Abstract Title: Designing PLCs for Enhancing Student Success: What do we know and how can we learn more?

MSP Project Name: MSP Knowledge Management and Dissemination Project

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120 word summary:

The MSP KMD project is charged with situating what the MSPs are learning in the broader knowledge base. One area of inquiry we are pursuing involves professional learning communities, an approach for improving mathematics/science teaching and learning that is included in a number of MSP projects. The idea is that by working together, school-based groups of teachers can improve their mathematics/science instruction and, in turn, increase student success. This inquiry builds on a synthesis of the research in a recently-completed NCTAF project; the MSP KMD project is collecting and synthesizing recent MSP research as well as the insights of experienced practitioners utilizing PLCs as a key mechanism for impacting student success in mathematics and science.

- Section 1: **Questions for dialogue at the MSP LNC**.
    - What do we know from research on the link between PLCs and student success?
    - How can MSP research be designed to generate more knowledge about the impact of PLCs on student success?
    - What are the key practice-based insights of MSP leaders on designing PLCs for enhancing student success that warrant further examination?

Section 2: **Conceptual framework**.

Professional Learning Communities are an increasingly common approach for improving mathematics/science teaching and learning. The idea is that by working together, school-based groups of teachers can improve their mathematics/science instruction and, in turn, increase student success. A recent synthesis of research conducted by the National Commission on Teaching and America's Future (NCTAF) and WestEd indicated that PLCs can be effective in improving teaching and learning in mathematics/science. (Fulton, Doerr, & Britton, 2010.) The NCTAF study examined the current knowledge about the impact of PLCs on teachers' disciplinary content knowledge (DCK) and pedagogical content knowledge (PCK), instructional practices, student achievement, and teachers' job satisfaction and retention.

Unfortunately, the research literature does not provide much guidance about how to design a PLC in a given context in order to have a positive impact on classroom practice and student outcomes. The synthesis project found that the research literature is very thin; there are relatively few research studies, and when standards of evidence were

applied to the identified studies, the majority was judged to be of poor quality. In some cases, studies looked at a small number of teachers in depth, but did not explain how these teachers were selected, or the extent to which their prior backgrounds or experiences in the PLC were representative of the larger group of participants. In other cases, subjects were dropped from the studies with no explanation given or the impact on the results. And there were very few published studies, of any quality, that explored the relationship between PLCs and student success on mandated or other administered assessments. In both of these ways, the knowledge base about PLCs is similar to what is known about deepening teacher content knowledge and developing and utilizing teacher leaders. (Heck, Markworth, & Weiss, under review; Pasley, Smith, Taylor, & Heck, under review.)

Improving the research designs in individual studies is essential for expanding the knowledge base, but considerably more needs to be done if research is to provide the kinds of guidance practitioners are seeking. Isolation of research efforts and lack of accumulation of evidence are evident broadly in education research (Burkhardt & Schoenfeld, 2003). These problems appear to be characteristic of efforts at organizational learning from social science research more generally, and are "exacerbated [by] lack of agreement on definitions and measures" (Huber, 1991, 9). In response to this situation, the National Research Council (NRC) has issued a broad statement about the current status and needed future direction of education research:

> Even if the quality of discrete education research projects has been ensured, if the field lacks the will or the tools to forge connections among studies, it will amass a multitude of studies that cannot support inferences about generalizability nor sustain the theory building that underlies scientific progress. We conclude that greater attention must be paid to reanalysis, replication, and testing the boundaries of theories with empirical inquiries, as well as to taking stock of what is known in areas of interest to education policy and practice on a regular basis. (NRC, 2005, 4)

The Math and Science Partnership Knowledge Management and Dissemination (MSP KMD) was funded as a Research, Evaluation, and Technical Assistance project to support knowledge management within the MSP program and to disseminate information to the broader mathematics and science education community. The overall goal of MSP KMD is to synthesize findings in the K–12 arena in a small number of important areas, articulating the contribution of the MSP program to the knowledge base and identifying "gaps" and promising practices/strategies for further investigation. In this way, MSPs and the field at large can benefit from MSPs' research and development efforts. The MSP KMD process involves the collection and synthesis of both research-based findings and practice-based insights.

To date, MSP KMD has focused its knowledge acquisition and knowledge sharing efforts in three primary areas: deepening teacher content knowledge, teachers as intellectual leaders, and STEM faculty involvement in the K-12 arena. The MSP KMD project is currently building on NCTAF's synthesis of research on professional learning

communities to add to our "drill down" of deepening teacher content knowledge. MSP KMD staff will be collecting and analyzing MSP research, including documenting how student success is being defined and measured, using the Standards of Evidence process developed by MSP KMD to operationalize best practices in empirical research involving various quantitative and qualitative methodologies (Heck & Minner, 2010). In addition, practice-based insights will be collected from an on-line panel composed of representatives from MSP projects and other experienced practitioners.

