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The Path to Teacher Leadership in Educational Technology

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The Benton Foundation's report, *The E-Rate in America: A Tale of Four Cities* (Carvin, 2000), found that with federal funding, network infrastructure deployment accelerated and Internet access significantly expanded in the schools that were investigated. Yet, even with the infrastructure in place, critical "human questions" must still be addressed. Reporting the results of a recent study of schools in Silicon Valley, California, Cuban and his colleagues stated:

> Most policy makers, corporate executives, practitioners, and parents assume that wiring schools, buying hardware and software, and distributing the equipment throughout will lead to abundant classroom use by teachers and students and improved teaching and learning…We found that access to equipment and software seldom led to widespread teacher and student use. Most teachers were occasional users or nonusers. When they used computers for classroom work, more often than not their use sustained rather than altered existing patterns of teaching practice. (Cuban, Kirkpatrick, & Peck, 2001, p. 813)

Cuban and his colleagues believed that this pattern of computer use was due to contextual factors within the high school environment rather than individual factors of hostility to technology, inertia, or passive resistance

(Cuban et al., 2001, p. 827). Our own research (Sherry, 1997; Sherry, 1998; Sherry, Tavalin, & Billig, 2000) indicated that the "slow revolution" process is due to a combination of technological, individual, organizational, and instructional factors—not simply to lack of access or time, or to individual perceptions such as lack of relative advantage, obvious benefit, and the like. As Rogers (1995) pointed out, diffusion of innovations takes place within a social system. From a systemic view, "Fundamental changes would need to be made in how schools are organized, how time is allocated, and how teachers are prepared." (Cuban et al., 2001, p. 830).

LIMITATIONS OF EXISTING ADOPTION MODELS

Researchers have been studying the process of adopting new innovations for over 30 years. Two of the most popular adoption models are Rogers' (1995) *Diffusion of Innovations* and Hall and Hord's (1987) *Change in Schools,* which described their Concerns-Based Adoption Model (CBAM). Our research has shown that these traditional models must be extended and modified (Batty, Dobrovolny, Myers, Ryder, Sherry, & Wilson, 1999; Wilson, Ryder, McCahan, & Sherry, 1996; Wilson, Sherry, Dobrovolny, Batty, & Ryder, 2001). Systems Theory (Senge, 1990), Activity Theory (Engestrom, 1996), and Information Ecologies (Nardi & O'Day, 1999) can offer some refreshing alternative viewpoints that can be used to develop models that have both explanatory power and predictive power.

There are two fundamental limitations to the traditional adoption models. First, an educational system is not a single social system. It is a decentralized organization with embedded systems consisting of teachers within classrooms, within schools, within districts. According to the traditional view, "A social system is defined as a set of interrelated units that are engaged in joint problem-solving to accomplish a common goal" (Rogers, 1995, p. 23). However, in Schein's framework of organizational learning,

> Every organization has various subsystems whose function it is to deliver the products or services that derive from the organization's basic mission or primary task. These subsystems develop their own cultures and it is those cultures that often become the primary target of organizational transformation efforts. (Schein, 1999, p. 4.)

The organization also contains virtual communities that may include students, preservice teachers, inservice teachers, technology mentors, curriculum coordinators, content experts, and administrators, all of whom fall somewhere along a spectrum ranging from "novice learners" to "expert learners" (Carroll, 2000). Second, traditional models ignore external factors such as the rapid, worldwide evolution of the Internet and the presence of change facilitators within a distributed, networked community.

Any new model must deal with the complex interrelationships among the many key actors and parts of the system. It must provide a framework and language for describing many simultaneous interactions. It must represent the flow of resources in a system over time. And finally, the model must make visible both the patterns and the extent of involvement of the various players and parts of the system.

LEARNING/ADOPTION TRAJECTORY VIEW

In our studies of the Boulder Valley Internet Project (BVIP) (Sherry, 1997, 1998), a district-wide technology training program sponsored by the University of Colorado at Boulder, the Boulder Valley School District, and the National Science Foundation, we developed a professional growth model by which teachers progress through a series of four stages at which they learn to use instructional technology (IT) to enhance teaching and learning, namely, (a) teacher as learner, (b) teacher as adopter, (c) teacher as co-learner, and (d) teacher as reaffirmer or rejecter. We called this the Learning/Adoption Trajectory.

As the field of educational technology advanced, as we tested our model on a statewide Technology Innovation Challenge Grant (Sherry, 1998), and as expectations for how teachers performed their work also changed, our model evolved as well. Table 1 presents our current view of the Learning/ Adoption Trajectory, together with effective strategies for moving teachers along the path to leadership in technology infusion (Sherry, Billig, Tavalin, & Gibson, 2000, p. 45.)

