MSP Knowledge Management and Dissemination Project (MSP KMD)

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Precursor to MSP KMD

- **Handbook for Enhancing Strategic Leadership in the Math and Science Partnerships**
  - Based on research on large-scale reform, and insights of practitioners involved in prior teacher enhancement and systemic reform efforts.

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MSP Knowledge Management and Dissemination Project

Goal: To synthesize knowledge generated through the Math and Science Partnerships and integrate it into the broader knowledge base for education reform

- Teachers as Intellectual Leaders
- Involvement of STEM faculty
- Deepening Teacher Content Knowledge

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MSP KMD Products

- Knowledge Reviews
- Database of Measures of Teachers' Content Knowledge
- MSP Cases
- Presentations and Papers

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Teacher Leaders

- Research and practice both add to the knowledge about how teacher leaders go about their work and the impact of that work.

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- Based on our review of the empirical research on teacher leadership, we know that teacher leaders engage in various strategies to provide direct support to classroom teachers with a focus on improving instruction.

- These strategies include:
  - observing classroom teaching and giving feedback to teachers
  - leading workshops
  - modeling lessons
  - engaging in lesson planning
  - leading teacher work groups (e.g., to analyze student work)

- But the studies in the literature provide very little detail about these leadership roles.

- MSP research is contributing to our understanding of teacher leader practices:
  - Doyle, Hanssen & Huinker, 2007
  - Manno & Firestone, 2006
  - Martinez, Firestone, Mangin & Polovsky, 2005
  - Oehrtman, Carlson & Vasquez, 2009
  - Pustejovsky, Spillane, Heaton & Lewis, 2009
  - Shanahan, Hyde, Mann & Manrique, 2006
  - Spillane & Camburn, 2006
  - Spillane, Diamond, Walker, Halverson & Jita, 2001
  - Weaver & Dick, 2009
  - Whitenack, Cavey & Ellington, 2008

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- Manno and Firestone (2006) found that teacher leaders identified as content experts (minimum of an undergraduate major in the teacher leader's content area and teaching certification in that area) were more likely to:
  - provide support in curriculum implementation, including modeling and leading professional development and
  - establish greater trust between themselves and the teachers with whom they worked

- Weaver & Dick (2009) examined the effect of School Leadership teams (two teacher leaders and an administrator) on mathematics instruction, comparing student achievement on state-standardized tests in MSP schools to state averages and found:
  - The degree to which schools implemented the practices promoted by MSP was a significant positive predictor of student performance and
  - This relationship was stronger at secondary; additional factors were at play at elementary levels.

MSP KMD Knowledge Reviews: Teachers as Intellectual Leaders

- Teacher leaders providing classroom support through demonstration lesson/modeling
- Teacher leaders providing classroom support through lesson planning
- Teacher leaders designing and facilitating professional development for teachers
- Teacher leaders supporting implementation of instructional materials

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- Teacher leaders providing leadership to teams of teachers and administrators
- Teacher leaders working with principals
- TLs' preparation: Developing knowledge and skill for teacher leadership
- TLs' preparation: Structure and pedagogy
- Providing classroom release time for teacher leaders
- Selecting teacher leaders

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Practice-based Insights: Selecting Teacher Leaders

- Selection vs. preparation
- Select with the role in mind
- Address content knowledge
- One of their own
- Been there, done that – effectively
- Adults are not the same as kids
- Less may be more
- Selection is not a one-time event
- Involve key stakeholders

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An insight includes:

- Advice synthesized from experienced practitioners
- Quotes from program leaders (including MSP leaders)
- Examples from MSP programs
- 2-4 paragraphs in length

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MSP KMD Knowledge Reviews Involvement of STEM Faculty

- Involving STEM Disciplinary Faculty in Deepening Teacher/Teacher Leader Content Knowledge
- Selecting for Success: Identifying STEM Disciplinary Faculty for Involvement in MSPs
- Ensuring Initial and Ongoing STEM Disciplinary Faculty Participation in MSPs
- Orienting STEM Disciplinary Faculty to the MSP Work
- Supporting STEM Disciplinary Faculty Work Over the Course of the MSP Project

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Flexibility is key

- Although deciding which STEM faculty to involve will depend in part on the roles STEM disciplinary faculty will play, it is generally important to select individuals who are open-minded, flexible, and reflective about their own teaching.

