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The Internet Learning Forum: Developing a Community Prototype for Teachers of the 21st Century

SUMMARY. This paper reports an effort to create a community of practice for teachers' professional development via the World Wide Web. Beginning with a discussion of our theoretical foundations and current online models of professional development, we address the problem of how developing Web and video technologies may provide innovative and effective professional development for teachers. We describe the initial conceptions of the Internet Learning Forum (ILF), a Web site

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developed to support mathematics and science teachers sharing and evolving their pedagogical practices. This site includes exemplary instructional units, teachers' reflections, and peer discussion. Starting with video, ILF participants examine assumptions, reflect on practices, and share within the ILF community. The goal of this unique community of practice is to create quality professional development. While this paper provides an overview of our initial design work, the site has evolved into a nationally funded project. However, the work described here, which guided the development of the prototype, has important implications for other Web-based efforts to support teacher professional development. *[Article copies available for a fee from The Haworth Document Delivery Service: 1-800-342-9678. E-mail address: <getinfo@haworthpressinc.com> Website: <<http://www.HaworthPress.com>> © 2001 by The Haworth Press, Inc. All rights reserved.]*

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The difficulty of implementing change in education has been widely discussed in recent years. Traditionally, approaches to teacher development have assumed a stance toward teaching practice that concentrated on answers: conveying information, providing ideas, training in skills (Ball, 1996; Willis, 1997). In addition, Chism (1985) indicates that, while the notions of peer interaction and support within the school and community of teachers are well understood, and indeed most teachers claim to practice them, ethnographic observation has found a significant lack of professional peer interaction among teachers in public schools (Darling-Hammond, 1996). Consequently, a lack of critical reflective discussion among teachers has existed, and generally teachers find themselves developing their practice in isolation or at in-service workshops. Additionally, support for change is rarely ongoing and rarely situated in the immediate pedagogical needs of the teachers (Smylie & Conyers, 1991).

Barab and Duffy (2000) point out that traditional approaches to teacher development often fail because they do not create a sense of community that values and engages in reflection on the teacher's own classroom practice. Furthermore, the lack of pedagogical models for teacher professional development that move from a didactic approach to a learning-as-part-of-a-community approach hampers reform efforts.

Most critically, change has been slow simply because the culture of sharing pedagogical strategies is not well-established. Clearly, new models for professional development are needed, models that foster a culture of sharing and provide sustained communal support for teachers as they evaluate both their beliefs and practices.

The project we describe here is the creation of a virtual community on the World Wide Web designed to support the professional development of teachers. We call the community the Internet Learning Forum, or ILF. The project is based on the design efforts of the 24 members of the ILF prototype team. The design of this virtual community was guided by theoretical research on situated learning, and community building structures, as well as current virtual models for professional development. Practical concerns drawn from analyzing the teaching contexts of community members also shaped the project: specifically, available technology, professional standards, licensure requirements, and the teacher's own needs. Exploring these elements resulted in four fundamental principles for the ILF. Ultimately, the project itself is our attempt to integrate these elements.

THEORETICAL BACKGROUND

The theoretical underpinnings of this project grow out of situated cognition theory, into communities of practice, and, finally, into an exploration of Web-based professional development models. Much of situated cognition theory is based on observing learning in everyday activities and apprenticeships, and on the wealth of research that has found that content learned in the context of schools frequently fails to transfer when students enter out-of-school contexts (Brown, Collins, & Duguid, 1989; Greeno, 1998; Lave, 1993). Researchers emphasize engaging in real-world practices, partly for the reason that students can get the intact, spontaneous, sometimes hidden, wisdom from experts and practitioners, just as apprentices do with their mentors. Brown and Duguid (1989) also maintain that everyday activities situated in the cultures in which people work allow students to develop matured proficiency through observing how experts engage in intuitive reasoning, problem solving, and meaning negotiating.

Real-world problems arise in a particular context and are resolved within the constraints of those contexts. Becoming knowledgeable skillful necessitates not simply developing specific skills but having a

contextualized appreciation for how those skills relate to actual practice. Thus, being deprived of the opportunity of interacting with real professionals in an authentic context and activity, students are likely to engage in what Brown et al. called “ersatz activities” and, consequently, develop incomplete conceptions of the practice and the domain. Opportunities for pre-service and in-service teachers to situate their learning in real-world practices and classrooms are important (Barab, Squire, & Dueber, 2000).

