1. Questions(s) or issue(s) for dialogue at Learning Network Conference session:

What have we learned over the past 8 years from the implementation of an intensive systemic reform initiative to improve K-12 mathematics within a school district of 13,000 students in western South Dakota? What has been the value of different components of the work – teacher professional development, new instructional materials, principal training, attention to issues of equity, and attention to data? What have been the major successes and challenges? What is sustainable? And, what lessons are likely to transfer to other settings?

2. Context of the work within the STEM education literature and within your MSP project:

Underpinning the project has been a vision for mathematics instruction as described by Hiebert et al. (1997) and Kilpatrick et al. (2001). The primary strategy for achieving this vision has been through teacher professional development. The format and nature of the teacher professional development offerings emerged from the work of Loucks-Horsley et al. (2001).

Many of PRIME’s central questions are among the most prominent within current mathematics education research. What has been the impact of PRIME’s professional development offerings on teachers’ mathematical content knowledge, pedagogical content knowledge, understanding of student thinking, and beliefs about teaching and learning? To what degree do changes at the teacher level influence classroom practice and student achievement? What is the influence of teacher leadership? How can a project develop and support teacher leaders?

PRIME has also wrestled with questions related to instructional materials. Which materials best support the development of mathematical understanding? How can we be sure that instructional materials are implemented with fidelity? Do instructional materials drive the nature of the mathematics that gets taught? How closely aligned are student assessments with the mathematics being taught and with the vision of the project?

3. Claim(s) or hypothesis(es) examined in the work (anticipating that veteran projects will have claims, newer projects will have hypotheses):

What follows are sample findings to date. The session will highlight areas of promise as well as persistent challenges across a wide array of indicators.
1. Instructional practice across all grade levels K-12 has improved over a 6-year period as measured by external evaluation researchers using the Horizon Classroom Observation Protocol. Instructional practice has become consistently strong at elementary grades. The current status is more mixed at secondary levels.

2. A group of 46 Rapid City teachers volunteered to take a test of their content and pedagogical content knowledge two years into the project and then again two years later, using parallel forms of "Learning Mathematics for Teaching" measures (LMT). The average number of hours of professional development completed by each of these teachers over the two years was 80. This group showed significant growth on the LMT over the two years with an effect size of 1.0.

3. Student achievement has improved as measured by South Dakota’s accountability measure for mathematics, the Dakota STEP (DSTEP), and using a more performance-oriented test developed by the Mathematics Assessment Resource Service.

4. Achievement gaps between American Indian and non-American Indian students have decreased as measured by the DSTEP over the duration of the project.

5. Different components of the project have had different levels of impact on teachers, depending on where teachers are within the change process as measured by a “Stages of Concern” survey. Teachers farther along in teaching standards-based mathematics, for example, perceive more value in classroom coaching provided by teacher leaders than do teachers who are less advanced in teaching standards-based mathematics.

4. Evaluation and/or research design, data collection and analysis:

Data collection and analysis have been central to the work of Project PRIME. Data sources include student achievement on the state assessment, student performance on a more performance-oriented assessment, teacher content and pedagogical content knowledge, classroom observations, teacher and administrator surveys, focus groups, and interviews.

Student-level data have been examined for trends over time and disaggregated by race. Comparisons have also been drawn between achievement on the state test and on the more performance-oriented assessment.

Growth in teacher content and pedagogical content knowledge has been examined to determine the impact of professional development. Comparisons have also been drawn between pre-service teachers and in-service teachers on the content knowledge measures.

Qualitative survey and interview data have been synthesized and interpreted by the external evaluation team.
5. Key insights (retrospective for veteran projects, prospective for newer projects) that have value for the Learning Network:

Now in its 8th year, PRIME has identified five broad areas of the work to sustain and build upon:

- Vision
- Leadership
- Instructional Materials and Assessments
- Professional Development
- Partnerships

Within each domain are recommendations about what should be sustained and what additional work remains. As one example, the teacher leadership structure established as part of the project is now firmly in place within the district at the elementary grades, but is more tenuous at the secondary level. More attention is required to clarify and strengthen the secondary coaching model. A second example is in the area of instructional materials. Having high quality instructional materials that are well aligned with the project’s vision has been crucial in supporting teachers in changing their instructional practice. At grade levels and in buildings where the quality and consistency has been lower, the project has struggled.

In addition to the domains noted above, many lessons have been learned about research design and about the challenges of studying a systemic, multi-faceted project. Not all of the project’s data sets are linked, so many questions that are central within current mathematics education research remain outside the project’s grasp. For example, teacher content knowledge and classroom observation data have been collected in a way that guarantees teacher anonymity, making it impossible to connect gains in those areas with changes in student achievement. Also, most analyses have been conducted in aggregate across all buildings and classrooms in the district, whereas finer-grained analyses (looking, for example, at the buildings that have participated in the project most intensively or at teachers who have changed their instructional practice most dramatically) might yield more powerful findings.

References