> The first two stages in this process are rather straightforward. Once teachers were informed about promising educational practices using technology in the classroom, and once they were given the opportunity to engage in professional development that matched their needs, the learning process began. As teachers experimented with multimedia workstations and telecommunications, they expressed a set of personal and task management concerns, such as, "Can I handle this?" "Will it make my job easier?" "Will I be replaced by a computer?" At this stage, they needed ready access to computers that would support the instructional activities they wished to try out in the classroom. Ongoing, sympathetic technical support and mentoring by trusted peers were critical facilitators.

Given adequate training, mentoring, access, and technical support, teachers tend to be more willing to move to the next phase at which they become colearners and coexplorers with their students. This was verified in conversations with university faculty members and K-12 teachers during three training institutes funded by a Preparing Tomorrow's Teachers to Use Technology (PT3) grant at California State University, Fresno. However, such risk-taking required a fundamental shift in their perspective as instructors. Technology proponents often talk about teachers shifting their role from the "sage on the stage" to the "guide on the side." But as the former director of the PT3 grant initiative pointed out in his keynote speech at the 2000 annual conference of the Society for Information Technology and Teacher Education (Carroll, 2000), the required shift is far greater. Teachers need to become "expert learners" along with their "novice learners" in a community of learning and practice that spans the classroom, the school, the district, and the entire online community.

At this stage, some teachers believed that they were losing control of the instructional process and that their role in the classroom was being compromised by the new generation of technology-savvy students. Many teachers became "rejecters" of instructional technology at this point, saying, "I tried it, and it didn't work for me," or "It increased my work load substantially," and similar statements. For example, an *Education Week* researcher quoted a teacher who considered himself a latecomer to the digital revolution as saying, "You've got to get the basics down before you even think of infusing technology into learning" (Bushweller, 2001, p. 32).

In contrast, other teachers who became "reaffirmers" began to develop a greater awareness of intermediate learning outcomes. They began to create

new ways to observe and assess impact on student products and performances and to disseminate exemplary work to a larger audience (Sherry, Billig, Jesse, & Acosta-Watson, 2001). As the boundaries of the classroom became more transparent to the reaffirmers, they also began to take a more systemic view of educational technology and its relationship to the educational organization of which they were an integral part.

Expanding the Learner/Adoption Trajectory

Through our work with The WEB Project, a fifth stage—"teacher as leader"—emerged (Sherry, Billig, Tavalin, & Gibson, 2000). In the teacher-leader stage, experienced teachers expanded their roles to become active researchers who carefully observed their own practice, collected data, shared their improvements in practice with their peers, and taught new members of their virtual learning community. Moreover, their skills became portable. Portability, or "job mobility," is a double-edged sword that deserves further explanation.

Miles (1983) studied institutionalization of educational practices in high- and low-institutionalizing sites. Whereas career advancement motivation (the genuine desire of professionals to move on to new challenges) stimulated professional growth, it could also lead to portability, which posed a threat to institutionalization of an innovation at a local site by destabilizing both the program staff and the key leadership. "Working relations between administrators and teachers had to be clear and supportive enough that the pressures and stresses of incorporating something new could be managed together" (Miles, 1983, p. 19). Billig (2001) suggested that finding a way to fund a permanent staff position for such teacher-leaders helps dedicated staff keep a project "on the radar screen" and may buffer an educational institution against the threat of teacher portability.

Testing the Learning/Adoption Trajectory in Higher Education

In her thesis, Hagenson (2001) provided an independent test of the Learning/Adoption Trajectory by investigating the integration and diffusion of instructional technology into teaching by college of education faculty at a

land grant midwestern US university. Her results showed that the level of expertise (or stage) most representative of faculty in her study was the "teacher as adopter" stage, which indicated that the faculty members were incorporating technology within the classroom in various ways. They learned about technology by collaborating with someone in the technology field, by collaborating with someone who purports to be a teacher-leader, or by personal learning experiences. She also found that faculty sometimes skipped stages if they were extremely innovative, indicating that learning and utilizing technology was an ongoing process that continued to evolve every day with each new idea and was not a linear, one-dimensional process (Hagenson, 2001, p. 55). She also espoused a systemic view of technology integration:

> In integrating adoption within the society, the diffusion of instructional technology (IT) helps to create a unified whole. If some use IT and others do not, then the society will function less effectively as a group and have the potential of…decomposing. We, therefore, must integrate adoption into the society so that the diffusion will spread throughout the group for a combined, full functioning organization. Integrated adoption of technology leads to diffusion within social systems; therefore increasing the level of education one needs to develop the skills and knowledge necessary for further involvement. (Hagenson, 2001, p. 54)

Given administrative support, incentives for conducting inservice training, opportunities for peer coaching and outside consulting, structured time for sharing new ideas and promising practices with their colleagues, and support from enthusiastic students, teacher-leaders were able to grow beyond their traditional roles. On the other hand, if the school system failed to support them in this effort, they realized their skills were portable and marketable, and they moved on, leading to the "decomposing of the group" predicted by Hagenson. This is consonant with Miles' view that "job mobility, whether driven by advancement motivation or by funding cuts, is a threat to institutionalization" (Miles, 1983, p. 19).

