Temperature vs. Number of Pirates

![Graph showing the relationship between global average temperature and number of pirates. The temperature increases as the number of pirates increases.]
Global Average Temperature vs. Number of Pirates

- 1820
- 1880
- 1920
- 1940
- 1980
- 2000

Number of Pirates (Approximate):
- 35,000
- 20,000
- 15,000
- 5,000
- 400
- 17

Global Average Temp (°C):
THE LESSON HERE?

Dig Deeper!
What Are the Greatest Threats?

Confounding factors
- Nonrepresentativeness
- Hawthorne effect
- History effect

Selection effects
- Maturation effect
- Regression to the mean
- Participant mortality
- Testing effect
Confounding Factors

- Are there other variables that could explain your results?

- **Example:** Are the students doing better on the assessments because the intervention is working, or are their gains due to other program initiatives not being studied?
Data Display: Gapminder World

- Gapminder World (http://www.gapminder.org/) shows the world’s most important trends with just a few clicks. We will use this program to show an example of what confounding factors threat is.
Confounding Factors: Types of Threats

1. Nonrepresentativeness
   - Are you drawing broad conclusions on the basis of very limited observations?
   - **Example:** You conclude that the intervention is successful and should be implemented statewide because it shows promise in one site. The one site serves mostly Spanish-speaking ESL learners.
Nonrepresentativeness

[Population] All Student Age Profile (Frequency)

[Study Sample] Sampled Student Age Profile (Frequency)
Confounding Factors: Types of Threats (2)

- Hawthorne (observer) effect
  - Did participants change their behavior because they knew they were being observed?
  - **Example:** Did the intervention really work, or did student test scores improve because once students heard that you were doing research on them and their test scores, they started coming to class more because they wanted to do well?
Confounding Factors: Types of Threats (3)

- **History effect**
  - Did things external to the study change over time affect the outcomes?

  - Example: OVAE is changing reporting requirements from “goals” to “cohorts” for long-term outcomes like employment. So an intervention to improve employment outcomes statewide will have different results once this change takes place. It would be hard to separate the effects of the intervention from the change in from whom you collected data.
History Effect

Percentage of students obtaining employment

Year

Intervention in 2005

Intervention Effects = Red line – Blue Line

YEAR
Selection Effects

- Selection effects
  - How were participants chosen?

  **Example:** A new student counseling service was offered. Students who volunteered for counseling made greater gains than other students, but is the effect due to counseling or student factors?
Selection Bias

Examine differences between online instruction and face-to-face instruction

<table>
<thead>
<tr>
<th>Student ID</th>
<th>Student has computer at home</th>
<th>Sign up for the study</th>
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<td>1</td>
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<tr>
<td>10</td>
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</tbody>
</table>
Selection Effects: Types of Threats (4)

- Maturation
  - Have participants matured significantly over the period of the study?

  - **Example:** Are students showing gains because of instruction or because of natural literacy development from interacting with print outside the classroom?
Selection Effects: Types of Threats (5)

- **Statistical Regression** ("Regression to the Mean")
  - Do the high scores seem to be dropping while the low scores seem to be increasing?
  
  - **Example**: A teacher was given the highest possible scores on the end-of-semester evaluation one semester but the next semester received scores that were still very good, but not nearly as high.
Regression to the Mean

If more students perform poorly in the sample, they tend to get a higher score in the posttest and move the mean closer to the population mean.
Selection Effects: Types of Threats (6)

- Subject Mortality
  - Who dropped out of the study?

- Example: Were the only students who stayed in the class to receive the intervention the ones who could benefit most from it (i.e., the intervention group got “creamed”)? Or did the opposite happen?
Selection Effects: Types of Threats (7)

- Testing Effect
  - Did you use the same questions to test students as you did previously?

  Example: Students pretested with TABE Form A should not be posttested with the same form, so that the results reflect what they’ve learned rather than their ability to learn how to take that particular test.
See Handout 7: Threats to Validity
Glossary
Your Threats to Validity

Apply your learning about threats to validity to your own study.

In your state teams, identify your anticipated results, any possible alternative factors that may influence these results, and strategies for controlling for these factors. Enter these in your Evaluation/Research Planner.

See Handout 4: Evaluation/Research Planner Section G
Questions and Discussion
+/Δ for Day One