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

Policymakers are interested in finding ways to close the achievement gap between student groups as well as raise the overall level of student achievement. Given the explosive growth of technology and global competition, there is understandable urgency to better prepare young people for college and career success. However, at the high school level, achieving these goals has been elusive in Pennsylvania. Student PSSA (Pennsylvania System of School Assessment) 11th grade performance in math over the past 8 years has improved only slightly from 49% to 56% and remained virtually flat in reading. Spending more money in the aggregate particularly in the face of large differences in pupil expenditures and closing the per pupil expenditure gap would seem like a prudent educational as well as long-term economic development policy. Yet, the results of our study show that aggregate district instructional expenditures which ranged between $4,276 - $11,010 per student are, in fact, not associated with 11th grade PSSA proficiency in either math or reading, at least in 2006-07. The correlation is near zero and in some cases even slightly negative. We propose several impediments that may account for why we did not find an association between aggregate per pupil instruction expenditures in a district and the percentage of 11th grade PSSA math and reading proficiency (see section 5 below). Do these impediments resonate with the research findings of other MSPs? We also suggest several recommendations in section 5 below. Are these recommendations generalizable beyond our particular MSP?

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

While our findings are admittedly only a snapshot of the relationship between per pupil expenditures and 11th grade PSSA scores, other studies have examined whether student achievement rose after considerable added public investment. The results of our study do not support the assumption that increased spending necessarily improves student performance. In New Jersey, Coate and VanderHoff (1999) found no relationship between additional district expenditures and high school student achievement before and after the 1990 Abbott II decision (which resulted in substantially more state funds to poorer school districts). Ritter and Lauver (2003) analyzed the same data and concluded that the higher funding received by Abbott districts did not seem to improve student outcomes. Simple resources are likely to be a necessary but not sufficient condition for improved teaching and learning outcomes (Grubb, 2008; Yeh, 2007). Previous studies show that adequacy litigation can play a limited role (as evidenced by small effect size) in a comprehensive education reform strategy (Glenn, 2009). Peevely and Ray (2001) found that students in the school districts that prevailed in Tennessee’s school-finance
litigation showed no consistent pattern of greater gains than students in the rest of the state, despite the infusion of funding.

Such findings leave policymakers in somewhat of a conundrum. There is general agreement that raising student achievement and improving high school graduation rates are critical policy goals for individuals’ personal success and the long term economic vitality of the Commonwealth. While the data we analyzed suggests that increasing aggregate educational expenditures will not likely yield increased 11th grade PSSA proficiencies, such an interpretation does not capture the possible effects of programs that have been implemented. The cautionary note here is that it is entirely possible that the underlying relationship between instructional expenditures and student achievement has been changing due to other factors and initiatives. But there are not reliably consistent data sources at present to examine these possibilities. With this in mind, what alternatives are available to policymakers?

One alternative could be to question whether the 11th grade PSSA test truly measures student achievement and the totality of value high schools contribute to a student’s development. A second alternative is to expand and refine the per pupil expenditure calculations in this study in the hopes of showing a positive correlation between specific per pupil expenditures and specific desirable high school outcomes. A third alternative for policymakers is to focus on specific areas where increased expenditures are likely to prove fruitful and then sponsor independent research to learn whether such investments produced the expected outcomes and if so, how much of an effect resulted and at what cost? For example, studies of Kindergarteners have shown that children from families with low socio-economic status typically enter school already far behind their more advantaged counterparts. This achievement gap usually persists throughout their K-12 careers (Lee and Burkham, 2002). To counter this initial disadvantage, Southeast Delco School District with its diverse racial ethnic student population, recently established an all day Kindergarten Center that focused on bringing all students up to grade level. This past year, 82 percent of students entered first grade on grade level. Thus, from a strategic standpoint, investing in preschool and Kindergarten at least in theory could make sense.

