

**Abstract Title:** PRISM Phase II: Linking Culture, Self-Efficacy Beliefs and Change Processes to Student Learning and Achievement

**Strand I:** Definitions of and research designs related to student success

**Section Addressed:** Innovation in MSP research design and measurement of student success (Role of STEM faculty in student success)

**MSP Project Name:** PRISM Phase II: Research on Key PRISM Strategies

**Author(s):** Chad D. Ellett, Judy Monsaas, Kadir Demir, Lisa Martin-Hansen, Judy Awong-Taylor, Chuck Kutal, Nancy Vandergrift

**Presenter(s):** Chad D. Ellett and Kadir Demir

**120 word summary:**

This presentation describes the design and implementation of Georgia PRISM II research studies designed to link student success (undergraduate student achievement in introductory science and math courses) at 8 IHEs, over three years, with new measures of faculty perceptions of receptivity to change, self-efficacy beliefs and departmental culture. The development and initial validation results with these three new web-based measures will be described. Basic research questions and more specific research hypotheses framing the research are detailed. Implications of the predicted findings for understanding personal and organizational variables in future MSP studies in higher education contexts are discussed. How findings from this particular research study will be understood using the results of other PRISM II studies IHE contexts will be explained.

**Section 1: Questions for dialogue at the MSP LNC.**

What is the current PRISM Phase II conceptual framework linking change processes, department culture and self-efficacy beliefs to student learning and achievement? How have new measures for higher education faculty been developed to measure faculty assessments of change processes, department culture, and self-efficacy beliefs? What is known about the empirical relationship between these three new measures? What is being hypothesized about establishing linkages between these new measures and student learning and achievement in higher education mathematics and science core courses over time? How can these new measures be adapted/adopted by other MSP projects to help meet their research and evaluation needs?

**Section 2: Conceptual framework.**

**Context of the Work**

The *Partnership for Reform in Science and Mathematics (PRISM)* (Phase I, a comprehensive MSP awarded to the University of Georgia in 2003 was designed to assess key strategies to increase student learning and achievement in science and mathematics (SM) in schools and colleges. The PRISM partnership in its first phase, analyzed evaluation data for indications of changed teacher and faculty behavior in school and college classrooms as well as the effects of these changes on improvements in student learning and has used lessons learned to influence statewide change in policy and practice.

From the original set of 10 interconnected strategies implemented through *PRISM Phase I*, three were selected for further study through the PRISM Phase II project.

PRISM Phase II: Research on Key PRISM Strategies is designed to gather evidence of impact, including changed culture in K-16 STEM education in Georgia, through partnership-driven research comprised of well designed studies of 1) K-16 professional learning communities, 2) higher education recognition and reward for involvement in efforts to improve K-16 teaching and learning in science and mathematics, and 3) the public awareness campaign. These three focus areas for PRISM Phase II were selected not only for their successful implementation and preliminary impact on K-16 STEM education, but also for their potential contributions to the knowledge base in these areas of STEM education.

One important focus of PRISM II research has been culture change in higher education. In the fall of 2006, the Georgia Board of Regents of the University System of Georgia (BOR) adopted a major policy change called “Work in the Schools.” This policy calls for institutions of higher education (IHEs) in the University System to advocate for faculty participation in work that improves teaching and learning in K-16 education and sets the tone and expectations for these IHEs. A key element of this policy is the requirement that IHEs provide a system of faculty recognition and rewards (for example in the tenure and promotion process) for work in schools. PRISM I research in Georgia clearly identified departmental culture as an important variable related to the extent to which various IHEs moved forward with adoption and implementation of the new Work in the Schools policy.

The continued research on departmental culture being addressed in PRISM II extends studying cultural change (as well as faculty self-efficacy beliefs and faculty receptivity to change) in view of empirical linkages to student learning and achievement in eight participating IHEs. *In this research, student success will be defined by introductory (core) course grade distributions in undergraduate science (S) and math (M) courses over the three-year period of the PRISM II project. Positive changes in these grade distributions (e.g., a reduction in D, F, W and I grades) will be predictably, and positively linked to measured changes in departmental culture, faculty self-efficacy beliefs, and faculty receptivity to change. This component of PRISM II is the primary focus of this presentation.*

### **Claims/Hypotheses**

Of primary concern in the work of PRISM II is to better understand the extent to which personal and organizational factors that facilitate changes in department culture can subsequently be linked to student learning and achievement. The conceptual framework in which this research is grounded assumes that a combination of elements of departmental culture, faculty receptivity/resistance to change, and faculty self-efficacy beliefs (about engagement in PRISM and the ability to enhance student learning) enhances student learning and achievement over time (in this case three years of PRISM II). There are multiple research questions and hypotheses emanating from this work that will be addressed at this conference. Among the most important research questions are the following:

- What are the psychometric characteristics (validity and reliability) of the three new measures of faculty assessments of characteristics of departmental culture, receptivity/resistance to change, and self-efficacy beliefs?
- What are the empirical relationships among various measurement dimensions comprising these three new measures?
- Can empirical linkages between these new measures and student learning and achievement be established?

Among the most important hypotheses are the following:

- There is a statistically significant, positive relationship between increases in student learning and achievement and the extent to which faculty are (have been) engaged in PRISM II/STEM activities.
- There is a statically significant, positive relationship between student learning and achievement and faculty engagement in elements of departmental culture that support the Georgia BOR Work in the Schools Policy.
- There is a statistically significant, positive linkage between student learning and achievement and faculty self-efficacy beliefs about the extent to which they can reform (or have reformed) their own teaching consistent with newer MS teaching strategies (e.g., inquiry-based teaching and learning, Process Oriented Guided Inquiry Learning),
- There is a statistically significant, positive relationship between faculty receptivity to change (consistent with the BOR Work in the Schools Policy) and student learning and achievement.

### **Section 3: Explanatory Framework.**

#### **Evaluation and/or Research Design**

Three new web-based, faculty self-report measures have been developed to date in PRISM II. Collectively these three measures are termed the CSC (change, self-efficacy, culture). The CSC has been administered to all MS faculty in our eight cooperating IHE's on two occasions (Winter 2010, 2011) and a third administration is expected in the early summer of 2011. Initial Principal Components Analyses (PCAs) and reliability analyses have been completed for each of these new measures. The results of these analyses are strongly supportive of the initial validity and reliability of these new faculty measures.

Student learning and achievement (success) will be measured in our research by examining SM grade distributions in SM core courses at each of our eight participating IHEs). These data will be tabulated for each of three project years. Of interest is the extent to which grade distributions in MS improve over time (e.g., reduction in I, W, F and D grades) and the linkage between these grade distributions and each of the three new measures of change, culture and self-efficacy beliefs

### **Key Insights**

To date, several events have occurred in our PRISM II research and evaluation work, and are expected as a result of future work, that should have value for the Learning Network. These include the following:

- New theory-based measures of important personal and organizational variables have been developed for use in future MSP research and evaluation studies
- These new measures can be used with confidence in future MSP research and evaluation studies given the initial validity characteristics and reliability estimates established through PRISM II research.
- The results of future analyses of our CSC data base and student learning and achievement should yield important information about linkages between student outcomes and PRISM II/STEM faculty engagement in, and support for, the Georgia BOR Work in the Schools Policy.

The feasibility and utility of using undergraduate SM grade distribution data as a proxy measure of student learning and achievement (success) should inform future MSP research and evaluation studies.