A concept that can guide the design of teacher professional development programs, according to some situated cognition theorists, is community of practice (Barab, Cherkes-Julkowski, Swenson, Garrett, Shaw, & Young, 1999; Barab & Duffy, 2000). Barab and Duffy (2000) described a community as having three components. First, a community has a significant history and a shared cosmology, especially related to shared goals, practices, belief systems, and collective stories that capture canonical practices. Second, the notion of community suggests something larger than any one member. Third, a community is constantly reproducing itself such that new members contribute, support, and eventually lead the community into the future. In a community of practice, novices have the opportunity to participate in real-world practices alongside experts and professionals as, what Lave and Wenger call, “legitimate peripheral participants” (Lave & Wenger, 1991). Indeed, research in professional development indicates that the most effective professional development occurs when formal instruction is supported by informal community structures (Lagache, 1993; Seely-Brown, 1998). To engage in community of practice is important for both pre-service and in-service teachers’ professional development throughout their careers.

Our belief is that technological innovations on the Internet create new opportunities for supporting the development of a community of practice and for situating teacher professional development in classroom contexts. Particularly, we see the potential of allowing teachers from different contexts to form a community of practice, which can greatly benefit teachers in their professional development. As far as we can observe, the Web has enabled at least four different models of teacher professional development: a skill-based training model, student inquiry projects model, spontaneous participation model, and distance education course model. In the next section we briefly review these models.

FOUR ONLINE MODELS OF PROFESSIONAL DEVELOPMENT

Skill-Based Training Model

Skill-based training presents a specific set of knowledge, skills, or information in more or less sequenced lessons, often patterned as a workshop or a collection of resources. The learning is self-paced, and answers are provided to specific questions that teachers might have. Some examples follow:

1. Link21earn–Workshop Kits
<http://121pd.arin.k12.pa.us/workkits/>
2. How to Make a Successful ESL/EFL Teacher’s Web Page,
by Charles Kelly
<http://www.aitech.ac.jp/~iteslj/Articles/Kelly-MakePage/>
3. Science and Math Initiative: Math, Science, and Classroom Resources
<http://www.learner.org/sami/>

The training model does not usually include the opportunity for collaboration or interaction among teachers or the opportunity for reflection on practices. The model is focused on transferring skills and information. The danger is that it can limit the teacher’s view to narrow content. For example, many Web training programs on computer skills tend to focus on nothing but technology and its functions, rather than encouraging teachers to consider how to properly incorporate technology based on their curricular needs. Successful use of this kind of skill-based model requires that learners consciously fill in the gaps and make the information useful in their respective context.

Student Inquiry Projects Model

Popularity of the Internet has encouraged inquiry project collaboration among students from different regions or parts of the world. For example, Ruopp and his colleagues in TERC, Inc., organized a series of scientific projects that puts students in the position of scientists working with scientists (Ruopp, Gal, Drayton, & Pfister, 1993). Many of these projects require that the teachers of participating classes work closely together in making project decisions, solving problems, and negotiating for the details of the project. That participating teachers exchange in-

sight and information is therefore a natural part of the project—a part that gradually becomes strong support for professional development. The student project thus is an opportunity for teachers to grow professionally by actually negotiating and engaging with other teachers. They depend on help from colleagues to develop expertise in guiding the students and managing the project, to reflect on their own practices, to examine their assumptions, and to develop their own technological proficiency. The rich learning, interaction, and reflection opportunities are congruent with many professional development standards for teachers.

The student project model is ideal for in-service teachers but may not work for pre-service teachers, because it requires that the teacher has his or her own student group, which most pre-service teachers do not have. According to the community of practice concept, providing members the opportunity to participate is essential, but how best to accomplish that participation is the subject of this project.

Spontaneous Participation Model

A third kind of Internet professional development opportunity allows teachers to participate whenever they have some free time. An example is TAPPEDIN (<http://www.tappedin.sri.com/>), which is an Internet virtual environment that takes the metaphor of a conference center. Organizations such as the National Science Foundation, Geological Society of America, and many others hold online offices, meetings, and projects there for users to engage in real-time (synchronous) collaboration. Gatherings of general purposes are also provided to all the teacher members in the community, such as the After-School Online Discussions. Users can send e-mail, post to bulletin boards and listservs (asynchronously), and browse Web sites together as a group. They also have the choice of following the discussion closely or participating only when they feel the need.

