Identifying Measures for Evaluating Changes in Teacher Practice, Teacher and Student Attitudes and Beliefs, and Sustainability

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Strengthen the quality of the MSP project evaluation and build the capacity of the evaluators by strengthening their skills related to evaluation design, methodology, analysis, and reporting.
Today’s Objectives

Identify and define a variety of *outcomes* and methods to *measure* those outcomes that projects may wish to use to demonstrate the impacts of the MSP project.
Things to Consider

• Exploratory nature of project vs. explicit nature of the project
• Measures of the logical connections between activities and impacts
  – Proximal vs. distal relationships
• Importance of fidelity measures
• Use existing vs. developing or adapting
  – Document validity and reliability
• Importance of documenting measures and instrument
Clarification of Terms

• **Measure**—What is to be quantified
  – Teacher beliefs

• **Indicator**—A concise description of how a value will be calculated for a measure
  – Examples
    • Percent of Grade 8 students who met the science standard on the state assessment
    • The teachers’ score on the professional culture subscale on the annual teacher survey

• **Instrument**—The tools used to collect data to calculate the measures
Chicken or the Egg Problem

The Evaluator’s Version:
Which came first?
The Instrument
OR
The Measure
Exploratory vs. Explicit Nature of the Project

Does the project have a theory of action?
If so, how explicit is it?
What Is a Theory of Action

- Collective belief about causal relationships between action and desired impacts
  - Simple:
    \[ If \ldots \quad Then \ldots \]
  - Complex:
    \[ If \ldots \ and \ldots \ and \ldots \ and \ldots \quad Then \ldots \]

- A collaborative interpretation of the literature
Characteristics of an Explicit Theory of Action

• Can be a testable hypothesis
• Useful for defining fidelity of project implementation
• Describes project impact as close to the primary target audience as possible
  – A description of what students do to learn
• Recognizable when it is going on
  – Observable
• Believable
Science Example

• Students learn science when they:
  – Articulate their initial ideas,
  – Are intellectually engaged with important science content,
  – Confront their ideas with evidence,
  – Formulate new ideas based on that evidence,
  – Reflect upon how their ideas have evolved
Math Example (Common Core State Standards)

If teachers use developmentally appropriate yet challenging tasks and activities that engage students in:

• **Justifying**—Explaining and justifying their reasoning mathematically

• **Generalizing**—Identifying and verifying conjectures or predictions about the general case

• **Representing**—Using representations (symbolic, notation, graphs, charts, tables, and diagrams) to communicate and explore mathematical ideas

• **Applying**—Applying mathematical skills and concepts to real-world applications

Then student achievement and interest in mathematics will increase.
Implications for Choosing Measures

Continuum of Project Types

Evaluating exploratory projects that seek to identify relationships between interventions and impacts
- Tend not to have an explicit theory of action
- Require a broad range of measures
- Measures must be general in nature

Evaluating projects with explicit theories of action
- Require fewer measures
- Measures can be more focused
Measures of the Logical Connections Between Activities and Impacts

AKA: What is in the Black Box?
Attainment of Goals and Objectives

• A Primary Role of Evaluation
  – To what extent has the project met its stated goals and objectives?

• Goals tend to be expected impacts
  – Student achievement goals
  – Increased enrollment in STEM disciplines

• Objectives tend to be activities or strategies
  – Conduct teacher professional development
  – Provide specific experiences for students
What is Between Activities and Impacts?

• Example of **proximal** relationship

**Activity**

Provide training to educators on specific subject matter content

**Impact**

Educators demonstrate increased subject matter content knowledge
Example of Distal Relationship

**Activity**
Provide training to educators on specific subject matter content

**Impact**
For almost all projects in education, the expected impacts are very distal with respect to the planned activities!

Students increase achievement in the subject matter content
What We Really Want!

**Activity**

Provide training to educators on specific subject matter content

**Impact**

Student increase achievement in the subject matter content

A Miracle!
In Reality, A Lot Must Happen

**Activity**
- Provide training to educators on specific subject matter content
- Educators demonstrate increased subject matter content knowledge
- Educators apply new knowledge to enhance lesson development

**Impact**
- Classroom instruction improves
- Students are actively engaged in rich learning experiences
- Students increase achievement in the subject matter content
What is Between Activities and Impacts?