In our study of 20 middle schools in Pennsylvania and New Jersey that adopted an inquiry-based math program coupled with substantial teacher professional development (180 hours), we found some schools raising their 8th grade PSSA and HSPA scores by 34% points as compared to comparably matched schools. However, some schools actually declined by the same amount when matched against similar schools. What made the difference? Based on numerous visits to classrooms and schools, and dozens of administrative interviews, we found that the differences in 8th grade math student achievement on the PSSA was related to the degree of instructional leadership displayed by the principal in getting teachers to accept and implement the new math programs as they were designed and initially tested. Indeed, the research literature has accumulated strong evidence as to the critical role that principal leadership plays in teacher practice and the learning environments (Leithwood and Jantzi, 2000; Hallinger, 2000; Gronn, 2002). Thus, investing in principal leadership development across the board as is the case with Pennsylvania’s Inspired Leadership program (PIL) could prove very cost effective. In sum, our experience and our analysis of the data suggests that the issue is not simply how much money is made available to districts so much as it is how districts make use of the money that is made available to them.
3. Claim(s) or hypothesis(es) examined in the work (anticipating that veteran projects will have claims, newer projects will have hypotheses):

This study was originally intended to explore the relationship between course enrollment and passing rates and performance on the Pennsylvania and New Jersey 11th grade state math assessments within the MSPGP’s (Math Science Partnership of Greater Philadelphia) 46 districts. PSSA performance includes the percentage of students scoring advanced, proficient, basic, and below basic for each district. Since we had already obtained other “contextual” variables from public sources in order to write the School Math and Science Status Reports we used these data to run a series of stepwise multiple regression analyses. The regression coefficients allowed us to examine the unique effect of each variable while holding other variables constant. For both the analysis of the 46 MSPGP districts and the state-wide study, we performed a forward stepwise linear regression with percentage of 11th graders scoring advanced, percentage of 11th graders scoring proficient or above, and percentage of 11th graders scoring below basic on PSSA as the dependent variables respectively, and the following variables as potential predictors:

- Percentage of economically disadvantaged students
- Percentage of white students
- Percentage of community residents with a bachelor’s degree
- Percentage of low-income households in the community
- Revenue per student (in $1,000)
- Total pupil expenditure (in $1,000)
- Instructional expenditure per student (in $1,000)

For the 46 MSPGP district analysis, we also considered the percentage of 11th graders who took Level 3 college prep or above math courses, and the percentage of 11th graders who took Level 4 or above college prep math courses. In addition, an analysis of publicly available data for the 498 school districts in Pennsylvania reveals that:

- 11th grade PSSA performance in math and reading is slightly negatively associated with total district expenditures per student, which ranged between $8,168 - $29,512 per student, while holding other contextual variables constant.
- 11th grade PSSA performance in math and reading is not significantly associated with instructional expenditures per student, which ranged between $4,276 - $11,010 per student, with less than 1 percent of variation in district-level PSSA proficiency attributable to instructional expenditures.
- 11th grade PSSA performance in math and reading is positively and strongly associated with the percentage of community residents with a bachelor’s degree.
- The percentage of minority students in a district has a moderate to strong negative correlation with the percentage of students scoring advanced or proficient on the 11th grade PSSA test.
- The percentage of students in low-income households in a district has a moderate to strong negative correlation with the percentage of students scoring advanced or proficient on the 11th grade PSSA test.
- These patterns remain even when Pittsburgh and Philadelphia districts are excluded from the analysis, suggesting that these are consistent patterns across the state.
• A more in depth study of 46 districts in PA and NJ suggests that there is a moderate positive relationship between higher-level math course taking and 11th grade PSSA test performance.

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

This study relies primarily on publicly available district-level demographic and PSSA performance data for the 2006-07 school year. PSSA performance includes percentages of students scoring advanced, proficient, basic, and below basic for each district. For those thirteen MSPGP districts that are located in New Jersey, New Jersey System of School Assessment (HSPA) data were used as achievement variables. District and community demographic data were retrieved from multiple sources, including the school report card profiles at the state department of education website as well as www.schoolmatters.com and www.schooldatadirect.org.

The study was divided into two phases. During the first phase, we analyzed the relationships between district performance on the state tests and a series of school and community demographic and contextual factors, using data for the 46 MSPGP districts. Specifically, the analysis focused on the relationship between percentage of advanced math course completion and student math proficiency during the 2006-07 school year. During the second phase, we excluded NJ districts and extended the PA analysis to the entire state, including 498 secondary school districts. Since information on advanced course completion is not available on all the districts in the state, we focused on the specific roles of demographic, socioeconomic, and financial factors in explaining student academic proficiency in math and reading. Forward stepwise linear regression analysis, a standard statistical approach in social science, was applied to both sets of analyses so that the unique contribution of each factor could be determined while controlling for other variables. Variables with p-value of less than .15 were added to the model and variables with p-values greater than .15 were removed from the model. Tolerance index was used to control for multicollinearity. Predictors with tolerance values less than .30 suggest multicollinearity and were removed from the model.

