

The Best Laid Plans of Measures for STEM

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Aurora Public Schools (APS) was awarded a 3-year Title II B – Mathematics and Science partnerships (MSP) grant in the fall of 2011. The goal of the grant was to deliver a comprehensive professional development plan to math and science teachers in support of a realignment of the math/science course sequence in high school (i.e., teaching Physics in 9th grade – Physics First curriculum). The plan was to provide professional development through three critical components:

1. Content support for teachers in physics and the math content knowledge that supported physics concepts;
2. Instructional pedagogy in both math and science courses that was research-based and supported differentiation for students; and
3. Job embedded content instructional coaching.

The focus of the grant was on 9th and 10th grade math and science teachers from six high schools. APS partnered with the University of Colorado at Denver to help provide the professional development in summer sessions and periodic day long trainings throughout the school year. Professional learning was housed in district either as a whole group or in individual classrooms through coaching or a modified lesson study model through the Teacher Development Group’s structure of studio cycles.

We chose these avenues for two reasons; we needed to present common practices for teachers to use as they learned to implement an inquiry based/problem based classroom. Teachers were making this transition along with changing course sequence and they expressed that they needed support in this area. Also, we wanted the main aspect of our professional learning to be centered on the classroom so teachers could see how these strategies worked with students in “real time”.

The evaluation examined the intended impact of the program on

* teacher and classroom-level outcomes (e.g., changes in teachers’ knowledge and skills, in teachers’ practices within the classroom);
* student-level academic outcomes including student achievement on state assessments (e.g., TCAP Mathematics and Science); and
* student perceptions of science and math courses.

Evaluation methods included

* web-based surveys [surveys of self-report of teacher knowledge and practices, surveys of evaluation of professional development training,
* classroom observations; and
* analysis of student perceptions and achievement.

**Initial Measures**

Teacher content knowledge: Force and Motion Conceptual Evaluation

Classroom pedagogy: Pre/post survey (*Scientific Work Experience Programs for Teachers*-SWEPT)

Classroom observations (Horizon Research observation protocol)

Student attitudes: Pre/post student attitude survey (*Scientific Work Experience Programs for Teachers*-SWEPT)

Student content knowledge: TCAP 10th grade science scores

TCAP 9th and 10th grade math scores

ACT EXPLORE, PLAN, and ACT scores (math/science)

**Obstacles**

Across the grant period, teacher turnover and shifting interests resulted in inconsistent cadres attending the summer training sessions, as well as participating in the classroom coaching.

Not all teachers who participated in summer training sessions and/or classroom coaching completed the various surveys or pre/post assessments; this resulted in small numbers of respondents to compare year-to-year results.

Shifts in district priorities and changes in staffing resulted in changes in professional development days on school/district calendars previously designated for science training.

Teachers expressed frustration with the professional development that was delivered by university faculty stating that there was no “classroom application” for the training they received.

Colorado’s state-level assessment system (TCAP) only assesses science in Grades 5, 8 and 10 and does not measure growth in science content knowledge. Also, the ACT series of tests were not necessarily aligned to the new sequence of science courses (Physics in 9th grade, Chemistry in 10th grade, and Biology in 11th grade)

**References**

Basile, C., Koellner, K., Kimbrough, D., Jacobson, M., Morris, L., Heath, B., & Lakshmanan, A. (2006). The veritable quandary of measuring teacher content knowledge in a math and science partnership. Retrieved from http://hub.mspnet.org/index.cfm/13461

Colorado Department of Education. http://www.cde.state.co.us/fedprograms/tii/b

Horizon Research, Teacher questionnaires: http://www.horizon-research.com/instruments/

SWEPT Multi-site Student Outcomes Study: http://scienceteacherprogram.org/SWEPTStudy/instruments.html

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