

Designing On-line Communities to Enhance Teacher Professional Development.

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Introduction

Despite the interest in fostering new intentional online communities that support learning, online professional development is still a rarity and often not well understood (Barab, 2003). Many on-line communities are emerging in the wake of social networking tools, but how these environments benefit knowledge construction is unclear. In the Web 2.0 era, it seems only natural that the teaching profession, as a community, would identify the need for more technology-enhanced ways of sharing knowledge, social exchange and collaborating on effective strategies for student learning. This paper reports research on the use of the wiki tools and an accompanying Web site to create a teacher professional community focused on teacher learning. By engaging teachers in legitimate practices of planning, enactment and reflection within a community of peers, their study aims to establish a successful design for online communities of practice.

This design-based research study, follows nine science teacher participants with different areas of domain specialties (such as biology, physics or chemistry) and different years of experience, as they co-design a technology-enriched project-based lesson for their courses. We explored the impact of scaffolded reflections and peer exchange in four phases: teacher background, lesson planning, enactment and revision. The teachers were prompted for reflection at regular intervals throughout the design process, and then participated in face-to-face and on-line collaborative activities that examined their lesson design, their enactment and their students' learning. These nine teachers established a community with both online and offline components and were committed to improving their practices, to developing their knowledge, to introducing innovative technologies to their science classrooms, and to improving their students' learning.

Theoretical Foundations

Research has shown that online communities offer peer-assisted learning, allowing members to help solve one another's problems and share ideas and experiences (Rourke & Anderson, 2002; Palloff & Pratt, 1999). In addition, learning within online environments can be influenced by reflections and interpretations of ideas, experiences and assumptions gained through prior learning and the sharing of life experiences (Palloff & Pratt, 1999). On-line collaborative communication supports constructivist principles for teacher knowledge growth. Teacher knowledge growth can occur through professional development, which can facilitate teachers in their understanding of inquiry instruction by extending their ideas, student learning technology and their role as an instructor (Slotta, 2004). Research on professional development programs report that teachers are concerned about student success and justify their classroom and curriculum decisions (Borko et al., 1997). While, such findings are encouraging, professional development programs for teachers are limited in providing persistent and collaborative support. This study adopts Cultural Historical Activity Theory (CHAT- Leont'ev, 1978; Engeström, 1991) to capture the complex nature of teacher knowledge and the actions that teachers engage in and to develop a formalism of the interplay between various actors within a community, the rules that govern their actions and the activities in which they participate in relation to some objective. An activity system consists of a participant (e.g., the teacher(s)) who has intent to act (e.g., teach) on an object (e.g., teacher knowledge development), as well as the tools (e.g., wiki peer comments, lesson plans) that mediate between the participant and the object. Activity theory offers a model for representing and interpreting the teachers' conscious teaching activities and embraces the socio-cultural and historical perspectives of the teachers' day-to-day life.

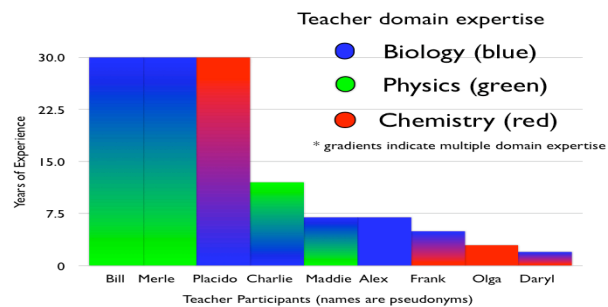
Methodology

This is an iterative design-based study of teacher professional development as it occurs in the rich context of a curriculum-design community, where nine science teachers ($N=9$) each design, enact, and revise a technology-enhanced project-based lesson. The lessons were designed according to a generic set of characteristics for Project-Based Learning (see Laffey et al., 1998; Blumenfeld et al., 1991) and used various technologies including productivity software (e.g., Microsoft Office), visualization tools (e.g., Inspiration) social technologies (e.g., wikis or blogs) and interactive learning environments (e.g., WISE: The Web-based Inquiry Science Environment). This study focused on the role of two primary forms of intervention in a teacher professional development: reflections and peer-exchange within a community.

There were nine science teacher participants with a range of experience and disciplinary expertise (i.e., physics, biology, chemistry, or general science). Figure 1 below illustrates the years of participants' teaching experiences and subject expertise. Selection was based on their interest and content knowledge but also their understanding of project-based instruction and technology. The student learning was followed through each teacher enactment of their lesson.

Figure 1. Teacher participants – Years of experience and subject expertise.

The teachers were from 5 different schools located in a large urban city in North America and had a wide variety of technology supports provided by their school base.



Materials

There are several materials that were used to examine the question of community development for fostering teacher knowledge. In order to establish a measure of teachers' background and pedagogical content knowledge, a pre-survey was administered to all teachers, followed by an interview that was administered for purposes of clarification and to orient the teacher with the mentor researcher. Reflection (both individual and community based) was one of the key interventions for this study. The reflection wiki site and interview questions were designed to promote reflections about pedagogical content. Examples of reflection questions asked during the study include: (1) What are your thoughts about the student ideas?; (2) What are some of the key elements in your project-based design?; (3) What is one change or addition you would like to put into place for next time? (4) What was one advantage in using the technology within the project-based activity?