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

Previous work by MSPGP reveals several impediments that may account for why we did not find an association between aggregate per pupil instruction expenditures in a district and the percentage of 11th grade PSSA math and reading proficiency. These impediments include:

1. High turnover of school district administrators
   a. We have noted a high level of instability in school district administration from superintendents to principals and curriculum supervisors.
   b. Even when senior leaders are committed to academic initiatives, this inherent instability and the general lack of systemic approach to district organization and goal alignment severely limits the potential for success.

2. Inconsistent policy and its implementation
   a. In the midst of school board, administrative and teacher turnover, one of the major determinants of actualizing school and student improvement is whether there is consistency of policy and fidelity of its implementation.
b. If a district has goals and policies that are deeply and consistently embedded throughout the system, then changes in administrators and teachers are less likely to have a significant effect.

3. **Insufficient external monitoring and technical support**
   a. The Pennsylvania Department of Education (PDE) requires districts to submit various planning documents: Strategic, School Improvement, Teacher Induction, Technology, Special Education, Professional Development and Finance.
   b. PDE does not have the field-based capacity to work with districts on a regular basis to review these plans for content, consistency or practicality. Furthermore, there is inadequate state-level technical assistance to support district-wide implementation.

4. **Disorganized data management, analysis and translation to action**
   a. Obtaining and processing student achievement and enrollment data from our district partners in a usable and timely matter presents significant difficulties.
   b. This is not due to any reluctance by administrators to honor data requests, but rather from their districts’ lack of organizational and technological capacity to do so.

5. **Poor communication vertically and horizontally within and between schools and the district**
   a. District reports or performance data are not shared vertically or horizontally. At times all the stakeholders in initiatives are not engaged until it is too late for them to have meaningful input.
   b. In some districts there are no opportunities for comfortable or collegial discussions of issues, ideas or questions that emerge at different levels of district hierarchies or across schools.

6. **Absence of coherent and aligned k-12 curricula**
   a. This is often characterized by the lack of internal capacity for its development in each of the content areas.
   b. There is not enough time allowed for professional development and coaching of teachers to implement new curricula prior to expectations of observable student outcomes.
   c. Fidelity of implementation of programs requires buy-in at all levels of the school hierarchy, and it requires training of supervisors so that classroom observations and evaluations are based on enacted pedagogical strategies that are congruent with the intended curriculum.

7. **System incoherence**
   a. Some districts have too many initiatives that are not well coordinated and are often working at cross-purposes.
   b. Several districts start an initiative one year and develop plans to continue that for several years because full implementation takes multiple years, but then the next year a new initiative or directive takes its place.

8. **Lack of teacher staff capacity**
   a. Some districts lack effective protocols for improving the hiring and mentoring of new teachers.
   b. Some districts lack effective plans for sustained, quality professional development.
**Recommendations: A New Way Forward**

Overcoming these impediments is a daunting task. It requires a new way of thinking about the challenges associated with increasing student literacy and achievement. We recommend policy makers should first consider the infrastructure that would be necessary to actually begin assessing in reliable and measurable ways the effects of the ways that funding is used to increase student performance.

Specific recommendations to address these impediments and to increase 11th grade proficiency include:

- Creating statewide and regional infrastructures for school improvement comprised of members from the Pennsylvania Department of Education, Intermediate Units, K-12 schools, community colleges and four year public and private higher education institutions, nonprofit research and educational organizational and economic development and workforce entities.

- Encouraging school planning that is rooted in site-based data and research that supports the implementation of Standards Aligned Systems.

- Enabling districts to create action plans based on a variety of process and performance indicators that are relevant to district action plans.

- Increasing the knowledge, understanding and use of existing research for effective district planning and statewide policymaking by expanding the research base on educational proven programs, policies and practices.

- Providing research design assistance to local districts to assist them in developing a culture of evidence as it relates to new and existing program interventions.

- Brokering collaborations and partnerships to achieve any of the above goals especially in terms of linking the Pennsylvania Department of Education, K-12 schools, community colleges and four-year public and private higher education institutions and the workforce.