Abstract Title: A Value-Added Model and the Effects of AMSP

MSP Project Name: Student Outcome Effects of the Appalachian Math and Science Partnership (RETA)

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120 word summary:

The ultimate goal of the MSP program is to improve student outcomes in math and science. The underlying assumption of the program is that professional development for teachers will lead to enhanced teacher quality and to higher student performance. The purpose of this paper is to estimate whether the Appalachian Math and Science Partnership (AMSP) resulted in improved scores for students of those teachers who participated in the program. To assess whether AMSP had an effect on student outcomes, this paper uses a value-added model to estimate the effects of the AMSP intervention while controlling for other factors expected to influence student test scores. The preliminary estimates suggest there are statistically significant improvements in math scores for those students whose teachers have participated in AMSP interventions.

Section 1: Questions for dialogue at the MSP LNC.

- What is a value-added model and why is it appropriate for evaluating MSPs?
- How is an MSP intervention quantified?
- Why use state standardized tests to measure student outcomes?
- How do you account for rescaling of state tests over time?
- How can tests across states be made comparable for evaluation purposes?
- Are there measurable characteristics of teachers that influence whether an MSP intervention is more or less likely to result in better student outcomes?
- Are there identifiable characteristics of teachers that influence whether they choose to participate in MSP interventions?
- Are partnerships significant in influencing teacher participation in the professional development interventions?

Section 2: Conceptual framework.

Student success in this project is defined by the improvement in state standardized exams in math and science that can attributed specifically to an MSP intervention. There are many factors that influence the performance of a student on any test including state standardized exams. This project uses a set of variables to control for each of these factors as it measures students' performance on standardized exams in Kentucky (a later version will also measure performance in Tennessee and Virginia). These include the student's own ability as measured by past achievement in math and science, the student's home environment and, finally, attributes that define the current teacher and school quality. The current teacher quality is measured by observable characteristics such as the teacher's experience level, education earned, and race and gender. Importantly, for this project, we also include the number of hours the teacher participated in an Appalachian

Math and Science Partnership (AMSP) professional development activity. A value-added model will be used to test the hypothesis that more hours of teacher participation in AMSP will positively influence the score of his or her students relative to those students of teachers who did not participate or who participated fewer hours.

The AMSP was a comprehensive intervention that consisted of a variety of math and science teacher content interventions. This version of the project differentiates the intervention only by assigning hours to math content interventions and science content interventions. They model allows for the possibility that math professional development influences not only a teacher's ability to teach math but that it may also spill over to science teaching. The same allowance holds for science interventions.

For this version of the project, we report on the analysis of data collected from students and teachers in 11 school districts in the state of Kentucky. The data are individual students matched to the teacher for which they had a math or science course, the classroom in which the instruction occurred, and the school in which the student and teacher are located. The time period covered is two years prior to the advent of AMSP and six years of the program (2000-01 to 2007-08). With these longitudinal data, we can track students as they progress through grades and track teachers with multiple cohorts of students. This reduces any bias associated with a particularly good or bad school year for the student or the teacher.

Section 3: **Explanatory framework**.

Our preliminary results suggest that teachers do not randomly select into MSPs. Weak teachers and strong teachers do not have equal probabilities of participating in these interventions. As a result, evaluations of the effects of MSPs must include some technique to correct for this nonrandom selection. This version of the project uses propensity scoring to capture the probability a given teacher will participate in a math or science intervention and then essentially compares teachers with equal probabilities of participation in AMSP.

Without correcting for differences in propensity to participate in the MSP, our results indicate that AMSP interventions had no statistically significant effect on the student scores. Once we correct for these propensities, however, we find that scores of students whose teachers participated were significantly higher on the mathematics exams than those whose teachers did not participate.

The findings of this project will be valuable to other MSPs as they attempt to use standardized test scores to measure the success of their interventions. In addition to recognizing the importance of correctly measuring teacher participation, one of the lessons of this project is that a single year of data is not sufficient to measure success or failure of an intervention. Recognizing the long run nature of professional development and encouraging projects to take a long run view of both improving teacher quality and student outcomes is very important.