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

- MSP research can help advance the state of knowledge about how to design and implement PLCs so they contribute to student success.

- The insights of MSP practitioners can provide valuable guidance to the education community.

Section 3: **Explanatory framework**.

The MSP KMD knowledge acquisition process involves the systematic review of empirical research using a standards of evidence process, and the collection and synthesis of practitioner insights utilizing an on-line panel process. The proposed session will describe what we know from existing research from the NCTAF synthesis, address research design issues for strengthening MSP research in the areas of PLCs to allow greater knowledge accumulation, and surface MSP leaders' practice-based insights which warrant deeper exploration in MSP KMD practitioner panels to be conducted in the early 2011.

Participants in the session will begin by discussing in small groups a number of key design issues for PLCs. For example, one important decision is whether PLCs should be limited to teachers from a single grade, allowing them to focus on common learning goals and activities, or include teachers from multiple grades in the school, facilitating discussions of learning progressions and K-12 articulation. Similarly, the source of PLC tasks is an important decision. On the one hand, allowing participating teachers to "bring in the curriculum" based on problems from their own practice helps ensure that the tasks will be viewed as "authentic." On the other hand, framing problems as tasks amenable to group work requires curriculum design skills that may not be available, suggesting an advantage to using prepared tasks, e.g., from professional development materials.

After an initial framing of the session, participants will discuss these and similar issues in small groups, sharing their insights, and noting the extent to which they are derived from theory, empirical research, or their own experience. Each group will then be asked to choose an insight to share with the larger group, with other groups indicating if they had a similar insight.

Moving beyond the selected issues, small groups will be asked to generate a list of questions they have about effective PLCs, organizing their thoughts on poster paper. Participants will then do a poster walk to see the similarities and differences among the groups.

The session will then turn to what is known from the empirical research, drawing from the NCTAF/WestEd synthesis of research and how to strengthen MSP research to enable knowledge accumulation in the case of PLCs. The session will address a number of variables needed for knowledge accumulation:

1. Identifying what information studies should be expected to provide about the PLC experience itself. The NCTAF synthesis study supplemented the research review with expert opinion on the important features that may affect PLC effectiveness, identifying such issues as how often the PLC meets, for what duration, who facilitates the work, who is involved, connection between teaching and student achievement, and what type of scaffolding is provided. Other features that seem potentially important and therefore merit documentation include, for example, the nature and content of tasks. If this kind of information about the treatment, the participants, and the context were routinely provided in research reports, efforts to accumulate research through research syntheses and meta-analyses can aggregate, disaggregate, and analyze findings in a variety of different ways. The findings of individual studies can then contribute to knowledge accumulation, supporting broader learning about what types of interventions, and what strategies that make up those interventions, are effective in what ways, for whom, and in what contexts.

2. Identifying the characteristics of the contexts in which PLCs operate that *might* matter in determining the effectiveness of a PLC for teachers and students. As these potentially important variables are identified, researchers should be expected to describe these features (including how student success and other variables are being defined and measured) in study reports submitted for publication. As a result, someone reading a study that yielded positive results would have a reasonably good sense of the extent to which their context is similar to that in the study and therefore the likelihood of that kind of PLC working for them as well.

Documentation of studies, including samples, interventions, contexts, and methods, provides a basis both for interpreting findings from individual studies and for combining findings across studies. Even though many studies do not have designs that allow for systematic examination of the importance or effects of differences in background across groups of participants, contextual factors, or variations in an intervention, these factors can be examined in research syntheses and meta-analyses. The ability to do so depends on documentation in individual studies. Even when these factors do not vary within an individual study, documenting them affords greater contribution of the study to the field's knowledge base.

In addition, an "unpacked" theory of action will be shared with participants, illustrating how studies can show a chain of evidence to make the case that a given type of PLC was responsible for measured improvements in student success, and explore potential explanations for why another PLC was not successful. The session will conclude with a discussion of the online practitioner panels MSP KMD will be conducting to collect and analyze knowledge from experts using PLCs.

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

- Similar to other areas of education research, empirical findings in current research on PLCs tends to be of a large grain size and do not provide very much guidance for practitioners on designing PLCs for impacting student success.

- The insights of practitioners experienced in designing and implementing PLCs for student success, when systematically collected and analyzed, provide valuable guidance to the education community and can serve as hypotheses for future research.

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