

**Session Title:**

Building Math and Science Content Capacity in a High Poverty Rural School District

**MSP Project Name:**

Appalachian Mathematics and Science Partnership

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**Project Session****Strand 1****Summary:**

The Marshall University AMSP began by investing NSF funds in five school district Partnership Enhancement Projects (PEPs), encouraging each school district to plan how Marshall University could advance sustainable improvements in mathematics and science education. This strategy proved valuable to each school district but insufficient to build sustainable teacher implementation in all districts. Project leadership refocused project funds and activities in the two most promising strategies. This session describes how the one strategy of investing NSF funds and technical assistance with the privately funded Shewey Science Academy for students in the high poverty district of Mingo County, WV, developing a more sustainable focus on teacher delivery of STEM content, making a positive change on student knowledge and attitudes in science.

**Section 1: Questions framing the session:**

1. How can a partnership that includes a College of Education, a College of Science, a private foundation, and a high poverty rural school district effectively invest NSF MSP funds to create a more sustainable strategy for teaching and learning challenging STEM content?
2. How does NSF MSP teacher development before, during, and after an external partner (such as the Shewey Science Academy ) improve knowledge, skills and confidence of middle school teachers in teaching science and math content?
3. How can a teacher- led and partnered- supported one-week summer academy offered in multiple locations for middle school students in a high poverty rural school district have a direct impact on students' science knowledge, skills and attitudes?

**Section 2: Conceptual framework:**

The session will reveal how during the life cycle of implementation (conference strand) numerous challenges and lessons learned required important changes in initially planned

project activities. Initially, project leadership and university faculty were to provide customer-focused assistance in responding to the specific needs of each school district for improving mathematics and science learning of students. Collectively, this implementation strategy would lead to a robust set of practices that all school districts might find valuable for improving mathematics and science education for their students. Realities of the economic recession's impact on school districts (e.g., teacher reductions), university changes (e.g., project leadership, faculty availability), specific school districts issues (e.g., teachers, curriculum content), and evaluation results required a rethinking of how best to invest NSF AMSP funds to achieve sustainable changes in building district capacity for teachers to deliver rigorous STEM content.

### **Section 3: Explanatory framework:**

The Marshall University AMSP supports professional development to 25 middle school teachers in Mingo County that takes place on weekends throughout the school year. The professional development is reinforced through a week-long implementation in summer at The Shewey Science Academy. At the Academy up to 125 middle school students are instructed in math and science skills through active learning strategies. The 25 teachers provide direct student instruction with Marshall University faculty and staff providing support. Funding for the week-long summer experience is provided by the Shewey Learning and Research Center, a nonprofit organization.

Among the lessons learned are

1. Professional development for teachers conducted on the University campus is less effective than when conducted at local middle school sites. It is difficult for teachers to determine how to transfer the teaching techniques from the university facility to their own classroom environment. If the training is held in a local middle school science classroom, the teachers can easily perceive how the lesson is transferable to their own classrooms.
2. Teachers trained in specific content or teaching techniques must have an opportunity to put the new knowledge and skills into practice with students soon after the training.
3. A supportive environment that includes appropriate instructional resources and university personnel available on-site (e.g., Shewey Academy) where the teacher is implementing the new knowledge and skills with students increases teacher confidence in implementation.
4. Teachers need to have a voice in selecting the content and pedagogy for their professional development and summer implementation related to the Academy. For example, teachers review results from standardized student assessment to target areas of relative weakness then work with university trainers to build activities and lessons to provide students with additional experiences in the weak areas.
5. Topics selected for student summer experiences at the Academy are more successful if there is a culminating event. The event is even more successful if it is competitive. Two of the best summer sessions (2011 & 2012) had a town hall meeting and election or a mock trial that resulted in high student engagement in learning rigorous science content.
6. Investment of NSF AMSP funds for teacher development are maximized when a private funding source can support the teachers getting to practice the new knowledge and skills with their own students in a supportive classroom environment.

#### **Section 4: Discussion:**

This project has provided the project director and collaborating staff with valuable experience in structuring professional development that builds a sustainable capacity in the school district. Underserved high poverty Appalachian school districts are bombarded with well meaning university and support agencies who want to help improve student outcomes in the district. In nearly every case, once the training is over, there is little, if any follow-up, support or expectation of implementation. While teachers may be exposed to advanced content and innovative teaching strategies, they typically lack the confidence to put this content or practice into place in classrooms.

By pairing a privately funded summer academy to the NSF-sponsored initiative, the teachers gain a timely opportunity to implement the new knowledge and skills with age-appropriate students from their own schools in an intensified and supportive atmosphere where teacher success is enhanced by on-demand assistance from university personnel. The teacher development supported by NSF AMSP funding enables the teachers to acquire content and relevant pedagogy based on opportunities to examine student needs and plan the Academy. Consequently, the teachers also acquire the leadership skills that add capacity in the district to sustain improvements in the district's mathematics and or science curriculum.

To address framing question 1 the project director will reveal how an investment of NSF AMSP funds over several years, with support of the private partner foundation to operate the Academy for the students, enabled the University's College of Education and College of Science to increase district capacity over time, and also build interest among university faculty in providing meaningful assistance and expertise to the school district.

The AMSP-Marshall University project is targeting use of its available funds in an extended year of the project to further embed this new strategy for teacher development in the school district and university cultures. Implementation of this strategy in other MSPs could help improve the limitations common to school districts requesting one-time workshop events for teachers with no relevant, timely and supportive application with students in their schools to reinforce successful implementation of the new content knowledge and pedagogy.

#### **Section 5: How will you structure this session? What is your plan for participant interaction?**

To address framing question 2 project leadership (project director and university science faculty member) will briefly reveal how the Marshall University AMSP evolved to implement a teacher development strategy that has increased from impacting six teachers and 50 students in 2008 to involving 26 teachers, seven pre-service teachers, and more than 120 middle school students in 2012. Also, a Mingo County teacher in the project who has completed a chemistry certification during the course of the project will present her perspective on reasons the teacher development strategy linked to the summer Shewey Science Academy for students is successful compared to past experiences. Lastly, the project director will share insights for gaining University and school district collaboration for this promising teacher development strategy. To address framing

question 3, the project's external evaluator will present evaluation results that reveal the project's impact on the knowledge, skills and attitudes of middle school students in the high poverty rural school district.

Project leadership and the evaluator will briefly explain how evaluation results helped point out NSF funds should be concentrated on the most promising practices that could evolve a sustainable approach to building district capacity for improving mathematics and science education.

It is anticipated that the project director, university science faculty member, and evaluator will use 1/3 of the allocated 45 minutes for the session, the project teacher will use 1/3, and 1/3 will be allocated to audience interaction (Q&A). A PowerPoint presentation and handout will guide effective and efficient use of the time allocated for presenters.