The Well-Planned Activities

The BLACK BOX of Implementation

The Desired Impact
Implications for Evaluation

- Evaluation is more complex
- Evaluation is more expensive
- It is more difficult to demonstrate success
- It is more difficult to attribute any success you may find to the intervention
Implications for Selecting Measures

• The logical connection between activities and impacts should be defined or at least anticipated

• Measures are identified at each step along the way
What is a Logic Model

• A diagram that shows the logical connection between project resources, activities, outcomes, and expected impacts
• Incorporates a primary theory of action
• Can be viewed as a collection of theories of actions
• Answers the question:

*Why would the planned activities be expected to have the desired impacts?*
Basic Logic Model

Inputs → Activities → Outputs → Outcomes → Impacts

Black Box Issues

Resources → Activities

Proximal Impacts

Distal Impacts
MSP Example

• Oregon Mathematics Leadership Institute
  – 5-year project funded by NSF
  – 10 School Districts and 86 schools, 2 lead IHEs, Teachers Development Group

• Logic model approach used during the development of the conceptual framework
OMLI Example

Inputs
- Partner Organizations
- Project Leadership

Activities
- Leadership Summit
- School Leadership Teams
- Summer Institutes
- Follow-up and Technical Support
- Leadership Symposium

Outcomes
- New Content Courses at IHEs

Impacts
- Increased Student Achievement in Math
- Close the Achievement Gap in Math

HUGE BLACK BOX
A Unifying Theme Emerged

• *If* students were more actively engaged in discourse that involves mathematical justification and generalization, *then* they would develop a deeper understanding of mathematics that would be evident by increased student achievement.

• This became the **Theory of Action** for the OMLI Project that enabled the leadership to fill in the black box.
OMLI Example

Inputs

- Partner Organizations
- Project Leadership

Activities

- Leadership Summit
- School Leadership Teams
- Summer Institutes
- Follow-up and Technical Support
- Leadership Symposium

Outcomes

- New Content Courses at IHEs
- Professional Learning Communities
- Increased Mathematical Discourse Through Explanation, Justification, and Generalization
- Improved Conceptual Understanding

Impacts

- Increased Student Achievement in Math
- Close the Achievement Gap in Math
Using the Logic Model to Identify Measures

• Identify evaluation question for each major component of the logic model
• Identify measures for each component of the logic model
• Develop indicators
• Identify methodology
  – Multiple informants
  – Multiple data collection methods
Questions!
Some Common Measures

- Teacher Practice
- Student Engagement
- Teacher and Student Attitudes and Beliefs
- Sustainability
- Teacher Preparedness
- Instructional Leadership
- Administrative Leadership
- Partnership
- Professional Climate
- Fidelity
Teaching Practice

• **TEACHERS**—Actions a teacher takes to support students learning

<table>
<thead>
<tr>
<th>Method</th>
<th>Existing Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation</td>
<td>Inside the Classroom Observation and Analytic Protocol</td>
</tr>
<tr>
<td></td>
<td>Reformed Teaching Observation Protocol (RTOP)</td>
</tr>
<tr>
<td>Survey</td>
<td>Arizona Mathematics Partnership (AMP) Teacher Survey</td>
</tr>
<tr>
<td></td>
<td>Surveys of Enacted Curriculum</td>
</tr>
<tr>
<td></td>
<td>Inside the Classroom Teacher Questionnaire (Math or Science)</td>
</tr>
</tbody>
</table>

• **STUDENTS**—Evidence that students are intellectually engaged—focus on what instruction elicits in students

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<tbody>
<tr>
<td>Observation</td>
<td>LASER Science Classroom Observation Protocol (Science)</td>
</tr>
<tr>
<td></td>
<td>OMLI Classroom Observation Protocol (Math)</td>
</tr>
</tbody>
</table>
# Attitudes and Beliefs

## TEACHER
Underlying philosophies that influence teacher practice and day-to-day instructional decisions that teachers make

<table>
<thead>
<tr>
<th>Method</th>
<th>Existing Instruments</th>
</tr>
</thead>
</table>
| Survey      | Inside the Classroom Teacher Questionnaire  
Surveys of Enacted Curriculum  
TIMSS-R Teacher Questionnaire (Math and Science)  
Principles of Scientific Inquiry Teacher Survey |
| Interview   | Teacher Beliefs Inventory                                                             |

## STUDENT
Underlying philosophies that influence student engagement in learning and future aspirations

<table>
<thead>
<tr>
<th>Method</th>
<th>Existing Instruments</th>
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</thead>
</table>
| Survey      | Attitudes Toward Mathematics Inventory  
Attitudes Toward Science Inventory (Revised) |
Sustainability

• Institutionalization of factors that will sustain the work of the project beyond current funding
  – Policy changes
  – Administrative support
  – Time and structure for school-based PD
  – Establishment of instructional leadership positions (coaches, TOSAs, mentors)
Sustainability Examples

• **Policies**—Evidence of changes in policies and procedure intended to support continuous improvement