Where Schools Fall Short

Unfortunately, school and district technology plans generally fall short in implementing the strategies presented in Table 1. In a 2001 "Technology Counts" report, an *Education Week* researcher indicated that despite the increasing need for training and support, spending by school districts on these items continued to lag behind funding for hardware and other equipment. The author cited results from two surveys carried out by Market Data Retrieval, which found that spending for professional development increased from 14% to 17% of total school technology expenditures between 1999 and 2000, with the rest of the funds allocated to hardware and software. In a September 2000 report by the National Center for Education Statistics, "82% of teachers said they were not given enough time outside their regular teaching duties to learn, practice, or plan how to use computers and other technologies" (Meyer, 2001). Both the BVIP and The WEB Project experienced internal threats to institutionalization of technology infusion by teacher-leaders when these individuals were either transferred back to traditional classrooms or lost the ability to advance professionally through local administrative mandate.

Addressing the Challenges to Teacher Leadership

Two federal programs were instrumental in addressing this need: the Technology Innovation Challenge Grants (TICG) and the Preparing Tomorrow's Teachers to Use Technology (PT3) grants. The Teacher Education Network (TEN), a 2000 PT3 Catalyst Grant codirected by McLaughlin and Gibson, was an outgrowth of The WEB Project, originally including it as a partner. The first goal of TEN is to develop, strengthen, and disseminate web-based tools for personal learning planning and digital portfolios for preservice students. It is also developing a national web-based clearinghouse on PT3 strategies and materials that are appropriate and relevant for preservice and inservice teachers alike.

The National Staff Development Council (NSDC) and the National Institute for Community Innovations (NICI), two of the members of the TEN consortium, emphasize professional development and community-building among teacher-leaders. In their recently published document, *E-Learning for Educators: Implementing the Standards for Staff Development*, NSDC

and NICI emphasized the importance of the teacher-leaders' role as continuous learners who help to create and expand a school's context for continued professional growth; strengthen its content offerings that are needed to provide students with the best opportunities for learning; and model the processes for adult learning that reflect the processes desired in the classroom:

> Despite the increased demand for ongoing professional learning, education may continue to struggle with external forces shaping its direction unless educators themselves begin to take responsibility for shaping the learning communities within which they work and learn. To do this, it is important that they not only become informed consumers of e-learning products and services, but co-constructors of them. Their learning needs and preferences along with the needs of their students and their schools must become the driving forces in the design of professional e-leaning products and services. (NSDC/NICI, 2001, p. v.)

THE SYSTEMIC SUSTAINABILITY VIEW

What are the implications of the "path to teacher leadership" for a teacher, a technology coordinator, or an administrator serving on a school or district technology team? As part of the planning process, we may ask, "What organizational factors need to be in place to support this learning/adoption process?" At the same time we may also ask, "How can we facilitate diffusion of IT throughout the system?" Faced with both questions, a systemic view helps us understand how resources flow within an educational system, which in turn, provides us with new insights about the processes and supports needed for the diffusion of technology expertise throughout a school, district, or larger educational system.

Several theories are helpful in understanding the systemic change process. Proponents of systems theory have studied the interplay between internal and external factors that impact organizations and other systems. Systems theory has a longstanding tradition within both hard sciences and soft sciences (Bar-Yam, 1997; Bateson, 1972; Lazlo, 1972) and deals with forces and information that are transmitted through semipermeable boundaries. It is these boundaries that distinguish the classroom from the school and the district from the community in which it is based.

For systemic change to take place and to be sustained, our research (Gibson, 2000) has begun to show that three critical processes must be in place: (a) *convergence* of resources, providing a starting point for the change; (b) *mutual benefits* to those who are affected by the changes taking place; and (c) continuous, *extensive* free flow of resources and expertise throughout the system to fuel its sustainability.

