

## The Use of a Web-Based Professional Development Forum to Enhance In-service and Pre-service Teacher Education

In this session, we will present how technology has been used in two intersecting innovative teacher education activities. In particular, we will describe how we have provided a rich context for pre-service and in-service teachers' professional development through the use of information technology in the form of a web-based professional development tool (the Internet Learning Forum (ILF)) in a professional development project (the Collaboration for Enhancement of Mathematics Instruction (CEMI)) and in a secondary mathematics methods course at Indiana University.

### The Internet Learning Forum (ILF)

The ILF, hosted at Indiana University, "is a web-based professional development tool designed to support a community of in-service and pre-service mathematics and science teachers creating, sharing, and improving inquiry-based pedagogical practices" (Barab, Makinster, Moore, Cunningham & the ILF Design Team, in press, p. 3). The ILF is funded by the National Science. The virtual facilities for the community include classrooms that can be visited, various types of meeting rooms, a library, and "workrooms" that provide "an on-line space for groups to form working circles, or sub-communities, to facilitate collaboration on a particular project, product, or goal" (Barab, Scheckler & Makinster, 2001, p. 7). Thus the ILF creates a comprehensive web-based professional development community through which the participants connect with each other and participate in interactive construction of professional knowledge (Barab, Makinster, Moore, Cunningham & the ILF Design Team, in press).

### The CEMI Project

CEMI seeks to engage teams of middle and high school mathematics teachers, university mathematicians, university mathematics educators, and pre-service secondary mathematics teachers in an activity that is inspired by *Lesson Study*, a form of professional development that is widely used in Japan. In Japan, an entire school has a general theme for the *Lesson Study* and each lesson study group develops a lesson that relates to the theme. *Study lessons* are then taught in regular classrooms. An implemented lesson is observed by many teachers in the school and is followed by a public discussion of the lesson with the planning group. This cycle of meetings and lessons is repeated several times during a year.

Our lesson study groups (LSGs) also work through cycles of planning, implementing, and reflecting on individual lessons. Responsibility for planning and reflecting on lessons is shared among participants, while the teachers are responsible for implementing the lessons and other group members observe and take notes. The CEMI project is not simply trying to engage U. S. secondary mathematics teachers in Japanese Lesson Studies, but rather to adapt this model of professional development for several purposes. These include providing professional development for all of the participants in the project

and creating an extensive community of people with diverse perspectives with the common goal of providing secondary students with quality mathematics education. The evaluation/research component of the project seeks to understand these activities and their impact on the participants and the participants' classroom teaching.

The Collaboration for Enhancing Mathematics Instruction project conducts many of its activities through the ILF website. For example, CEMI project participants, including pre-service and in-service secondary mathematics teachers, mathematicians and mathematics educators, co-construct lesson plans in the work space on the ILF site. The planning process and plans are thus visible to other educators. Additionally, the project participants engage in discussion on the ILF site, both about the lessons developed through CEMI activity and about other classrooms on the ILF site.

It is a goal of the CEMI project to help those interested in secondary mathematics education to develop professional communities for the purpose of reflecting on and improving instruction. The ILF supports our efforts by providing examples of practice as well as a common work and discussion area which facilitate collaborative work between face-to-face meetings. Participants build and revise lesson plans on-line, reflect on lesson implementation, and discuss issues related to the teaching and learning of mathematics. Ultimately, video of the lessons developed through CEMI activity and artifacts related to these lessons (e.g., student work, teacher reflections) will be included on the ILF site.

### The Methods of Teaching Secondary Mathematics Course

It is a goal of every teacher educator to stimulate meaningful discussion about issues related to teaching among their students and to help students become reflective about their own and other's teaching. The ILF is currently used for both these purposes by our secondary mathematics education students. In addition to their participation in CEMI Lesson Study Groups, our students use the ILF to (a) virtually visit mathematics lessons which include everything from written plans and video clips of implementation to student work and teachers' own reflections, (b) engage in discussions about issues related to teaching and learning mathematics, (c) create and revise their own lesson plans, and (d) build a cadre of web-based teacher-related resources and lesson ideas.

The mathematics lessons and related materials on the ILF are used to stimulate on-line and face-to-face discussion about important issues in mathematics teaching and learning such as the cognitive demand of a particular mathematics problem or task, the role of the teacher in fostering student discussion of important mathematics, and the use of a variety of methods for assessing student learning. Students also use the ILF as a means of sharing ideas and discussing issues they encounter as they begin to teach lessons in area middle and high school classrooms. Research on the benefits of the ILF for our students' understanding is ongoing, but initial evidence suggests that the ILF is beneficial both as a tool for developing an intellectual community among our students and as a means of examining the complexities of teaching and learning.

### Research Components and Issues

Research related to the ILF, CEMI, and the secondary methods class have several foci including (a) the role of the ILF in helping mathematics teachers, mathematicians, teacher educators, and secondary methods students develop “communities of practice” (as defined by Wenger, 1998), (b) the integration of Japanese lesson study methods into U.S. teacher professional development and the ways in which the ILF enhances this process, (c) the characteristics of on-line discussions and the ways in which the ILF can be used to support reflection on teaching and learning, and (d) the roles of teachers, education students, teacher educators, and mathematicians in lesson study groups and on-line and face-to-face discussions. This project has given the researchers involved an opportunity to use and further develop the theoretical perspectives of inquiry learning and activity theory (Engeström, 1987, 1990; Leont’ev, 1978), as well as opportunities to explore Wenger’s (1988) notion of “communities of practice”. “Communities-of-practice are informal networks that support professional practitioners to develop a shared meaning and engage in knowledge building among the members (Hara, 2000 p. 11).” This definition is based on the Wenger’s (1998) four characteristics to define communities-of-practice as a social fabric of learning: negotiating meaning; preserving and creating knowledge; spreading information; being a home for identities. Correspondingly, we are examining the LSGs as communities of practice and analyzing the extent to which characteristics such as negotiating meaning; preserving and creating knowledge; spreading information; being a home for identities are present in the activities and whether there is evidence of building communities of practice in the LSGs.

Data for this research consist of audio and videotape of CEMI lesson study group meetings, videotape of lesson implementation, and ILF-based discussions and lesson plans. Qualitative data analysis methods are used to determine the degree to which communities of practice develop within the CEMI lesson study groups, the ways in which Japanese lesson study methods may be useful to U.S. teachers, and the level and content of discussions in which participants engage.

### Conclusion

The ILF provides a technological tool that provides opportunities for professional growth for pre-service and in-service secondary mathematics teachers as well as other mathematics educators. Our use of the ILF in the CEMI project and in the secondary mathematics methods class is only in its second year, so conclusions about its value must be tentative. However, we are convinced that the ILF is helping us introduce pre-service teachers to reflection on practice in ways that were previously unavailable and that are valuable. Similarly, the ILF provides a mechanism for engaging in-service teachers and other mathematics educators in collaboratively constructing and examining practice in new and powerful ways. Whatever terms are used to describe what is developing – discourse community, community of practice, collaborative, or something else – the bottom line is that through the use of the ILF we have people talking with each other and working together who have not previously done so.

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