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In-service education through face-to-face and on-line interaction in learning communities

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Introduction

In North America, there is a growing tendency to link education reform to school-based professional communities, and teacher education reform to university-school partnerships. The increasing diversity of school learners and the social expectations associated with school success, the knowledge economy and the so-called Knowledge Age make teaching an even more demanding and complex task. A few months ago, Quebec's Minister of Education, launched the new school curriculum with the following moving words: "Il ne faut pas en échapper un!". Our Anglophone neighbors say: "Success for all!"

To face this challenge, more sophisticated theories of learning are now available affirm Brown (1994) et Resnick (1999). But a more collaborative teaching culture (Seashore-Louis *et al.*, 1998) needs to develop (Conseil supérieur de l'éducation, 1998). Distributed leadership (Barry, 1991) and progressive expertise (Bereiter & Scardamalia, 1993) are notions that may guide professional educators seeking a new balance between transformation and social reproduction either at the school or at the classroom level.

As all of us know, information and communication technologies (ICTs) are beginning to transform the way students, in fact, all of us learn. For teachers to take advantage of better technology to support their complex task, their students must access networked computers (desktop, laptop, and now PocketPC). The appropriate use of learning technologies in our schools has become an important and urgent issue on the education agenda (see the technology plans that organizations are implementing; see Conseil supérieur de l'éducation du Québec, Rapport annuel 2000).

One assumption underlying this paper is that the preparation and ongoing professional development of teachers are crucial for any significant gain to occur using ICTs for learning purposes (Grégoire, Bracewell, & Laferrière, 1996). Envisioned as the central activity of a professional learning community at work, in-service education¹ is conceived of as more informal

¹ I thank my colleague Alain Breuleux, McGill University and TeleLearning Network of Centres of Excellence, Canada (TeleLearning NCE) for his contribution to the development of this paper.

than formal (for-credit courses). By their powerful demonstration of participation as learning in what is called a community of practice, Lave and Wenger (1991) brought substance and credibility to informal learning. When a community of practice uses electronic network and online tools, it supports and extends its activities, and connects in new ways. Lieberman and Grolnick (1996) studied teacher networks: "These networks...sidestep the limitations of institutional roles, hierarchies, and geographic locations." (p.7). With the support of networked technologies, it is our assumption that those limitations can be overcome to a greater extent.

The TeleLearning Professional Development School (TL-PDS), explained more fully in the next section, is a network of communities of learners which draws from two movements in teacher education, that of renewing pedagogy and that of renewing technology in use. It is a R & D program on Educating Educators. Telelearning is defined as the thoughtful use of online resources and tools for learning purposes. The networked-classroom-as-a-learning-community is the locus of collaborative inquiry, and network-enabled professional learning communities are designed. It is our understanding that the network structure which is unfolding is of a socio-technical nature. In other words, it is our belief that broadband networks without teacher collaboration are risky for education, whereas together they may help improve learning.

We first present a description of our process (self study²) of establishing the TL-PDS Model within our own institutions, with surrounding schools and communities, and between four sites, namely Laval University (Quebec City), McGill University (Montreal), OISE/University of T & York University (Toronto), and the University of British Columbia (Vancouver). Secondly, we submit milestones as results. Thirdly, we draw implications for in-service education, namely support for new forms of relationships among users, ones leading to extended communication patterns and ones of a different sort, and to the development of networks of professional learning communities. We welcome dialogue on the design of a comprehensive TL-PDS as a strategy for teacher education renewal.

The promise and pitfalls of the professional development school strategy

A full-fledged stand-alone professional development school (Holmes Group's strategy, 1990) is a university-school partnership where there is collaboration in pre-service and in-service education, and in research. Teitel (1993, 1996, 1997) and others have shown the potential of that idea for the simultaneous renewal of schools and teacher education, for quality clinical experiences for pre-service teachers, and for quality of instruction for school learners.

² Self studies are to be considered in light of Zeichner's observation that they have an important influence on practice in teacher education (1999, p. 12).