Although many opportunities exist for individuals to participate and exchange information, a potential weakness of this model is that, when commitment is lacking, the learning may be loose and does not last long. Also, a short online meeting often does not allow participants to fully discuss an issue. Another problem is that participants may not access the site at the right time for the needed discussion. To benefit from the experience, it may require strong motivation, interest, commitment, and consistent participation, which are quite different from the intention of keeping the opportunity flexible enough for people to participate spontaneously. TAPPEDIN tries to solve this problem by providing

regular e-mail notices which, however, are not always effective in encouraging commitment and participation. Commitment may be enhanced when the user can rely on the quality of information offered by the site. Many teachers rely on such content-focused sites as the Math Forum (<http://forum.swarthmore.edu/>) for that precise reason.

Distance Education Course Model

Another recent popular choice for teacher professional development is the Web-based distance education course. These courses use the Internet as the medium for instruction and interaction, using a combination of technologies such as printed text, hypertext, Web scripting, audio, video, e-mail, and synchronous and asynchronous conferencing tools. An example is a series of distance education courses offered by the School of Education at Indiana University (<http://www.indiana.edu/~disted/>). Teachers do not need to leave their jobs to get accredited courses that are required for certification or license renewal. They can attend the class any time that is convenient to them, and the course requirements and structure can often create a commitment. The distance nature of the course can also bring together participants with much more varied backgrounds than conventional classroom courses. Interaction with colleagues from diverse backgrounds is possible to help expand the participants' perspectives in many different ways.

Given the large number of courses being offered by different universities, colleges, and private organizations from all over the world, confirming quality is so far a challenge for users. For example, some courses are similar to traditional correspondence courses that do not allow the important opportunities of interaction and reflection with colleagues. Consumers must be alert in selecting courses. As discussed above, each of these models has its strengths and weaknesses. Our goal, then, has been to create learning opportunities that combine the advantages of all of the described models—and eliminate as many disadvantages as possible—and to seek to fill in gaps in meeting professional standards.

FUNDAMENTAL PRINCIPLES

In creating the Internet-based professional development tool, we have incorporated elements of the four models—skill-based training, student inquiry projects, spontaneous participation, and distance educa-

tion courses—into the ILF. The in-depth resources central to a skills-based environment have been placed in the ILF resource room. The rich learning, interaction, and reflection opportunities central to the inquiry model are developed in the professional interaction found in the discussions of individual lessons and on specific topics of interest. The flexible and spontaneous participation found in such high-quality, high-reputation, spontaneous participation model sites such as the Math Forum, is found in asynchronous discussions with professors and peers. The flexible, yet structured, benefits of distance education coursework are found in teacher training courses currently being designed for the ILF. By synthesizing the best elements of all four models, we seek to build on these already successful projects. In designing this environment, we drew on this synthesis and the below discussed three design principles: visit the classroom, grow the community, and foster ownership and participation. Last, there were several practical concerns and opportunities that informed our design work.

Visit the Classroom

The goal of situating the participants in the social context of the practice was central to the design of the ILF. Observation and reflection are powerful modes of learning. Further, the craft of teaching consists, in large part, of tacit skills and knowledge that are not easily shared in words alone. Hence, an important starting point for sharing practices in a community of teacher practitioners is through visiting one another's classrooms to observe the craft of teaching as a basis for analysis, discussion, and reflection. To achieve this metaphorical classroom visit, supporting members of the community share videos of their own teaching practices.

While video has been used for decades in teacher training, the potential of this medium has not been optimized in online professional development settings. Reynolds and O'Neil (1997) noted how video technology remedies several difficulties associated with in-service teacher development. They observed that even teaching at the same school, teachers found it difficult to find time to observe other teachers' classes. Video allows for the capturing of instruction until both the teacher and the observers find time to sit down and explore the practice. Reynolds and O'Neil (1997) emphasized that working together to analyze instruction using the videotape fostered community building among teachers. They reported that social interaction between teachers increased and that a greater sense of community within the institution was found.

