Professional Learning Communities for STEM Teachers

Background
Administrators and leaders of professional development have, in recent years,developed professional learning communities (PLCs)—one of the most common professional development strategies in use today across education at large. And leaders in STEM education have universally advocated their use—the *Successful K–12 STEM Education* report specifically urges considering "factors that strengthen and sustain learning communities." There are exciting rationales for PLCs, such as the desire to morph teaching from solo artisan instruction to a synergy of great teaching.

But what effects can be expected? Under what conditions? Could widespread unrealistic expectations placed on weakly designed and implemented PLCs at some point evaporate support for them? Through NSF support, WestEd and the National Commission on Teaching and America's Future (NCTAF) recently tackled these questions through an intensive "knowledge synthesis" in which researchers:

- exhaustively collected and studied the existing research about teacher PLCs, specifically in STEM, and
- convened a panel of experts (professional developers, administrators, researchers) who have designed and run STEM PLC projects.

Two versions of the results by Kathleen Fulton and Ted Britton are available online at NCTAF and WestEd (www.wested.org).

- *STEM Teachers in Professional Learning Communities*: *A Knowledge Synthesis*. 2010. (full report, with detailed research results and practice-based insights)
- *STEM Teachers in Professional Learning Communities*: *From Good Teachers to Great Teaching*. 2011. (summary report, released for a U.S. Congressional briefing)

Documented Results: *What effects can be expected?*
Research has shown that STEM teachers in PLCs can:

- increase their discussion of STEM content and how to teach it,
- learn STEM content,
- feel more prepared to teach STEM content,
- enhance their inquiry-oriented teaching methods, and
- pay more attention to students' reasoning and understanding.

And student learning improved for the content discussed in the teachers' PLCs. Only a little research has been conducted that can clearly link students' standardized test scores to teacher PLCs, in part because of large challenges in designing and conducting research on this particular topic; the limited studies/results to date show some positive gains in mathematics. (No studies have yet been conducted for science.)

Documented Results: *Under what conditions can the above effects be expected?*
The STEM Seattle breakout discussions will focus on this question. The prior research studies and the WestEd/NCTAF project's panel of experts found the following design and implementation factors to be critical:

shared values and goals
leadership support
use of student data and work
collective responsibility
good facilitation
trust

In each 25-minute breakout session, participants will choose a few of these design-level issues to discuss. Participants and the session leader will raise questions and offer research or "wisdom of practice" about how to address them.

Potential Applications

Research studies focused on wide-ranging sites where STEM PLCs were being created and implemented. Similarly, the panel of experts had successfully implemented PLCs in varied settings (or observed this), including school districts having diverse students and challenges. Disclaimer: There was little research on PLCs specifically for technology or engineering teachers.

For More Information (beyond the NCTAF/WestEd reports) about key issues in PLC design and implementation:

Research-based, scholarly advice.

Slavit, Holmlund-Nelson, & Kennedy.(2009). *Perspectives on supported collaborative teacher inquiry*. New York: Routledge.

Expert Advice on key design issues:

(1) Additional "knowledge synthesis"/advice by the Knowledge Management and Dissemination Project (KMD), funded by NSF's Mathematics and Science Partnership Program (MSP). www.mspkmd.net. [Most of the focal PLCs involved STEM teachers*plus*scientists/mathematicians.]

(2) Mundry& Stiles (2009). *Professional learning communities for science teaching*: *Lessons from research and practice*. NSTA.