Goodlad also insisted (1990) on the importance of strong university-school partnerships for the sake of improving school learning. But professional development schools (PDSs) are atypical given the clashes they create with university and school cultures. Committed individuals must face numerous stumbling blocks as they develop partnerships in order to address the need for change (Abdal-Haqq, 1995), both in faculties of education, and in schools (see NCATE, 1997). NCATE is considering the existence of the learning community as the first indicator in PDS assessment. Recommendations by the National Commission on Teaching and America's Future (NCTAF) (1996)³ include professional development schools, the main intent being, however, to provide high-quality clinical learning opportunities in schools. At best, at each university, a few faculty members are willing to rearrange their teaching load in order to carry on teaching and research activities in schools (see Bullough *et al.*, 1999). At Brigham Young University where the partnership "has moved from a phase of initial euphoria to one in which the reality of the complexity and cost of the program have fully settled in", they have observed that "Faculty are tired; teachers are tired" (Bullough *et al.*, 1999, p.388). As a result, they are reconsidering their initial expectation of "profoundly affecting the educational offerings of 46 elementary schools". Instead, they now affirm that "To believe that a single university can dramatically influence a very few schools makes sense (p. 389)".

Although the establishment of strong university-school partnerships is a difficult task for teachers and teacher educators, it is now built into the new performance-based system for university and P-12 school faculty in the United States. As stated by Chase (2000), President of the National Education Association and of the Executive Board of the National Council for Accreditation of Teacher Education (NCATE), "Policymakers are searching for ways to scale up school and higher education reforms; NCATE's system is an effective strategy for achieving both reforms simultaneously." Accordingly, as of 2001, schools of education and P-12 schools are now expected to:

(...) collaboratively design, implement, and evaluate field experiences and clinical practice and ensure that candidates demonstrate the knowledge, skills, and dispositions to help all students learn. The emphasis on the partnership between the university and cooperating schools is profound, and will engender change in many current programs. (Chase, quoted in NCATE Press Release, May 15th, 2000)

NCATE is also conducting a field test in which 20 professional development school partnerships are applying a set of draft standards. This field test is likely to lead to recommendations for the recognition of PDSs as settings for clinical preparation of new teachers, continuing professional

³ We do not have such a committee or report in Canada because education is a provincial matter. Pan-Canadian initiatives are rare, and likely to involve the Council of Ministers of Education (Canada).

development, and practice-based research directed at improving the quality of education for students in schools (<http://www.ncate.org/accred/projects/pds/m-pds.htm>). In their influential book on *Situated Learning: Legitimate Peripheral Participation*, Lave and Wenger (1991) pointed to a basic contradiction during apprenticeship, that of “continuity-displacement”, and one we have been personally confronted with in our thirty-year experience⁴ in teacher education: “On the one hand, [newcomers] need to engage in the existing practice, which has developed over time: to understand it, to participate in it, and to become full members of the community in which it exists. On the other hand, they have a stake in its development as they begin to establish their own identity in its future” (p. 115). This tension is at play in P-12 schools, but also in faculties of education. Furthermore, the tension is taken to yet another depth when, as is the case with the integration of ICTs in the classroom, the established practice of teaching is being challenged by the new context in the larger community (the digital network phenomenon), when pressure from outside the school pushes for possible transformations in it (Laferrière, 1997a), and creates expectations that the “newcomers” will *lead* the realization of this new practice. Although some may see this as a problem, we don't: we consider it a clear opportunity to rethink the links between apprenticeship and leadership, with increased reciprocity (or symmetry) between both. However this requires a lot of careful design and inquiry that only PDSs can allow at this moment.

Carl Bereiter (1999), the Theme Leader on Learning models in TeleLearning NCE, addresses the two cultures within the education profession in the following terms:

One is a traditional craft culture and the other is a research culture. There is commerce between them, but each is stultified by the division, a division that does not exist in the more progressive professions. The solution, I suggest, lies in the evolution of a hybrid culture. For such a culture to emerge, the existing craft and research cultures must come together to solve common problems that require the knowledge and talents of both cultures. (Ch. 11, p. 4)

In response to this problem, Marlene Scardamalia, Theme Leader on K-12 schools in TeleLearning NCE, is putting together a Knowledge Society Network on collaborative knowledge-building and deep understanding supported by the tool that the CSILE Research Team (Computer Supported Intentional Learning Environments) has been developing using first local area networks (LAN) and now wide area networks (WAN), in K-12 classrooms (<http://csile.oise.utoronto.ca>). The TeleLearning Professional Development School Project is envisioned as a solution to the one hundred year old problem between learning in a faculty of education and learning in a K-12 school in Canada.

⁴ The author of this paper has conducted a number of pilot projects in student teaching and teacher induction, and has also thirteen years of administrative experience in the Faculty of Education at Laval University, including two mandates as Dean of Education. She currently works a couple of days per week in a secondary school.