The strategy for employing videos is based on the design of the multimedia system, Strategic Teaching Framework (STF) (Duffy, 1997). The STF employs the “visit-the-classroom” metaphor, where a teacher virtually sits in on a class, pausing at any time to get different perspectives on class activities. She may also link her comments to the video and, when issues arise, access a rich database on teaching strategies. Chaney (1995) described elementary school teachers collaboratively using STF to analyze and critique exemplary instruction demonstrated by model teachers captured on videodisc. Observing teachers watched the demonstration and then had the chance to hear the demonstrating teachers’ reflections on the viewed segment afterwards. The video captured the model teachers’ moment-to-moment decision-making process, while the discussion among observing teachers after viewing the video clip helped them critically review their own assumptions about teaching and learning and improve their practices. Evaluation of the STF has demonstrated its effectiveness in both pre-service instruction (Lambdin, Duffy, & Moore, 1997) and in-service support for change (Chaney-Cullen & Duffy, 1998).

A critical issue in this project was understanding what representations and participant structures support the sharing of (making explicit) tacit knowledge (Brown & Duguid, 1998). Videos provide a start, but context and an interpretive frame are certainly needed. Thus, the videos are seen as a jumping-off point for discussions about the practice, including discussion of video use in different contexts, its relation to other practices, artifacts from the episode, and, eventually, discussion of attempts to implement or adopt the practice.

Grow the Community

It is *not* our notion that we will “build it, and they will come.” Instead, initially we intend to create links with already existing communities, meeting their existing needs and building on their existing relations. For example, one way to create a culture of ongoing professional sharing and collaboration is to establish such professional sharing and collaboration as an expectation from the beginning of pre-service teacher education. The culture of sharing and discussing teaching practices, and the ILF as a tool to support that activity, will be introduced during undergraduate teacher education. Thus, our hope is that the community established on campus will rapidly grow into off-campus, in-service communities. Further, the size of the community, even focusing on only math and science teaching, offers a rich research environment in as-

sessing the social, psychological, and technological issues in establishing and sustaining communities.

A critical issue in growing the community also involves supporting the transition process and responding to the changing needs of individuals as they move from the university campus to the K-12 school environment. While we will have established the culture of sharing, the relevant issues for discussion and sharing will change as individuals move into the teaching environment. Further, the world of work will offer less time for community participation. We examined two related strategies for sustaining participation during this transition and beyond. First, the design is based on enlisting core members of the mathematics and science teaching professional associations in the state to become active participants in the ILF—serving as “old timers” in the profession. Additionally, we discussed establishing face-to-face meetings among ILF community members in association with the professional meetings.

Foster Ownership and Participation

We believe that a truly effective and sustained professional development environment must be distributed throughout a community of professional practitioners of varied and wide experience and skill, who accept responsibility for building and maintaining the environment. In other words, the model must encourage a high degree of ownership and commitment, thereby bringing about participation. Professional development is not something that others “do” to teachers; rather, it is part and parcel of their individual and collective professional identity. Contributions to the system (e.g., new video episodes, revisions to system design, rules for participation) arise from the participants—a unique partnership of in-service teachers, pre-service teachers, teacher educators, researchers, technologists, etc.

A second factor that we think will drive teacher ownership and participation is the previously mentioned change in Indiana teacher licensure policy. We are confident that the requirement to include a teaching video in each teacher’s licensure portfolio will reinforce the desire to participate in a community and contribute examples of teaching practices for discussion. Finally, the intent of the new professional teaching standards to actively evaluate teaching practices, along with the discipline-based standards, will serve as a major factor in determining the practices teachers will want to see and share. From a research perspective, we evaluate the degree to which establishing the culture of sharing in the pre-service and early years of teaching and the linkages to

professional associations will provide the foundation for sustaining continued participation in the community.