Convergence

Research (Clarke et al., 2000; Gibson, 2000) has shown that *when resources converge at a certain level of a hierarchical organization*—at the classroom level, the school level, the district level, or the virtual learning community level—*that is the highest level to which an innovation will diffuse*. For example, if there are two teachers in a school who are master teachers with technology, but the principal and the school staff fail to offer administrative support, then the exemplary practices in teaching with technology will be confined to the teachers' individual classrooms. When resources converge, it is like a spark of ignition that can start an engine, if the two other systemic/sustainability conditions (mutuality and extensiveness) are right. At the other end of the spectrum, if resources, knowledge, and skills are never concentrated enough to spark something, there will only be a mild, diffused impact. For example, if most of a school's professional development resources are spread "evenly" among all staff (which appears to be equitable distribution), but individuals choose whatever they want to do with those resources, then it is highly unlikely that a unified change effort will emerge.

Mutuality

One can visualize the educational system as a set of circles nested within one another: the individual teacher, the classroom, the school, the district, and the virtual community of other teachers and mentors who share common interests. Each circle has a boundary: the walls of the classroom, the property boundaries of the school, the political boundaries of the district, and so forth. For promising practices with educational technology to diffuse beyond the classroom—in addition to the convergence of

resources at that level or above—there must be a mutual benefit for people on both sides of the boundary. Researchers have identified this condition as "mutuality," "reciprocity," and "mutual empowerment" (Clarke et al., 2000; Gibson, 2000b; Lambert et al., 1995). This condition guarantees that there will be a flow or confluence of resources and influence from one level to another.

For example, consider a school administration that rewards an exemplary teacher with release time, opportunities for professional development, and increased recognition. The teacher, in turn, may be able to offer evidence of increased academic performance by students who are using technology. The teacher may also be able to provide peer leadership to help others create curriculum-related products and performances. Since this is a "win-win" situation, that teacher's best practices are more likely to diffuse throughout the school. The engine of change is sustained by the cyclical effect of mutual benefits flowing across the boundaries in the system; however, we must constantly be aware of where the vehicle is going, lest unintended consequences outweigh the envisioned benefits. Developing skills in viewing the systemic/sustainability elements in a system helps anticipate many of those consequences.

As a system of nested elements, an educational system is a connected community in which one part of the system responds to changes that either do or do not take place at another location. The spark that starts the process by which resources converge at a localized starting point in the educational system, plus the cyclical renewal supplied by mutual benefits flowing across boundaries, provide all the motivating force needed to transform the system—to take it to a higher state.

Extensiveness

However, a third component needs to be in place for that transformation to go beyond its initial localized setting and reverberate throughout other parts of the system. The resources and mutual benefits need to flow back and forth continuously among all the parts of the system. Otherwise, an educational innovation may be confined to a small area of a school and not impact all students. We have found examples of schools where a sustainable innovation was successful, but it impacted only 6 classrooms out of

100. While cases like this achieve sustainability, such innovations are not "systemic" in the full sense of the word. To be systemic, the innovation must also become "extensive" (Gibson, 2000b). In other words, its important features need to be found and supported at several levels in *all parts of the system*. This condition can lead, for example, to the creation of "leadership density" in schools, where there are numerous acts of leadership in the setting, because supportive conditions have empowered many people to look for needs and take actions to address them. Sometimes those actions include an outstanding teacher leaving the local system to join a larger or interpenetrating system, such as a regional or national network. For example, our research found examples where shared and sustained resources throughout an entire online community led to teachers being free to move throughout the network to other schools that were more open to their vision of learning. This was evident in our research with The WEB Project (Sherry et al., 2000). In such cases, the teacher-leaders' portability of expertise and skills strengthened the larger virtual community, even while threatening the sustainability of an innovation within a local school.

Sustaining Momentum

In systems that start with a *convergence* of resources, and an extant characteristic of *mutuality*, and where *extensiveness* emerges over time, systemic sustainability is imminent. For a technology innovation to achieve systemic sustainability, it must extend the requisite resources (such as continuous access to hardware and acquisition of skills) and the mutual benefits (such as the opportunity to learn and to contribute to the learning of others) to all parts of the system. This achieves what researchers have identified as "systemic momentum" (Clarke et al., 2000). An educational system that achieves systemic sustainability of a technological improvement would include all of the teachers in all of the classrooms and all of the administrators in every school building, and it would also be evident in the district's expectations for all students.

The Dialogue View of Mutuality

The role of mutuality in the Systemic Sustainability model is sustaining a flow across boundaries, which is perhaps most readily exemplified by a

dialogue between parties. The "Dialogue View" contributes a new level of detail into the workings of mutuality in online learning communities. Reflecting back on the WEB Project serves to tell the story of two kinds of online conversations that are important on the path to teacher leadership.