Not “one and done”

- Establishing a collaborative culture among STEM disciplinary faculty and teachers/teacher leaders right from the start is key, but efforts must be ongoing.

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Rome wasn't built in a day

- Engage MSP STEM disciplinary faculty first as participants, then apprentices, then as leaders of project components.

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What’s in it for them?

- Highlighting the scholarship aspects of the MSP effort is a way to pique STEM disciplinary faculty's interest and continued involvement in the work.

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Trust but verify

- Collect (and use) formative evaluation data to refine STEM disciplinary faculty efforts in the MSP.

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- What have we learned about deepening teacher content knowledge?

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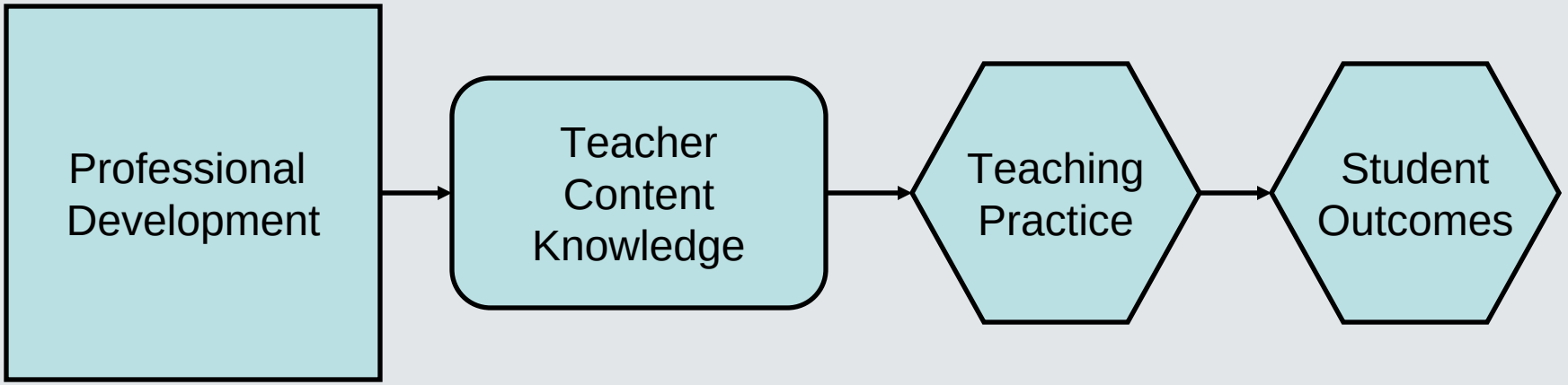
Logic Model for Deepening Teacher Content Knowledge (DTCK)



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Teacher content knowledge matters…

- For teaching practice
  - Selecting content to emphasize
  - Selecting instructional strategies and sequences
  - Selecting assessment tasks
  - Implementing curriculum materials
  - Engaging in teacher professional communities

23 studies in mathematics, 11 studies in science

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Relationship between TCK and Student Outcomes

- 4 studies in mathematics
- 3 studies in science

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Teacher content knowledge matters for student outcomes

For example, Magnusson and colleagues (1992) found that when teachers held an incorrect idea about heat energy and temperature, their students were more likely to develop the same incorrect idea than if the teacher correctly understood the concept.

