

Session Number: 32

Abstract Name: **Impact of WI MSP on Student Achievement**
MSP Project: U.S. Department of Education MSP
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1. Questions(s) or issue(s) for dialogue at Learning Network Conference session:

What is the impact of professional development in STEM areas under ED MSP on teacher content knowledge?

Is the impact of professional development in STEM areas on student achievement measurable during the life of the project?

Is the interaction and participation of teacher with varied content knowledge baseline beneficial to all participating teachers?

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

The current proposal focuses on the evaluation of the impact of the Mathematics and Science Partnerships (MSP) programs under the No Child Left Behind (NCLB) on teacher content knowledge and student achievement using quasi-experimental design. In this research, the professional development plans in mathematics in Wisconsin, including 120 high need local educational agencies were evaluated using a quasi-experimental design. The effect size model using comparison group was utilized to analyze the student and teacher outcomes. Items from the Learning Mathematics for teaching (LMT) by Ball and Bass at Michigan State University have been used to assess the teacher growth in mathematics. Students' growth were measured using items from the Measures of Academic Progress (MAP). The analysis of pre- and post- test results for all participants and their students clearly showed that program teachers and their students gained significantly on the undertaken tests compared to the comparison group. This proposal will report information related to the research and conclusions on the impact of these plans will be shared.

The needs of the participating LEAs were identified using the Wisconsin Knowledge and Concept Examination (WKCE). All participating LEAs have similar needs i.e. lack of performance in algebra, statistics, and probability. Four partnerships consisting of 120 High-need local educational agencies (LEAs), 6 higher education institutions, 6 educational organizations, and 2 business partners developed plans to address the needs of teachers and their students. The four MSP interventions were developed to address all three areas identified for improvement. Each teacher participated in three 3-credit courses in algebra, statistics and probability offered at the summer institutes and throughout the school year. The current research investigated the impact of these projects whose focus is similar on student achievement.

The project selected 150 mathematics teachers from 120 high need districts in Wisconsin who participated in projects under the ESEA, Title II, Part B; Mathematics and Science Partnership Grants. This selection assigned half the sites to the program and half to the comparison group. Therefore, 75 teachers served in the comparison group and 75 teachers participated in the program group. All professional development activities of the comparison group were monitored closely to ensure that the impact of the program was measured correctly.

Teachers and students were tested using valid and reliable assessment instruments. A sample of teachers consisting of 75 middle school teachers in grades 7-8 were selected from high-need LEAs. Another sample of teachers from similar LEAs who did not participate in the current projects was selected. The groups were carefully selected in order to control hard-to-control variables such as the student mobility rate and teacher absence. All professional development activities of the comparison group were monitored closely and documented by each individual to ensure that the impact of the program is measured correctly and all external threats were controlled. Students of the program teachers who participate also served as the sample of the student-program group, and the students of the comparison group served as the sample of the student-control group. Five students were randomly assigned to each of the groups from each classroom. The total number of students in each group is 375 students. Additional students were tested to offset the effect of mortality as a result of dropping out of the program.

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

- 1- The impact of ED MSP in mathematics is very significant on teachers without a minor in mathematics
- 2- The gains of students whose teachers do not have a minor in mathematics was significant compared to other students
- 3- All participating teachers gained more mathematics content knowledge during the implementation of the MSP programs

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

In order to estimate the true gains, a common statistical way of standardizing data on one scale so a comparison the z-score were used. Each assessment instrument consisted of 26 items with different difficulty and complexity levels. The reliability coefficients (r_{xx}) of all instruments were calculated prior to the administration of tests using Kuder-Richardson Formula 21 (Wilson, 1979) as shown below, Table 1,

Table 1, Reliability Coefficients

r_{xx}	Pre-test	Post-test
Teachers	.779	.823
Students	.789	.867

Procedure:

150 secondary school teachers who are teaching mathematics from 120 school districts were assessed on the mathematics content knowledge as part of their initial participation in the Mathematics and Science Partnership Grant in September, 2005. The tests were directly related to the needs identified by the analysis of student achievement data for each school district. These tests were generated from the LMT forms developed by Ball and Hill (Ball and Hill, 2004). 75 of these teachers were selected from high-need LEAs to participate in the program as the program group. The remaining 75 teachers were assigned to the comparison group. Seven program group teachers did not participate in the post-test, therefore, only 68 of the program group teachers contributed to the final comparison score. The program group participated in 3 three-credit courses in algebra, statistics and probability during the summer institutes offered at six universities in Wisconsin. Upon completion of the second summer institute in August, 2006, 139 teachers participated in the post-test.

Items from the Measures of Academic Progress (MAP) developed by the Northwest Evaluation Association (NWEA) in mathematics have been used to assess student achievement. More than 138 school districts in Wisconsin use MAPs in mathematics and reading to monitor the progress of student achievement. 750 students were pre-tested in September, 2005. The student pre-test took place one day after the teacher pre-test. The same groups of students were tested in May 2006. Scale scores were generated and analyzed using z-score. The true gains were estimated using the Effect Size model (Cohen 1988). Effect Size uses the idea of 'standard deviation' to contextualize the difference between the two groups.

5. Key insights (retrospective for veteran projects, prospective for newer projects) that have value for the Learning Network:

- 1- The program had a positive impact on all program teachers as shown by their gains in the LMT content test,
- 2- The program appears to focus more on teachers whose mathematics content knowledge is relatively lower as shown by the larger gains of these teachers in the LMT tests,
- 3- the program has a positive impact on all program students as shown by their true gains in the mathematics MAP tests,
- 4- the program has more impact on students whose mathematics content knowledge is relatively lower compared to their peers with higher mathematics content knowledge,
- 5- the gains of teacher content knowledge is directly correlated to the student achievement,
- 6- the deeper teacher content knowledge will ultimately translate to high student achievement, and
- 7- the instruments have limitation and may not measure the impact of interactivity of teachers