
Addressing the Research Component of an MSP Proposal

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The Task Before You

- “...all Institute Partnerships are expected to provide explicit research questions and associated design in order to contribute to what is known about teacher leadership and student learning.”
- “...the proposal must identify the research questions to be studied and show how the design of the project will allow warranted claims that the activities conducted by the Partnership contributed to the measured outcomes.”
- “All proposals must include a robust research design that discusses the theoretical or research base for the proposed activities, a clear description of these activities, the proposed assessment instruments that would be used to measure outcomes, and the logic of how reasonable, warranted conclusions will link the activities to the outcomes.”

Session Overview

- The “Gold Standard” of research design
 - How and why education studies often fall short of this standard
 - Practical suggestions for avoiding common pitfalls as you address the research component of your proposal
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The “Gold Standard” vs.
What Happens Too Often

Research Questions

Gold Standard

- Research questions:
 - Have a clear focus
 - Identify independent and dependent variables
 - Suggest a research design

Too often

- Research Questions are too vague to guide research design
 - Questions are variations of, “Did it work?”
 - Why?
 - Lack of opportunities to develop skill writing research questions
 - Research was an afterthought; the main goal was delivering a service to teachers
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Comparison Groups

Gold Standard

- Random assignment to treatment and control conditions
- Avoids contamination of control group (e.g., ensuring that treatment and control teachers are not in the same school and do not have opportunities discuss the treatment)

Too often

- No comparison group
 - If there is a comparison group, no random assignment, and therefore probably not comparable.
 - Why?
 - Recruiting a control group is very hard work.
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Obstacles to Recruiting Comparison Groups

- If the intervention is supposed to be a good thing, everyone will want it.
 - Data collection burden is a disincentive.
 - If student-level data are being collected, there is concern about intrusion on instructional time.
 - School district research approval processes can be difficult to navigate.
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Instruments

Gold Standard

- Validity
 - Instruments have established evidence of validity
 - Instruments are aligned to the treatment
- Instruments are reliable

Too often

- Instruments were idiosyncratic to the studies
 - No evidence of validity or reliability
 - Why?
 - As a field, we lack established instruments.
 - Some exist, but the odds that they will align with a particular treatment are low
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Data Analysis

Gold Standard

- Adjusts alpha for multiple tests of significance
- Appropriate to the structure of the data; i.e., if student outcomes are used to make claims about an intervention with teachers, multi-level modeling is used.

Too often

- No adjustment of alpha
- Treatment and control students are lumped in two big groups, ignoring that they are nested within classes and teachers.
- Why?
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Reporting

Gold Standard

- Clear description of treatment, instruments, data collection, data analysis and findings
- Sufficient detail so that someone could replicate

Too often

- Lack of detail on treatment. We may know that “it” worked, but we don’t know what “it” is.
 - Why?
 - A systemic problem—journals have page limits
 - May also reflect a weak research design
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Suggestions for *Avoiding* Common Pitfalls

Tap Education Research Expertise

- Include an education researcher as a member of the core project team.
 - Involve the individual in all aspects of project design.
 - Otherwise, project may not be able to answer research questions.
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Research Questions

- Promise what you can deliver.
 - Projects will be complex with many moving parts and unique contextual factors.
 - Identify the critical relationships that:
 - you are most interested in; and
 - lend themselves to systematic study
 - Your project will also have an external evaluation.
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Comparison Groups

- Recruiting a comparison group is probably going to be difficult.
 - A design that is often overlooked:
 - Design project with two or more cohorts that will participate in sequence
 - Recruit participants, randomly assigning them to cohorts.
 - Second cohort serves as a control for the first; gets all the same benefits as the first.
 - If random assignment isn't feasible, consider a matched comparison group:
 - Not as strong as random assignment, but better than no comparison group or an unmatched group.
 - Match on the factors that seem most important given your treatment (grades taught, subjects taught, certification status, course background, years of experience.)
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Instruments

Learning Mathematics for Teaching

(LMT) (NSF Grant No. 0335411)

Assessments for elementary and middle grades teachers

- Content Scales:
 - Number and operations
 - Patterns, functions, and algebra
 - Geometry
 - Knowledge domains:
 - Specialized content knowledge
 - Knowledge of content and students
 - Knowledge of content and teaching
 - Each scale has a pool of multiple choice items
 - For more information: <http://sitemaker.umich.edu/lmt/home>
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Diagnostic Teacher Assessments in Mathematics and Science

- Assessments for elementary and middle grades teachers
 - Content scales:
 - Number/computation
 - Geometry/measurement
 - Probability/statistics
 - Algebra
 - Knowledge types:
 - Type I-Rote memory
 - Type II-Conceptual understanding
 - Type III-Problem solving/reasoning
 - Type IV-Mathematics knowledge for teaching
 - Each form has 20 items, 10 multiple choice, 10 open-ended
 - For more information: <http://louisville.edu/edu/crmstd/>
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Diagnostic Teacher Assessments in Mathematics and Science

- Assessments in life, earth, and physical science (one in each area) for middle grades teachers
 - Knowledge domains:
 - declarative knowledge
 - scientific inquiry and procedures
 - schematic knowledge
 - pedagogical content knowledge (PCK)
 - science, technology, and society knowledge
 - Each form has 20 multiple choice and 5 open-ended
 - Straight content (except for PCK)
 - Available on fee basis; \$7 per teacher for scoring
 - http://louisville.edu/edu/crmstd/diag_sci_assess_middle_teachers.html
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MOSART: Misconception Oriented Standards-based Assessment Resource for Teachers (NSF Grant No. 0412382)

- Over 1,000 items on K-12 earth science and physical science content
 - Distractors based on published misconceptions
 - Each test is 20 m-c items
 - Same tests for teachers and students
 - Available at no cost
 - http://www.cfa.harvard.edu/smgphp/mosart/about_mosart.html
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ATLAST: Assessing Teacher Learning About Science Teaching (NSF Grant no. 0335328)

- Assessments for middle grades students and teachers in:
 - Flow of matter and energy in living systems
 - Force and motion
 - Plate tectonics
 - All multiple choice
 - Freely available
 - <http://www.horizon-research.com/atlast/>
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Instrument Database

- Horizon has catalogued well over 100 instruments from:
 - Literature review
 - Research conducted by MSPs
 - Created a searchable database
 - <http://www.mspkmd.net/instruments/index.php>
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Key Points

- Design your Institute Partnership and your research simultaneously.
 - Include the education researcher(s) on the core project team.
 - Promise a research study that the project can deliver.
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