Research on PD to deepen teacher content knowledge

- 27 studies in mathematics
- 38 studies in science

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MSP KMD Knowledge Reviews: Deepening Teacher Content Knowledge

- Teacher knowledge: Engaging with challenging mathematics/science content
- Teacher knowledge: Considering student thinking
- Defining teacher content knowledge
- Teacher knowledge: Considering mathematics/science as ways of knowing
- Teacher knowledge: Considering use of student instructional materials
- Teacher knowledge: Developing conceptual maps of content

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- Teacher knowledge: Analyzing classroom instruction
- Professional Development to Deepen Teacher Content Knowledge Understanding the Needs of the Target Audience
- Professional Development to Deepen Teacher Content Knowledge: Program Design
- Professional Development to Deepen Teacher Content Knowledge: Implementation
- Ensuring that Enhancing Teacher Content Knowledge Leads to Improved Classroom Practice

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One size doesn't fit all

- Plan for the likelihood that teachers with different course backgrounds in mathematics/science will have very different content related needs.

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Experience matters

- Anticipate that experienced teachers will have different needs than those who are new to the classroom, or new to a particular instructional approach.

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It takes time

- Developing deep mathematics/science conceptual understanding requires providing teachers with multiple opportunities to explore new ideas.

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You can’t do it all

- When addressing multiple goals for deepening teacher content knowledge program leaders must make difficult decisions about how deeply to pursue each goal.

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Make it relevant

- Teachers need to see the connection between the content they are encountering and how the topic appears in the grade-level content.

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Which comes first?

- Practitioners have different perspectives on the level of teachers' content knowledge needed for the analysis of student understanding.

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Be explicit

- Developing teachers' understanding of ways of knowing in mathematics and science requires going beyond modeling to an explicit focus on disciplinary habits of mind.

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Sense-making is key

- It is important to “debrief” teachers’ learning experiences, both from the perspective of the nature of the discipline and implications for classroom practice.

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Comparing Empirical Research and Practice-based Insights

- Empirical findings tend to be larger grain size; practice-based insights tend to be more contextualized and nuanced.

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Why don’t we know more from the empirical research?

- In applying standards of evidence, we often found vague or incomplete documentation of programs or interventions.

- Consequently, we know something worked, but we don’t know a lot about what “it” was.

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Why don’t we know more?

- Studies tended to be more like program evaluations rather than research on particular strategies.
- Consequently, we know the overall experience worked, but we don’t know how much particular interventions contributed to the gains.

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Why don’t we know more?

- We often found serious limitations with study research designs, including:
  - Selection bias in samples and contexts
  - Lack of comparison groups or criteria
  - Idiosyncratic instrumentation, without evidence of validity/reliability/credibility

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Deepening Teacher Content Knowledge

- Research in this area requires valid, reliable instruments that can be used to assess teacher content knowledge.

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TCK instruments

- MSP-KMD has developed a searchable, on-line, database with information about instruments used to assess teacher content knowledge (mathematics and science, K–12).

- Currently includes 159 instruments

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Can Search By:

- Content area
- Grade levels
- Nature of instrument, e.g.,
  - Any multiple-choice/constructed response assessments
  - Assessments that include a scale score with information about reliability and validity
  - Interview protocols
  - Observation protocols

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Subject

Limit to:

- ☐ Instruments that measure teachers' knowledge of mathematics

  Further limit to:

  - ☐ Algebra
  - ☐ Data Analysis, Statistics, & Probability
  - ☐ Geometry & Measurement
  - ☐ Number & Operations
  - ☐ Mathematical Processes (e.g., problem solving, proof, representations)

- MSPs have made a substantial contribution to the supply of high quality measures
  - Learning Mathematics for Teaching (LMT, Hill and Ball)
    - measures of teacher mathematics content knowledge
  - Misconception Oriented Standards-based Assessment Resource for Teachers (MOSART, Sadler)
    - Measures of science content knowledge in earth and physical sciences
  - Assessing Teacher Learning About Science Teaching (ATLAST, Smith)
    - teacher and student measures of science content knowledge in earth, life, and physical sciences

MSP Sustainability Cases

- Resources for current and future program designers
- Cross-case analysis and four cases on deepening teachers' content knowledge
- Cross-case analysis and four cases on developing and supporting teacher leaders
- Cases describe actions of, and lessons learned by, MSP project leaders

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We encourage you to:

- Create opportunities within your project to periodically take stock of what you are learning that might be helpful to others.
- Add to the knowledge base through your MSP research.

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