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

How has SW PA MSP integrated implementation and sustainability? How has SW PA MSP used its own evaluation to inform implementation and sustainability? What types of sustainability does SW PA MSP value and believe to be achievable: contributing to models of institutional change, STEM teaching and learning, and partnerships?

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

SW PA MSP is a comprehensive, K-12 math and science MSP funded in 2003. It involves urban, suburban and rural settings across the 11 counties surrounding the city of Pittsburgh. IHE partners have been 4 smaller private colleges and universities more heavily focused on teaching than research. K-12 partners include 45 local control K-12 school districts ranging in size from 1,000 to 7,000 students. The lead agency is the Allegheny Intermediate Unit, a publicly funded regional service agency, which also works with three other Intermediate Units as partners. The Partnership is governed by a Cabinet comprised of representatives of the core partners, as well as the leader of the Evaluation Team and the financial manager, who convene monthly to plan and monitor progress.

A logic model portrays the approach taken by SW PA MSP (available as handout). The particular interventions chosen grew out of the 9-year experience of the Math & Science Collaborative as it worked regionally to strengthen mathematics and science education. Particular attention was paid to the NSF funded urban and local systemic initiatives, as they piloted key research-based approaches. Working with local-control school districts of varying size and multiple higher education institutions, SW PA MSP acknowledged the inevitable turnover of faculty and administrators, and consciously sought to involve a “vertical slice” of leaders at all levels—and to recruit at least 2 individuals for each particular experience. Over the seven years of the MSP project, three-fourths of the K-12 superintendents and IHE presidents have changed, as well as 70% of building principals.

A key intervention is the development and support of Leadership Teams within each K-12 district and IHE who are convened 4 days each year to analyze student and organizational data to develop and implement annual action plans. The 500+ members of these teams have in turn recruited 180 administrators to experience “Lenses on Learning” and “Eyes on Science” seminars. These Leadership Teams also recruited 43 Teacher Fellows to be full-time on IHE campuses to deepen their own content knowledge by taking courses, and to assist the IHE faculty in revising their courses to better address K-12 standards. Educator Networks and Content Short
Courses involved 660 educators for 3 to 5 day experiences. As the major intervention, the Leadership Teams recruited 515 teacher leaders to participate in multi-year Teacher Leadership Academies specific to their discipline and level, which began with 16 to 18 days over two years—followed by 7 days in the third year focused on Lesson Study. Beginning with the teacher leaders fourth year of involvement, the summer offers a 3-day Learning Laboratory where a fishbowl approach allows in-depth exploration of real time classes for students. The school year offers discipline-specific Quarterly Academies (four times each year) involving all educators having completed the first three years. With support of their Leadership Action Teams, these teacher leaders have guided in-district learning of professional learning communities involving 4100+ educators.

These interventions were based on research supporting the importance of developing leaders and the strategy of facilitating on-going learning for leaders, whether administrators, teachers, or faculty (Ball, Loucks-Horsely, Senge, Stigler and Hiebert). The recent article, “Closing the Teaching Gap,” emphasizes the necessity of “broadening the definition of the teacher’s job to include continual improvement of teaching methods and continual improvement of their own knowledge, skills, and judgment … and … stable settings at the school site where this work can take place.” (Stigler, Kappan, Nov. 2009).

The SW PA MSP recognizes the value of input from the variety of participant perspectives on sustaining efforts toward improving mathematics and science. IHE faculty from the four partner IHEs were the first to be approached via focused group discussions at an evening dinner meeting in mid-October. The IU-based K-12 Math or Science Coordinators then also engaged in extended written responses. As they explored those responses, the MSP Project Directors decided to use the professional development experiences occurring in winter to gather similar input from the many K-12 educators directly involved.

3. Claim(s) examined in the work:

By actively engaging educators in extended, collaborative learning experiences focused on strengthening the teaching and learning of mathematics and science, SW PA Math Science Partnership built ownership of key sustainable strategies for continuous improvement: collaboration via professional learning communities. By explicitly requesting reflections from educators, SW PA MSP gathered evidence of ownership of that strategy, and insured that local voices added credence to the oft published endorsement of Professional Learning Communities.

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

All participants who were active in the 5th year of the MSP, were invited to complete an open-ended survey. As educators arrived for a day of professional development, they were asked to begin individually responding in writing to questions regarding the learning community assembling that day, i.e. Elementary Math Teacher Leadership Academy, Everyday Math Network. Deliberations about sustainability were intentionally situated within the context of
the continuous work of strengthening practice. The surveys were collected and entered into an Excel spreadsheet for analysis, including individual and district identification. Each stakeholder was asked to respond to the following prompts:

1. What has been strengthened in your teaching and/or your students learning of mathematics or science?
2. What enabled those positive changes to happen?
3. How might the on-going work of strengthening professional practice continue?
4. What facets need to be sustained? Why?