The WEB Project, one of seven exemplary and promising programs selected in the US Department of Education's year 2000 expert panel process, began with two directors—Gibson and Tavalin. They and a core group of teachers had already done significant collaborative work using student work samples as the point of discussion prior to federal funding, as 28 visual arts teachers participated in personal critique sessions led by a Vermont artist. After TICG funding began, teachers then conducted action research studies, guided by a university professor and a project codirector (Tavalin, 1998), to examine how their professional critique sessions might apply to their classroom practice. While visual arts teachers were working in person, music teachers were developing an Internet-based network for their explorations in critique of student music compositions. Increased popularity of the World Wide Web allowed the music teachers to migrate from an e-mail system based on one-on-one mentoring to a collaborative, online learning environment.

The purposes of the online interactions among the members of this virtual community ultimately drove the type of conversations that ensued. Two distinct genres of conversation emerged:

1. Online Dialogue—conversations in which meaning was constructed through sharing ideas and exchanging information. This is a community-building form of conversation.

2. Design Conversations—goal-related conversations that focus on creating something new.

Through the project's portal, students were able to upload their works-in-progress and solicit feedback and critique from a virtual community of experts, engage in design conversations with them, and filter their suggestions to revise and polish their work. Meanwhile, teachers and mentors engaged in an ongoing online dialogue about the processes of moderating online conversations, shared ideas and strategies with one another, discussed problems resulting from learning at a distance, reflected on the process of assessing student work, and developed and benchmarked rubrics for scoring student products in art, music, and multimedia production. This

led to the development of professional networks and groups of students and teachers who were learning from each other.

Guidelines were eventually developed for online dialogue (Tavalin & Boke, 1998) and design conversations (Tavalin, 1998). Concurrently, extensive research was conducted to refine the concepts of online dialogue and design conversations (Sherry, 2000; Sherry, Tavalin, & Billig, 2000).

These researchers found that in dialogue there are important mutual learning gains on all sides. Students acquire more advanced content-specific vocabulary, skills, and understanding of content as they seek out their teachers to help explain the critique and constructive feedback messages they receive from the experts and mentors. Teachers also grapple with the new ideas and content of their disciplines in ways that are common to the profession but uncommon in classrooms, such as using composition as a primary avenue of teaching about the expressive power of music. And professionals gain a better understanding of the earlier stages of learning in their respective disciplines in addition to forming new relationships and friendships at remote distances. Best of all, in studies conducted by the RMC Research Corp. (2000) and Sherry, Billig, Jesse, and Watson-Acosta (2001), student academic gains in both the designated content areas and in other content areas were found as a result of student involvement in collaborative and creative work in relation to the state standards.

The "dialogue view" that spanned across school sites in the WEB Project, had planted the seeds for systemic change within its virtual community, because it exemplified Gibson's three critical features. Namely, it demonstrated convergence of resources, mutual benefit to those who are affected by the changes taking place, and an extensive flow of resources and expertise among participants. However, similar changes did not take place within the schools at which the project's participants were located, for two reasons. First, those schools marginalized the targeted disciplines of art, music, and multimedia. (There was a lack of "extensiveness.") Second, the resources were limited to project participants and not shared throughout the participating schools. (There was a lack of mutual benefits.) There had been a spark, in the form of the convergence of funds from the initial grant, but the fire did not develop within the schools. Instead, it took hold among a network of teachers across the virtual community.

However, the sustainable success of online dialogues spanning across sites and the link between the use of educational technology and increases in student achievement provided a firm base for the ensuing TEN PT3 Catalyst grant's activities. The TEN Project furthered the development of the Personal Learning Portal (PLP) and the Netseminars (online professional development experiences), both of which were developed and piloted in 2001. Both the PLP and the Netseminars were intended as tools to embed the practice of online conversations and the principles of systemic sustainability within local educational systems, as well as within virtual communities of practitioners, so that the path to teacher leadership would be supported.

FROM THEORY TO PRACTICE

In the following sections, the approaches of the PLP and Netseminar are further described to point out how these tools and practices embody the theories of the Learning/Adoption Trajectory and Systemic Sustainability models. The two kinds of conversation (dialogue and design) and the three conditions of sustainable systems change (convergence, mutuality, and extensiveness) are supported within these applications of technology.

The Personal Learning Portal (PLP)

The PLP is a web-based planner and portfolio development tool for preservice and inservice teachers. A brief description of the PLP is available on the TEN project's web site, at http://www.teacherednet.org/product.html. The tool is designed to operate as a standalone application or inside a virtual campus environment of an educational program. For example, interested universities and other educational institutions with programs in teacher preparation and credentialing may customize the PLP in whatever manner best fits their own program or division requirements.