PRACTICAL CONSTRAINTS AND OPPORTUNITIES

One practical concern is incorporating and integrating the professional standards and guidelines that define much of the American teaching practice. In 1994, Indiana adopted the Interstate New Teacher Assessment and Support Consortium (INTASC) performance-based standards model (1991). INTASC is a program to enhance collaboration among states interested in rethinking teacher assessment for initial licensing as well as for preparation and induction into the education profession. Several of these standards impinge directly on the ILF. Standard nine of the Professional Standards for the Mathematics Specialist Credential states, “teachers of mathematics are reflective practitioners who continually evaluate the effects of their choices and actions on others . . . and who actively seek out opportunities to grow professionally” (Indiana Professional Standards Board, 1996, p. 12). Thus, every teacher working under INTASC is mandated to seek out opportunities for reflective professional growth. Further, teachers are asked to “model improved practices” and “draw upon . . . learned societies as supports for reflection, problem solving, new ideas, sharing experiences, and participating in workshops and courses related to mathematics” (1996, p. 12). Clearly, INTASC urges full participation in the wider community of teaching practice.

Another factor influencing design of the prototype is the change in Indiana teacher licensure policy. Under the new policy, graduates are given an interim teaching license. During the two years after graduation, teachers must develop a portfolio demonstrating their competency, with a permanent license awarded based on the quality of that portfolio. A video of teaching is a key element of that portfolio requirement. This new requirement creates a need to participate in a community and contribute examples of teaching practices. The current demands for professional growth and standard-based credentialing requirements in Indiana and nationwide create pressing needs to evaluate the present situation in professional development programs and examine whether the existing programs are able to meet these needs.

The final practical concern was the teacher’s self-defined needs. To determine what teachers want in an online professional development community, we surveyed and interviewed pre-service, novice and expe-

rienced teachers. Each group answered the same questions, using a combination of written surveys and one-on-one interviews. As a whole, the respondents spoke of needing to network with their peers and with more experienced teachers, and to some extent university faculty. The pre-service teachers interviewed and surveyed expressed a strong interest to work more extensively with senior teachers. Novice teachers found that working with their peers and with their “mentor” teachers (senior teachers assigned to work closely with first-year teachers in this state), proved the most important channel for professional development. Experienced teachers also rated working with peers as a vital part of their professional development, but in the case of these senior teachers, networking at professional conferences and workshops superseded in importance networking at the school site.

Similarly, the teachers surveyed wanted teacher resources to be provided by a professional development tool. Again, the nature of those resources differed between the experience groups. As mentioned previously, resources for workshops and conferences were most important for senior teachers. Novice and pre-service teachers looked for resources to meet their daily needs, such as lesson plans, unit plans, and background research on specific topics. A minority of respondents stated the need for special resources that might be difficult for a school site to provide, such as assistance with resources for special education students, links to teachers organizations, and assistance with legal issues.

A final theme consistent across all experience levels was that of connecting the professional development activities to “real” classroom experience. Experienced teachers talked of ensuring the transfer of new ideas to real classrooms. Novice teachers needed a virtual, human guide, and live interaction with teachers via chat or e-mail. Pre-service teachers wanted discussions with other teachers and direct feedback on classroom issues and experiences. Thus, incorporating community, resources, and direct connections to actual classroom experiences, became a priority for the design project.

THE INTERNET LEARNING FORUM

With an understanding of the theoretical research and the practical concerns drawn from analyzing the teaching contexts, as well as the fundamental principles for the ILF, a description of the preliminary product of the ILF prototype is in order. To design the site, three task groups were formed: content, video, and interface. The content team fo-

cused on issues of inclusion for such items as lesson and unit plans, professional and subject area standards, teacher and student reflections, and which clips of lessons to highlight. The video team dealt with aspects regarding the legal issues and permission forms required for videotaping children and publishing these clips on the Internet. This team was also responsible for all of the technical aspects behind capturing video in the classroom, digitizing the videotape, and then making it available on the Web through the use of video-streaming technology. The interface development team was responsible for developing the design and navigation of the site.

The heart of the site is the video of classroom instruction, which is designed to stimulate discussion related to teaching and learning among teacher participants. As an initial effort, we presented video segments of four practicing teachers as they gave unscripted math or science instruction in the classroom. Content team members worked with these teachers to choose the particular video segments from their lessons and presented these with the teacher's written comments, reflection, lesson plan, and matching professional standards in the Web site.

A brief description of the site is in order. The navigation of the site is relatively simple. The home page shows a virtual school with doors to a variety of offices (see Figure 1).