Although not part of the original evaluation plan, recognizing the value of the data being collected by program staff, Dr. Cynthia Tananis, the MSP Assessment and Evaluation Team Leader, offered to analyze the self-reported impact, as described in the first three questions. Dr. Tananis defined two parallel approaches to identifying emerging themes. (1) The AET research analysts involved in the Documentation and Case Study portions of the evaluation would independently review the data to identify themes. (2) Meeting with the IU-based MSP staff, Dr. Tananis facilitated their identification of anticipated emerging themes. The two perspectives were combined for use in the Evaluators’ Report.

The analysis was an inductive process using qualitative data that led to construction of a categorical system for representing sustainability data. The categorical examples are of two kinds: typical which are considered the most common survey responses and composite statement responses that illustrate a common response. Frequency tables were constructed by broad category and sub-category for sustainability survey questions one, two, three and four.

Data analysis is based on three hundred plus (300+) responses from two hundred twenty-two respondents consolidated from data collected (500+ records) from MSP events between November, 2007 and January 22, 2008. A 12-page report from the Assessment and Evaluation Team detailed the findings. While responses varied greatly with regard to depth of response for each question, it is notable that overwhelmingly respondents felt much has been learned and gained from their experiences with the MSP and most took time to indicate their learning and thoughts as a result.

The responses to the latter half of the survey, about particular facets and suggested changes for Year 6, once compiled, were referred back to district teams and particular stakeholder groups for clarification during the second semester. The input from these multiple sources was clarified and refined by the MSP staff and used to inform the planning work of the MSP leadership teams as they developed detailed implementation plans for Year 6 and beyond.

5. Key insights that have value for the Learning Network:

Sustainability has to involve ownership. As other MSPs consider how to sustain momentum for improvement, they may want to consider the following findings from SW PA MSP process as areas worthy of focus in building a culture of continuous improvement through professional learning.
A brief statement explains each broad category followed by a typical example and composite statement.

**Curriculum**
This category focuses on responses related to participant identification of and concerns about curriculum and content issues. The sub-categories include alignment with state standards and testing, teacher content knowledge, coherence (across grade levels), academic rigor, cohesiveness (cross-disciplinary), “Big Ideas”, materials, and change.

*Typical Example*
“We can't change the standards and anchors. We can find methods for realignment of what we're teaching to help teachers and students succeed to PSSA proficiency standards.”

*Composite Statement*
Participation in the MSP has prepared teachers for PSSA exam and state standards, deepened content knowledge, and led teachers to focus on the big ideas. The MSP has also given the district the chance to develop more cohesive curricula, increase academic rigor, and bring science and math together to coordinate methods of instruction. Within the district, teachers and schools are combining curricular materials, and implementing new math and science programs.

**Math and Science Thinking and Learning**
This category includes comments that focus on thinking and learning; e.g. the use and analysis of cognitive processes in an educational context. Some respondents clearly distinguish between student thinking and teacher thinking in their comments. However, the majority of responses connect changes in teacher and student thinking in support of learning.

*Typical Example*
“Taking time to examine student work and thinking has helped me better understand the importance of giving students opportunities for problem solving.”

*Composite Statement*
The MSP has provided a better base of knowledge of mathematical and/or scientific thinking with increased awareness of how students do math and science - the error patterns of their work and their reasoning. The focus is on the thinking involved in learning.

**Pedagogy**
This category includes responses that address the practice of teaching, with techniques, methods, applications, and strategies as key terms. Sub-categories are reflective practice and teacher strategies, both loosely related to a pedagogical spectrum from modal methods to Schon’s reflective practitioner.

*Typical Example*
“We were exposed to realistic, easily implemented teaching practices that allowed me to change my teaching style.”

*Composite Statement*
The MSP has exposed teachers to various instructional strategies, techniques, and methods, and given teachers tasks and activities to apply in their classroom; subsequently, it has helped teachers to reflect a lot more on their own teaching.

**Organizational Learning**
This category includes comments focused on social and structural aspects of schools systems. Sub-categories are collaboration, system change, teacher leadership, professional development, and supportive administration.
** Typical Example**

“Continue providing [opportunities for] collaboration across districts. Continue the workshops, conferences, and networking across districts and within districts. Continue the input from the educational, professional, and business sectors of the region.”

**Composite Statement**

MSP activities (TLA, LOL, content short courses, etc.) provide substantial resources needed to implement school reform in math and science, such as providing a space for collaboration with colleagues and training teachers to facilitate on-site PD and serve as disciplinary resource. Successful school reform will also require administrative and policy-maker support for adequate time, funding, and district-wide participation.

The analysis further analyzed the frequency of the responses. The educators’ responses note the value of the Professional Learning Communities and the structures and tools they convey.

1. “What has been strengthened in your teaching and/or your students learning of mathematics or science? Math and science thinking and learning (58%) Curriculum (15%) Organizational Learning (13%), Pedagogy (12%)

2. What enabled those positive changes to happen? Organizational learning (50%), Math and science thinking and learning (30%)

3. What facets need to be sustained and why? “Organizational learning” (48%) Specific mention included “to grow teacher leadership;” “Math and science thinking and learning” (25%) Specifically valued are discussions of teacher thinking in connection with student learning, noting lesson study.