Session Number: 48

Abstract Name: **Transforming Higher Education Culture to Support Faculty Engagement in K-16 STEM Education Reform**

MSP Project: Partnership for Reform in Science and Mathematics

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

   To what extent does policy change and incentive structures that reward higher education faculty to collaborate with K-12 schools and to strengthen their own teaching result in sustainable changes in departmental and institutional culture, including changed policies, changed practices, new partnerships, and dedicated resources?

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

   A central, though largely untested tenet of the NSF Math Science Partnership program is that deep and sustained engagement of higher education STEM faculty is crucial for the success of efforts to improve K-16 teaching and student learning in the STEM disciplines. When the PRISM (Partnership for Reform in Science and Mathematics) project began in Georgia, the importance of faculty involvement in such efforts was not generally recognized in the workload/salary and tenure/promotion policies of the higher education institutions involved. Recognizing the need to provide tangible rewards to faculty members who participate in K-16 STEM education reform, PRISM developed the *Faculty Work in the Schools Policy*, which subsequently was adopted by the Board of Regents and applies to all 35 institutions in the University System of Georgia (USG). This landmark policy specifically advocates rewarding faculty for working with K-12 schools, for improving their own teaching, and for contributing scholarship that promotes and improves student performance (Kutal et al., 2009). Georgia currently is the only state in the U.S. that has adopted this type of comprehensive faculty recognition/reward system.

   Continuing the successful strategies of PRISM Phase I, the University System of Georgia STEM Initiative has been instrumental in advancing the work of PRISM in 11 higher education institutions in Georgia. PRISM Phase II is conducted in concert with the implementation of the USG STEM Initiative. These 11 higher education institutions provide a strong base of support for PRISM and the research of PRISM Phase II. Activities supporting the *Faculty Work in the Schools Policy* such as K-16 learning communities (Hessinger, 2009) and mini-grants (Henry, 2009) that provide seed money for research focused on improving instruction and student learning are funded through the STEM Initiative. This financial support by the state of Georgia is important for sustaining PRISM activities beyond the life of the grant.
An important lesson learned during PRISM is that one size does not fit all. Collecting and analyzing various forms of evidence and talking to groups of faculty and administrators provided valuable insight and direction, and ultimately led to the recognition that sustainable change requires both top-down (USG and institutional policies) and bottom-up (college and departmental practices) approaches. Thus, culture change, which includes changes in policy and practice and requires effective partnerships and dedicated resources, frames the significant issues related to achieving increased involvement of higher education faculty in K-16 STEM education reform.

This presentation recounts the steps followed in creating the Faculty Work in the Schools Policy, the actions taken by various institutions to implement the policy, measures for assessing the effectiveness of these actions, and the prospects for sustaining the positive changes that have occurred in departmental and institutional cultures.

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

Evidence collected to date in PRISM’s ongoing research study supports the claim that the long-term success of the MSP program requires the deep and sustained engagement of a substantial number of higher education STEM faculty members. A valuable lesson learned from PRISM and other NSF-sponsored Math Science Partnership projects is that many faculty members are reluctant to participate in educational reform activities owing to the lack of professional recognition and tangible rewards (Clarke et al., 1996; Zhang et al., 2009). The Faculty Work in the Schools Policy adopted by the University System of Georgia provides the top-down institutional piece of the reward puzzle. Individual institutions add the bottom-up individual incentive piece by offering several opportunities and the requisite resources for faculty collaboration, scholarship, and recognition. Examples of these incentives will be discussed in this presentation.