The PLP is a combination of a collaboration tool and an electronic portfolio builder, with an emphasis on the online dialogue and design conversations between learners and the people advising them. In online dialogue, learners talk with trusted advisors about their interests, strengths, and aspirations for learning. As a result of these exchanges, the learner develops goals and an

action plan for producing evidence of learning. Then, as work samples or products are developed, design conversations help learners shape their work to conform to, address, or meet and exceed standards of performance. The PLP keeps track of the changes over time, stores the draft, intermediate, and final products, and assists learners in organizing and presenting their work. The current uses of the PLP include such applications as a performance-based assessment tool for an educational program, a team-based action planning tool facilitating remote mentoring of teams, an online critical friends group tool, and an individualized mentorship and e-portfolio tool. Using the PLP contributes to teachers' levels of technology literacy while supporting their professional development goals. It also allows for an expansion of the number and kind of advisors who are interacting with a learner, thus breaking the boundaries of classroom and program walls.

In brief, the PLP is a web-based shell for supporting a program's advising and review processes, for the purpose of facilitating and tracking the growth of expertise in learners, such as K-12 students or teacher candidates. The PLP facilitates the development of portfolios of goals and evidence linked to standards, where the evidence may be any form of work sample that can be digitized (audio, video, narratives, quantitative data, graphics, pictures, etc.) and can be evaluated by rubrics or open-ended narratives. The learner is situated in a context that is set by the educational program, with the program's performance standards and advisors already in place. A preservice program, for example, can use the online PLP to gather and critique portfolio products and to assess credential candidates' mastery of a set of competencies required for promotion, graduation, or certification through a portfolio of evidence linked to standards.

Learners determine the flow of goals and work products in a PLP. Learners are in charge of their own evolving collection of work in draft stages, work in progress, including work receiving formal evaluation, and work that has been completed. Learners can create various collections of their completed works, which may then be exported to DVD, CD-ROM, a server, or paper format. Learners decide which pieces of work are in the various stages, which advisors are being asked for feedback, what criteria or sets of criteria are to be applied during feedback, and when the work is complete. In a professional program, these kinds of decisions are often negotiated among learners and advisors to maximize both meaning for the learner and validity of the evidence to meet the program's requirements. Such a negotiation has mutual benefits for both the learner and the institution: learners gain self-

efficacy and power over their learning, and the institution gains evidence of its impact on learners. For example, a preservice program gains information and documentation about its impact on future teachers. The PLP structures the online dialogue with more power in the hands of the learner than is customary in face-to-face settings, and since that power is wielded "anytime, anyplace," learners can put more thought into the decisions and exchanges than is usually afforded them.

Prompts for statements about professional strengths, interests, and aspirations for learning and growth, as well as sets of intended learner outcomes or standards are built in by the sponsoring educational program. Learners encounter these prompts in surveys that reside in a "self-assessment" area and as databases of standards that they can link to pieces of work, or artifacts. The learner creates a set of goals to focus short-term work products, and those products then become the focus of feedback and improvement information that the learner requests. A sample goal form includes a descriptive title of the goal, a set of standards linked to the goal, and a work plan for achieving that goal. Advisors enter into online dialogue with learners during the phase of setting goals and exploring options, and then into a phase of design conversations around individual pieces of work. Learners interact electronically with course faculty, academic advisors, content mentors, peer advisors, and others to assess their learning goals; critique their work samples relative to graduation requirements, certification, and professional standards; and strengthen their content knowledge and pedagogical skills. The "anytime, anywhere" structure of the feedback supports a convergence of opinion, assistance, and elaborative ideas—which serves both improvement goals and the requirements of validated assessments.

Currently, the PLP is undergoing pilot testing in a variety of preservice programs, inservice and teacher certification and recertification programs (including state departments of education), grade 9-12 students, training cadres such as leadership cadres for national education efforts, the National Board for Professional Teaching Standards (NBPTS) teacher portfolio program, and others.

For example, a group of New Hampshire principals who are working with the state's PT3 project are using the PLP to develop their professional growth plans. In Lewiston-Auburn, Maine, and at New England College in Henniker, New Hampshire, groups of preservice students in elementary

school field placements and campus-based programs are using the PLP to communicate with campus professors and mentors. The University of Massachusetts (a Great Cities University) and the University of Tennessee in Knoxville (a member of the Holmes/UNITE network) are considering how to use the PLP within their programs. At its next annual conference, the National Staff Development Council (NSDC) is planning to experiment with the PLP as a way to extend the learning of the conference both before and after the face-to-face meeting and to show the utility of personal documentation of conference goals and objectives for sponsoring school officials. (See http://www.learningcentral.org and contact David Gibson at dgibson@vismt.org for more information concerning these activities.)