• **Access to Instructional Leadership**—The number of schools where instructional leadership is available to all teachers (established position)

• **Administrator Participation**—The attendance rate at meetings and PD intended for administrators

• **Administrator Beliefs**—Administrator’s score on the instructional beliefs scale
  – Compared for change over time
  – Compared with that of teachers
Other Common Measures

• Teacher Preparedness
  – The degree to which teachers feel prepared to engage students in learning activities that align with the project theory of action
    • LSC Through Teacher Enhancement Questionnaires

• Instructional Leadership
  – The degree to which teacher leaders feel prepared to fulfill their role as instructional leaders responsible for influencing colleagues
    • Examining Mathematical Coaching Teacher Survey
Other Common Measures

• Administrative Leadership
  – Factors such as administrator awareness and support of the project, engagement in professional development, and interactions with teachers

• Partnership
  – Factors that allow partners to move beyond their own individual institutional needs and engage in the work of the partnership to better meet project goals
    • Education R&D Partnership Tool

• Professional Climate
  – Factors that foster a constructive and supportive professional environment such as trust, collegiality, and collaboration
    • Arizona Mathematics Partnership Teacher Survey
Questions!
Importance of Fidelity Measures
Fidelity of Implementation

• Requires clear theory of action

• Fidelity of implementation:
  – The degree to which the initiative is carried out the way it was intended
  – The degree to which the spirit of the theory of action is enacted
  – Recognizing that not everyone will implement the way you planned
Identifying Essential Elements

- What are the essential elements of implementing the project/initiative that make the logic model valid
- Identifies what can and cannot be adapted
- Takes into account human nature and desire to personalize
- Well-defined essential elements can identify fidelity measures
Process Example

• A project has a PD model that includes five phases in a cyclic process that PD facilitators are expected to follow

• Evaluation Question:
  – To what extent are the facilitators implementing the proposed PD model with fidelity?

• PD Model Fidelity
  – The number of teacher participants who report that they experienced and can comment on the value of each of the 5 phases
Outcome and Fidelity Example

• Theory of Action Includes:
  – Student discourse that involves justifying mathematical reasoning

• Evaluation Questions:
  – To what extent has participation in the project increase student discourse that involves justification of mathematical reasoning?

• Classroom Discourse
  – The percent of classroom observations that indicated the majority of students were engaged in discourse that required them to justify their reasoning mathematically during at least part of the lesson observed
Advantages of Assessing Fidelity

• Formative Evaluation
  – Provides information to improve the project during implementation
  – Which elements are implemented well?
  – Why are some essential elements difficult to implement?

• Summative Evaluation
  – Did those who implemented with fidelity have better results than those who did not?

• Ensuring Attribution
  – How do you know the things you are measuring are a result of the intervention?
  – Clearly shows a relationship between important elements of the project and the expected outcome
Use Existing vs. Developing or Adapting

• When should I . . .
  – Use existing measures and instruments?
  – Adapt existing measures and instruments?
  – Develop new measures and instruments?
Using Existing

• Advantages
  – Can take advantage of reliability and validity information provided by others
  – No pilot testing—Ready for use almost immediately
  – Can reveal unanticipated outcomes

• Disadvantages
  – Alignment with project focus
  – Increased burden

• Uses
  – Exploratory

Don’t forget . . .
Get appropriate permissions
Give credit
Adapting Existing

• Advantage
  – Better alignment to project focus
  – Requires less development time than starting from scratch
  – Can be shorter and less burdensome

• Disadvantages
  – May require pilot testing
  – Must test reliability and provide evidence of validity
  – Less likely to reveal unintended outcomes

• Uses
  – Projects with more explicit theory of action
Developing New

• Advantage
  – Better alignment to project focus
  – Can be shorter and less burdensome

• Disadvantages
  – Requires development time
  – Requires pilot testing
  – Must test reliability and provide evidence of validity
  – Less likely to reveal unintended outcomes

• Uses
  – Projects with more explicit theory of action
Importance of Documenting Measures and Instrument

Reliability and Validity
Sharing to Improve Evaluation Rigor

• Wherever possible provide the following information about measures used
  – Complete description of what is measured
  – Target informants
  – Methods for data collection
  – Pilot test procedures
  – Evidence of validity
  – Results of reliability tests
  – Scales and subscales calculations
  – Threshold for missing data
Review

- Exploratory nature of project vs. explicit nature of the project
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- Use existing vs. developing or adapting
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- Importance of documenting measures and instrument
Resources

• For a copy of this presentation and a document containing the references used to support this presentation, go to:

teams.mspnet.org
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