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

The research study to assess the changes in higher education faculty culture uses a mixed methods (quantitative and qualitative), longitudinal, comparison group design. Eight higher education institutions representing four different levels of engagement in PRISM/STEM Initiative activities are included in a three-year longitudinal research design. Of interest is the extent to which immersion in these activities leads to changes in culture and sustainability over time. Changes in culture are understood with concern for strengthening faculty self-efficacy beliefs about participation in the scholarship of teaching and learning and work in schools, and faculty receptivity/resistance to change. Quantitative data are collected using survey measures. Qualitative data are collected using open-ended, semi-structured individual and focus group interviews with faculty, department chairs, and chair persons of tenure and promotion committees, and document analyses (e.g., tenure and promotion support letters, course syllabi). Student achievement data include distributions of grades in introductory STEM courses. Original quantitative measures administered annually to mathematics and science faculty and
administrators include the Inventory of Teaching and Learning (ITAL) and the Web-Based Survey of Change, Self-Efficacy Beliefs, and Department Culture (CSC), which is a comprehensive measure of stages of receptivity to change (Fullan & Stiegelbauer, 1991), self-efficacy beliefs (Bandura, 1997), and department culture (Kesar & Eckel, 2002). The ITAL consists of 52 items rated with a six-point scale reflecting the emphasis that faculty give to each item in their teaching. The CSC consists of 60 items measuring faculty receptivity/resistance to change (n=21), self-efficacy beliefs (n=14) and perceptions of department culture (n=25) rated with a four-point, forced choice Likert scale. Repeated statistical analyses over time using Principal Components Analysis procedures well document that the ITAL measures three latent constructs: 1) Traditional Teaching and Learning; 2) Inquiry-Based Teaching and Learning; and 3) Standards-Based Teaching and Learning (Ellett & Monsaas, 2008; Ellett et al., 2010). Alpha reliabilities for the three ITAL measurement dimensions range from .85 to .94. Currently, data are being collected from some 700 faculty at PRISM/STEM institutions. These two web-based measures are being administered in the spring (ITAL) and fall (CSC) of each of three PRISM II project years. Of interest in these surveys are faculty and administrator reports about implementation of the Faculty Work in the Schools Policy, changes in teaching practices, the nature of new partnerships, resources dedicated to accomplishing PRISM outcomes, and how these facilitate or impede changes in departmental and institutional cultures over time. A rather unique feature of the data collection system is administrators’ reviews and ratings of samples of faculty tenure and promotion (T&P) dossiers using a standardized review process. This process is designed to document evidence of the extent to which faculty work in schools and the scholarship of teaching and learning are weighed /considered in making T&P decisions.

A series of 9-10 case studies are also underway. These cases represent a range of possibilities including individual faculty and faculty groups (e.g., a whole department) and levels of engagement in STEM reform initiatives (e.g., new and experienced faculty). In some cases, classroom observation data will be collected using a modified form of the Reformed Teaching Observation Protocol (RTOP) (Ellett, 2004) to document changes in actual teaching practices. Of particular interest in analyses of the data are results that identify longitudinal change (or lack of change) in policy implementation, teaching practices, higher education/K-12 partnerships, and resource supports. Assessments of the extent to which reward structure and policy driven incentives result in increased use of effective teaching practices and student learning in STEM education will be made.

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

Several lessons have been learned during the process of creating and implementing a reward structure for higher education faculty involvement in K-16 STEM education reform in Georgia. These are presented below in the form of action items that should be considered by those designing a faculty reward structure for their institution or state system.

• When assembling the core leadership team, enlist individuals with the authority and expertise to move your agenda forward. The involvement of campus administrators at the level of Dean or
above and high ranking members of the Board of Regents staff greatly facilitated the adoption and implementation of the Faculty Work in the Schools Policy in Georgia.

• During the design stage of your reward structure, seek input from faculty and administrators at various levels in your institution or from different types of institution (e.g. two-year, four-year comprehensive, research extensive) in your state system.

• Be flexible in designing your reward system; recognize that one size does not fit all even within a single institution. The Faculty Work in the Schools Policy lists several possible faculty rewards/incentives that schools may consider without being prescriptive.

• Build upon existing education reform initiatives at the institutional, state, and national levels; join forces with those who can help you achieve your goals.

• Adopt strategies that result in top-down and bottom-up changes in the culture of your institution and state system.

• Sustainability requires financial support from your institution and state system, so frequently publicize the positive impact of your activities on K-16 STEM education reform to officials with budgetary oversight.

References