The NICI Netseminar

The Netseminar, first piloted spring 2001 by the TEN PT3 Catalyst grant, was a free, nominally 12-week, online professional development experience with online mentoring. Teams from several professional development schools (PDS), K16 partnership sites supporting teacher preparation and induction, participated in the Netseminar, titled "Achieving Full Partnership," and used a variety of TEN's online learning tools. The online seminar relied on assessment of products to demonstrate mastery of required competencies, rather than measuring elapsed time and testing information recall. Participants were advised that some teams could complete the learning requirements in a 6-week period, while others might even require up to 12 weeks to complete all team and individual requirements. As a result, the fluidity of the Netseminar enabled the teams to adjust the duration of the course to fit their own schedules as they submitted all required products to the moderator.

The Netseminar brings the concept of facilitated study groups or work groups into an online environment. Instead of a course model driven by a syllabus and content, the Netseminar builds conversations around the issues facing any kind of team, such as a faculty or administrative team of a school, or the leadership team of a professional development school. During the online dialogue, team issues are explored and developed into action research goals, drawing on internal as well as external expertise. During the design conversations, each team receives critical feedback on team products from experts, team members, and other colleagues. With both asynchronous

and synchronous tools, the teams can hold chats and build a documented base of knowledge. The Netseminar approach contributes to teacher knowledge and skills by building a shared understanding of the salient issues, sources of content, and the action opportunities facing their team, in a learning environment focused on drawing out and refining professional expertise. The seminar approach contributes to educational reform by offering a "problem-based, action research" model of online learning, by facilitating anytime, anywhere learning, and by directly addressing current reform issues in a team-based learning environment.

Like the PLP, the Netseminar was designed to be used inside a virtual campus environment that was hosted by the National Institute for Community Innovations (NICI), a TEN partner. The Netseminar also included features of a listserv, chat, a private journal for dialogue with the moderator, and web-based threaded discussions with e-mail notification, all of which supported the Netseminar's critical components—the online dialogue and design conversations.

The purpose of the Netseminar was to provide participating PDS sites with an online learning structure, in which team members practiced the skills of reflective thinking and active collaboration to take steps to improve their partnership and to receive feedback from others with experience in K-16 collaboration and partnership development. These features provided the mutual benefits to both the team and NICI: the teams received focused technical assistance on issues of high priority to them, and NICI had the chance to refine its Netseminar model and its online professional development model.

The roles of the individual team members were defined as historian, scientist, mathematician, essayist, and editor. Similar group methods that divided the responsibilities of a team provided a step toward extensive leadership in a team. Products were developed by each team and were related to one or more of the following categories: (a) strengthening partnership and purpose, (b) building capacity for collaboration and professional growth, and (c) expanding communication and constituency.

Structured online activities included:

- Orientation to the structure of the Netseminar, practice of associated technology skills, light readings, and first journal entries provided a convergence of initial resources.

- Adding to the resources area, inviting online dialogue about strengthening partnership and purpose, receiving feedback from the Netseminar staff, and making second journal entries.

- Facilitating design conversations to build capacity and providing feedback from the Netseminar staff on team products.

- Helping to move toward more extensive involvement by expanding communication and constituency, more feedback on team products, and distribution of program evaluation.

- Completing team products, submitting program evaluation, and posting final comments in the discussion area, providing mutual benefits to both the teams and NICI.

Teams were expected to develop a joint response to the discussion items and assignments and to add new items to the resources area based on their own experiences. Individuals were asked to complete six journal entries, in which they reflected on their own understanding about their role in their own PDS, and the nature of PDS work as it relates to teacher preparation, school change, or inquiry.

The Netseminar met the standards for effective staff development in context, process, and equity, as set forth in the NSDC/NICI (2001) standards for online professional development. It also exemplified the type of electronic learning environment espoused by NSDC/NICI:

> If educators are expected to introduce new practices into their work and to deepen their understanding of their content, their students, and teaching, the environment in which they work must support their learning—through adequate resources, strong supportive leadership, and a community that encourages collaboration and application of new learning. (NSDC/NICI, 2001, p. 4.)

Comments from the Netseminar pilot test participants were generally positive, for example:

> We collaborated on our team projects and learned a great deal through teamwork. I am hoping that this teamwork will carry over into other initiatives at the school.

> [The virtual campus technology] supported our teamwork through the group space. We used this to "listen" to each other and comment on the work we had done together. Once team discussions were posted, everyone reviewed what had been posted. Often, it energized our thoughts and discussions.

> There were many excellent discussions and sharing of ideas. All of our team assignments were truly collaborative efforts. I hope that more courses will be offered in the future and that we can bring more colleagues on board with this unique way of professional development.

A second Netseminar launched in Fall 2001 created a support environment for school teams to undertake "action research," using models such as that of Sagor (1997). The action research agenda again underscores the importance of online dialogue and design conversations about the questions, structure of inquiry, methods, and results of taking action. Bringing this agenda into the online environment is a legacy of The WEB Project and a hallmark of the work of NICI.