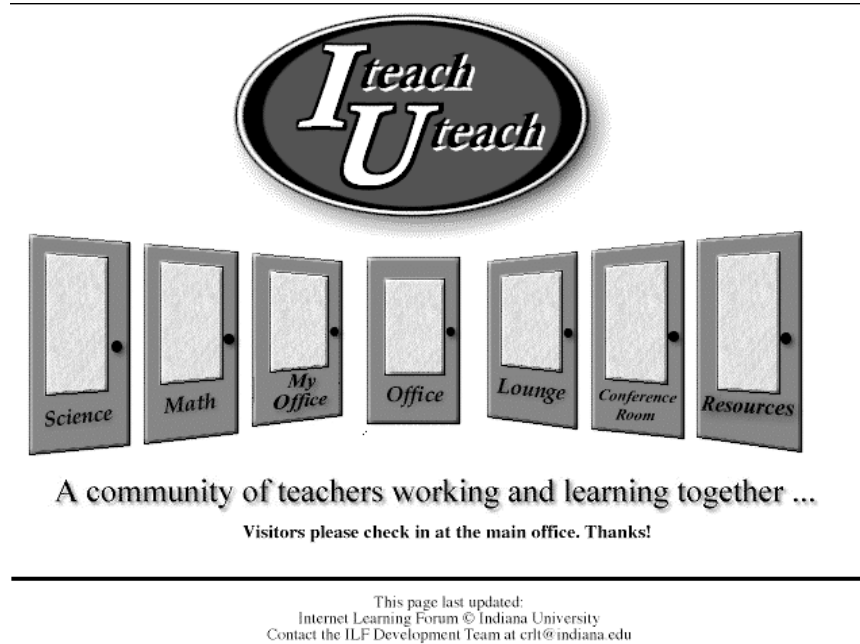
For the prototype, only math and science subject areas were included. Other administrative help can be found in the office and resource rooms. Teachers can meet and share their views in the teacher's lounge where Web-based conferencing tools are provided. Entering through either the math or science doors allows teacher participants to search for lessons by the demonstrating teacher's name, the instructional topic, or grade level (see Figure 2).

They can also browse through the video library. After selecting a classroom and lesson, participants will be taken directly to a classroom page (see Figure 3).

On that page participants can access the video as well as all of the text data for the lesson, including comments and reflections by the demonstrating teacher. As the information presented is about real classroom interactions with the demonstrating teachers working with their children, a password is required for participants to access the video image. Discussions and sharing occur on that page in relation to each video clip.

How will ILF users respond to the three fundamental community-building elements (visiting a classroom, building community, and fostering ownership and participation)? Ultimately, that is a question for

FIGURE 1. ILF Home Page



future research, but we should explore how they respond to our efforts to actualize those notions. Clearly, they will recognize the “visit-the-classroom” metaphor that situates this project in practical teaching experience and actual classrooms as an element that makes it real for the teacher participants. While our motivation as teacher educators is to provide teachers with professional development opportunities, the teachers also expressed a variety of real-world needs for their classroom teaching. Lesson plans, conference and workshop information, as well as special needs are provided for in the lesson areas, the teacher’s lounge area, and the office area, respectively, of the ILF. Additionally, we are aware that teachers are more likely to choose a single site to meet their teaching needs if the information provided is rich and comprehensive. For this reason, our teacher’s lounge is designed to include links to other sites that provide direct links to other subject area sites, as well as to sites of research institutions and foundations. Key to this learning environment is how the continual update process of site development, combined with




FIGURE 2. Classroom Selection Page

Choose a Science class to visit.

This is the Science entry way to the classrooms of the I teach U teach community.
Please choose a Science class to visit from the table below.

Search for:

Browse by:



 <p>"Properties of Tracks"</p> <ul style="list-style-type: none"> • Physical Science • Grade level 5 • Rise Paynter 	 <p>"The Y2K Terrestrial Zoo Theme park"</p> <ul style="list-style-type: none"> • Life Science • Grade level 5 • Wendy Tamborino 	 <p>"States of Matter"</p> <ul style="list-style-type: none"> • General Science • Grade level 5 • Jill Fabiano
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the immediacy of revision on the site, allows us maintain the site in ways that print documents could never accomplish. Moreover, the participants will be encouraged to add new information, share new lessons within the community, and ultimately create the most current environment for teacher resources and professional development.