The peer community within this project was manifested in both online and offline environments. The teachers had periodic community meetings where they exchanged ideas and shared their stories about the project-based enactment, which served to establish a personal relationship between community members. The online component of the community consisted of a website and a wiki site, developed to collect personal statements from teachers about their background and philosophy, as well as to collect details of lesson plans, and all reflections. The online community supported peer exchanges and reviews of lesson plans and discussions about enactments. Upon completing the lesson plan an update of the 'lessons learned' and the 'things I hope to add to the lesson next time' was added to the wiki lesson page. Teachers in a community were asked to connect to their peers by asking questions and commenting to this additional wiki page.

The on-line wiki site for lesson design and reflection played a significant role in supporting socially constructed knowledge. It enabled teachers and the mentor to make their knowledge visible for themselves and all members of the community. These on-line artefacts became assets for reference by all members of the community.

Design and Procedure

Four main phases of teacher activities occurred within each design iteration: (1) Teachers' background and experience; (2) Lesson design; (3) Classroom enactment; (4) Revision of lesson design. Data sources include teacher surveys, interview questions, lesson plans, reflections (captured in a wiki), videotaped classroom enactments, field notes, student artefacts and responses, peer exchanges (on a wiki and in group meetings).

The first iteration of the design study included four teachers who worked individually with the researcher-mentor to co-design a technology-enhanced project-based science lesson. The second iteration added five more science teachers, increasing the community to a total of nine teachers and one researcher.

Analysis and Findings

Evidence of Community Knowledge Sharing

The following is an example of how the peer-community and the mentor influenced participant's lesson design. (Charlie INT 29/10/08) "I would not have been able to consider the changes to the lesson or even trying this video project-based lesson without the community. Without you (researcher-mentor-peers), so it has changed me and my perspectives - giving me things to think about."

The layer of technology made many teacher ideas and actions more explicit, scaffolded discussions on revising lesson plans, and helped focus teachers' thinking on student learning. The following screen capture (Figure 5 below) of one sample of community comments, written by community members, about Charlie's wiki-lesson designs from the second iteration illustrates thoughtful reflection from his peers about his lesson and insightful suggestions about scripting and student focus.

Notes and reminders

Comments (Hide)

Creativity very strong and peaking student interest. To make sure student focus remains on physics concepts and that they do bring them up and do directly link them this should be in rubric or marking scheme or description and constantly mentioned.

Also, videos need to be screened and or critiqued while in process so some sort of format perhaps where there can be peer editing at some point to assure you do not end up off track, missing concepts or being inappropriate (censored)

Posted by: Aug 27, 2008 11:07 | [Permalink](#) | [Remove](#) | [Reply To This](#)

I love the idea. The students will enjoy this project. It will be fun for the students to see their results. Have you incorporatec
ong the way so that the process can be evaluated?

Posted by: Aug 27, 2008 11:56 | [Permalink](#) | [Remove](#) | [Reply To This](#)

Figure 5.
Wiki-Community
Reflections on
Peer's Lessons
(27/08/08)

Use of wiki documentation enabled teachers from different schools not only to see lesson plans but also to see why changes in the lesson plans occurred and what components were critical to the design. The layer of technology made many teacher lesson ideas and actions more explicit and facilitated effective community discussions about lesson plans, and student learning.

Development of On-line Community Learning Environment

By coding teacher knowledge and actions, and then placing coded themes on the nodes of activity triangles, the use of CHAT enables viewing of changes and shifts in teacher enactments indicating teacher knowledge growth from one iteration to the next, and the sharing of revised lesson plans through the on-line community between participants activity systems. Figure 6, identifies one example of a pattern of actions as the teacher knowledge and wiki-documentation of teacher participants is shared through the on-line learning environment.

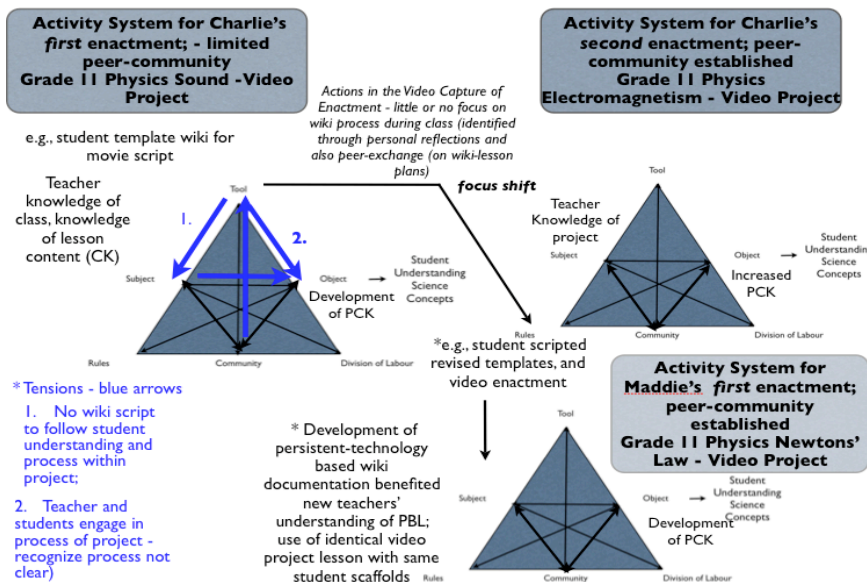


Figure 6. Activity Systems for different iterations and different participants;

Indicates the use of computer-mediated supports for the teacher community offered a persistent record of the artifacts and demarked the tensions within teachers' lesson planning and revisions.

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