TEN partner NICI is also associated with the Great Cities Universities (GCU) PT3 Catalyst grant (http://www.gcu-uec.org/). Having successfully piloted its first two Netseminars, NICI is assisting the GCU technology leaders in developing and delivering virtual learning to its members. GCU competitively granted resources to some of its member institutions to create courses, Netseminars, and online learning modules. NICI is providing GCU with technical assistance to support technology integration in urban schools, as well as to increase the capacity of the 17 GCU preservice programs to prepare large numbers of future teachers in the use of technology to improve student achievement. The GCU virtual campus, which uses the same architecture as the NICI virtual campus, will provide an online learning environment that can effectively extend/expand collaboration within and among the GCU partnerships, including the delivery of GCU's core curriculum.

WHAT CAN WE LEARN FROM THIS?

These examples demonstrate that by making the challenges, intentions, and questions of learners the center of an online dialogue between all partners in both the resolution of a shared interest or problem and all learners' education, the role of the teacher or mentor is transformed. The path to teacher leadership is opened up, and the many roles along that path are available to all participants, both teachers and learners. Teachers, mentors, and conference moderators become facilitators, translators of the professional vocabulary, and expert learners working alongside novices. As a result, the relationships among all of the learners in the system form a "virtual community of learning and practice" (Carroll, 2000).

Such a community is needed to support teachers as leaders. Teacher leaders are nurtured with an ecology of information that supports diverse partners staying connected in continuous evolution and growth, and where local experience and experimentation provides guidance to a larger-scale planning and implementation process (Nardi & O'Day, 1999, p. 75). Within such an expanded sociocultural system, the challenges and opportunities on the path to expertise and leadership are shared by a broad group of players. As early 21st century educators create and evolve contextually appropriate solutions to their challenges, their vision of using educational technologies to transform teaching and learning becomes ever clearer.

> We cannot ignore the potential impact e-learning will have on the development of both preservice and inservice educators. Integrated seamlessly with high quality face-to-face staff development, e-learning can enhance learning opportunities for adults in schools. Further, educators who act early in this trend can shape the quality and use of e-learning for staff development so that it embodies the characteristics of powerful professional learning that sustains growth over time, builds productive learning communities and, most importantly—improves student learning. Educators now more than ever can take an active role in coproducing knowledge, shaping the structure of their own learning experiences, and influencing producers of e-learning to develop programs, products, and services that are responsive to the needs of educators and their students. (NSDC/NICI, 2001, p. vi.)

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Table 1

Effective Strategies for the Stages of Learning/Adoption

Developmental Stage	Effective Strategies
Stage 1.*Teacher as Learner.* In this information-gathering stage, teachers learn the knowledge and skills necessary for performing instructional tasks using technology.	Time for training; demonstrations of promising practices; ongoing professional development by peers rather than one-shot workshops by outside experts; inservice sessions that stress the alignment of technology with curriculum and standards.
Stage 2.*Teacher as Adopter.* In this stage, teachers progress through stages of personal and task management concern as they experiment with the technology, begin to try it out in their classrooms, and share their experiences with their peers.	Online resources. Help desks and other forms of readily accessible technical support. Mechanisms to deal with technical problems as they arise; in-building technical specialists; other technology-savvy teachers who can mentor new users and provide them with care and comfort as well as information. Open lab workshops at school sites to solve specific technical problems.
Stage 3.*Teacher as Colearner.* In this stage, teachers focus on developing a clear relationship between technology and the curriculum, rather than concentrating on task management aspects.	Workshops and online resources with strategies for enhancing instruction and integrating technology into the curriculum. Collegial sharing of standards integration; exemplary products and assessment ideas; use of students as informal technical assistants.
Stage 4.*Teacher as Reaffirmer or Rejecter.* In this stage, teachers develop a greater awareness of intermediate learning outcomes. They begin to create new ways to observe and assess impact on student products and performances, and to disseminate exemplary student work to a larger audience.	Administrative support; an incentive system that is valued by adopting teachers. Awareness of intermediate learning outcomes such as increased time on task, lower absenteeism, greater student engagement, and increased metacognitive skills; evidence of impact on student products and performances; dissemination of exemplary student work.
Stage 5.*Teacher as Leader.* In this stage, experienced teachers expand their roles to become active researchers	Incentives for coteaching onsite workshops; release time and other semi-permanent role changes to

who carefully observe their practice, collect data, share the improvements in practice with peers, and teach new members. Their skills become portable.	allow peer coaching and outside consulting. Support from an outside network of teacher-leaders; structured time for leading in-house discussions and workshops. Transfer of skills if teacher goes to another school.