The next issue of growing the community implies that we are supporting member participation and not information dissemination. Central to the design of the ILF is to establish participant structures, not “black boxed” resources. It is our belief that one cannot mandate community; instead, we view that our job is to design responsive structures that facilitate participation and are easily modifiable based on the needs of the participants. However, if we are going to encourage participation, we must provide a structure that is compelling enough to draw in participants.

FIGURE 3. Virtual Classroom Page

<p>Clip 1: "What is a variable?" (click to view)</p> 	
<p>Choose a segment:</p> <p>"What is a variable?" "Evidence" "What if we release the ball?" "Student Questions" "Discussion"</p> <p>More Info:</p> <p>Teacher Reflection Overview of Lesson Lesson/Unit Plan Resources Integration Ideas Professional Standards Discussion</p>	<p>Lesson Plan: Properties of Tracks</p> <p>This is the 2nd lesson in this unit.</p> <p>Materials: Small and large spheres, carbon paper, white paper, and a ramp, science logs, pencil</p> <p>What are some questions you might try to find answers to using these materials?</p> <ol style="list-style-type: none"> 1. 2. 3. 4. <p>When you do experiments you have constants and one variable? Can you think of one variable? If the sphere size is different, everything else needs to stay the same. If the ramp release height is different then you would need the sphere size to stay the same. Ramp height changes, two large spheres.</p> <p>Today we'll do one experiment -- everyone will test one variable -- the sphere size. (Handout sheets)</p>
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The ILF's Web-based conferencing functions have the ability to connect, for example, a teacher in a rural school—who may be the only teacher in their grade level or subject area at the school—to other teachers across the state. Additionally, the ILF classroom videos will provide newer and standards-based teaching techniques, approaches, and concepts that may be interesting to teachers throughout the state. The final issue of linking the informal community of teachers with the formal teacher education system administered by the university is inherent again in the fact that this is a university project. Teachers will be able to seek advice from professors who are online in the community. Some university instructors are already using the pilot site as a part of their pre-service teacher education courses, and plans are in the works to use an area of the site for distance education courses.

Finally, the element of fostering ownership and participation is experienced through the fact that the site is managed by the teacher participants themselves and only administered by the university. One pitfall of

traditional teacher development is minimized. Participants engage in self-exploration and an opportunity to share and build a community. The asynchronous communication within the site allows teachers to enter the site at their own convenience and meet their own needs. Also, they can reflect on their own practice and work with others who can add to the depth of that reflection.

CONCLUSIONS AND IMPLICATIONS

The iteration of the ILF is but a first attempt to create a professional development community situated in real practice and delivered via the WWW. To accomplish this task, we combined the best of virtual teacher development models, used video to situate practices, and are collaborating with practicing teachers to create their community of practice. In this manner, we have incorporated the theory and principles discussed to create online professional development for pre-service and in-service teachers.

The ILF prototype presents numerous unanswered questions for future research: What factors underlie the effective use of electronic technologies to foster, sustain, and scale a virtual community? What principles enable a community of practice to value sharing of practice and dialogue in such ways as to outweigh participation costs—time, technology access, and the sacrifice of ego attached to one's teaching? How do people learn in and from the ILF, and how is that learning reflected in the classroom? How do the ILF members structure themselves into communities and how do we promote boundary crossing? How does the group transmit to newcomers the skills, knowledge, and values that constitute being an effective teacher? The ILF research team will continue to examine and explore these issues and look forward to enhancing the understanding of professional development in higher education on the World Wide Web. Currently, Barab and colleagues have received a National Science Foundation grant for \$1.5 million to grow and do research on the ILF (see the current site at <http://ilf.crlt.indiana.edu>).

Darling-Hammond (1993) reminds us that the new school reform paradigm starts with the assumption that students are not standardized and that teaching is not routine. We believe that this fact holds true for professional development as well. Growth and development for teachers is not routine and should not be made uniform. Likewise, the ILF is hardly routine, and we look at it as only a beginning. We eagerly antici-

pate the comments of teacher participants and readers to guide us in enriching the project as we all develop our professional teaching community into the 21st century, and to continue to explore many of the unanswered questions and pose new ones as the community grows over the life of the project.

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REFERENCES

- Ball, D. (1996). Teacher learning and the mathematics reforms: What we think we know and what we need to know. *Phi Delta Kappan*, 77, 500-08.
- Barab, S. A., & Duffy, T. (2000). From practice fields to communities of practice. In D. Jonassen, & S. M. Land (Eds.). *Theoretical foundations of learning environments* (pp. 25-56). Mahwah, NJ: Lawrence Erlbaum.
- Barab, S. A., Cherkes-Julkowski, M., Swenson, R., Garrett, S., Shaw, R. E., & Young, M. E. (1999). Principles of self-organization: Ecologizing the learner-facilitator system. *Journal of the Learning Sciences*.
- Barab, S. A., Squire, K., & Dueber, W. (2000). A co-evolutionary model for supporting the emergence of authenticity. *Educational Technology Research and Development*, 48(2), 37-62.
- Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 18, 32-42.
- Brown, J. S., & Duguid, P. (1998). Organizing knowledge. *California Management Review*, 40, 90-111.
- Chaney, T. (1995). *Design and implementation of a constructivist instructional model to support teacher change: A case study*. Unpublished dissertation study. Bloomington, IN: Indiana University.
- Chaney-Cullen, T., & Duffy, T. (1998) Strategic teaching frameworks: Multimedia to support teacher change. *Journal of the Learning Sciences*, 8, 1-40.
- Chism, N. (1985). *The place of peer interaction in teacher development: Findings from a case study*. Paper presented at the Annual Meeting of the American Educational Research Association (Chicago, IL, March 31-April 4, 1985). ERIC database access number: ED262469.

- Darling-Hammond (1993). Reframing the school reform agenda. *Phi Delta Kappan*, 74, 752-61.
- Darling-Hammond, L. (1996). The quiet revolution: Rethinking teacher development. *Educational Leadership*, 53(6), 4-10.
- Duffy, Thomas M. (1997). Strategic teaching framework: An instructional model for a constructivist learning environment. In C. Dills & A. Romiszowski (Eds.), *Instructional development state of the art. Volume 3: Paradigms*. Englewood, NJ: Educational Technology Press.
- Greeno, J. G. (1998). The situativity of knowing, learning, and research. *American Psychologist*, 53, 5-26.
- Indiana Professional Standards Board (1996). *Draft standards for teachers of mathematics*. Indianapolis, IN: Indiana Professional Standards Board.
- Interstate New Teacher Assessment and Support Consortium (1991). *Model standards for beginning teacher licensing and development: A resource for state dialogue* (Working Draft). Washington, DC: Council of Chief State of School Officers.
- Lagache, E. (1993). "Diving" into communities of practice: Examining learning as legitimate peripheral participation in an everyday setting. Paper presented at the Annual Meeting of the American Educational Research Association (Atlanta, GA, April 12-16, 1993). ERIC database access number: ED360387.
- Lambdin, D., Duffy, T., & Moore, J. (1997). Using an information system to expand preservice teachers' visions of effective mathematics teaching. *Journal of Technology and Teacher Education*, 5, 171-202.
- Lave, J. (1993). Introduction. In J. Lave & S. Chaiklin (Eds.), *Understanding practice: Perspectives on activity and context* (pp. 3-34). New York: Cambridge University Press.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. New York: Cambridge University Press.
- Reynolds, E., & O'Neil, M. (1997). Exploring teacher education through video. In S. Cornwell, P. Rule, & T. Sugino (Eds.), *Proceedings of the Annual JALT International Conference on Language Teaching and Learning* (23rd, Hiroshima, Japan, November 1996), 48-52.
- Ruopp, R., Gal, S., Drayton, B., & Pfister, M. (Eds.) (1993). *LabNet: Toward a community of practice*. Hillsdale, NJ: Lawrence Erlbaum.
- Seely-Brown, J. (1998). Internet technology in support of the concept of "communities of practice": The case of Xerox. *Accounting Management and Information Technologies*, 8, 227-236.
- Smylie, M. A., & Conyers, J. G. (1991). Changing conceptions of teaching influence: The future of staff development. *Journal of Staff Development*, 12(1), 12-16.
- Willis, E. M. (1997). Technology: Integrated into, not added onto, the curriculum experiences in pre-service teacher education. *Computers in the Schools*, 13(1/2), 141-153.

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