The telelearning professional development school (TL-PDS), a design experiment⁵

Another sensible response to the challenges of creating a hybrid culture is our telelearning professional development school initiative. The TL-PDS is a PDS *cum* telelearning, and we expand here on the meaning of this dimension. Above, we define "telelearning" as *the thoughtful use of online resources and tools for learning purposes*. The telelearning dimension brings to the PDS both extended capabilities (e.g., participants can reach one another through digital interactions), and a purpose turned to the future (to define successful practices of teaching in the networked classroom).

In its first phase (1995-1999), a virtual community of support and communication for pre-service teachers was established – a third professional space. The notion of legitimate peripheral participation became central. Participants were pre- and in-service teachers, teacher educators and researchers, graduate students and other educators from a number of schools, universities, and associations. Lave's concept of "settings for action" (1988, p. 98), and its counterpart, "arenas of activity", helped initially structure the framework of inquiry: a setting is a process that occurs as the individual establishes a relation with a given arena -- arenas for activity are public and durable, existing prior to individuals and, to a large extent, out of their control. The perspective adopted on the continuities and discontinuities in the dynamic relations being established at each site and between sites built on Lave's notion of continuity of activity as an "active production of the reproduction of settings, activities, and selves" (1988, p.187).

We recognized that the decade was highly productive in terms of the renewal of theories of learning, and that the advances in the learning sciences and professional practice needed to be reflected in the design of the TL-PDS: constructivist learning principles (APA's learner-centered principles, 1993; Koschmann *et al.*, 1994; intentional learning, Bereiter & Scardamalia, 1989; knowledge-building communities (Scardamalia & Bereiter, 1996) were given high consideration. "Agreement is growing within the research community", note Lieberman and Miller (2000), "about the premises that underlie the kind of learning and the instructional practices that move students beyond (...)". They point to the following premises: 1) student learning is based on the construction of knowledge; 2) students learn to make the connection through guided practice and interaction with others; 3) students learn according to their own developmental

⁵ In the design experiment approach, researchers tackle complex interventions in classroom settings. Brown (1992) argued in favor of this approach when it comes to "setting up a classroom ethos that would foster self-reflective learning, and finally to bigger concerns with technology, curriculum issues, and assessment" (p. 143).

dispositions (...) “By teaching to each student’s ‘zone of proximal development’ (Vygotsky, 1978), educators can help them move along a continuum and not remain stuck (p. 55)”.

Learning being a fundamentally social experience, we approached professional development as a continuum⁶, connecting pre-service and in-service education, in light of activity theory and in light of the cultural-historical framework (artifact-mediated and object-oriented action, Vygotsky, 1978, 1981; individual and collective action, Leont’ev, 1978; Wertsch, 1981; cultural diversity; Cole, 1988). Engeström’s (1987) way of depicting Leont’ev’s model of a collective activity system and its distinction between activity, action and operation were instrumental in the framing of collaborative action research, our most valued avenue for professional development.

With pre-service and in-service teachers, we engaged in the development of shared understandings of learning situations integrating network technologies⁷. The computer was seen primarily as a tool (Blanton *et al.*, 1996; Marx *et al.*, 1998). Yet, we understood that it could be used as a tutor by teachers (see the *TOI* model, Laferrière, 1997b). We rearranged the relationships between the “four common places” of the educational situation (Schwab, 1973) to fit new knowledge about learning and teaching, and moved from an instructional model emphasizing “someone teaching something to someone in a given context” to one that captures the essentials of the interaction between those constituents in the following way: someone learning something with someone and/or others in a given context, one inclusive of mediating artefacts. This rearrangement reflected a more active and interactive view of the learner. What the community of learners knew as a whole became more relevant⁸. The emphasis was put on the individuals’ contributions to the collective endeavour, their roles, and the responsibility which they engage in, as well as their attitudes toward change, readiness in filling complementary roles, and the like (Borko and Putnam, 1996).

When less experienced teachers (pre-service and beginning teachers) take active roles in creating discontinuities, conceptual and practical challenges arise. One approach a TL-PDS may use is to recognize the need for activities that will provide joint definitions of what constitutes the center and what constitutes the periphery in a classroom renewed by digital networks and reformed by advanced pedagogies. When university professors begin to

⁶ As exemplified, for instance, in the guiding documents of the *Comité d’agrément des programmes de formation des enseignants* in Quebec.

⁷ Casey & Vogt (1994), Blanton *et al.* (1996), and Harrington & Quinn-Leering (1996) presented promising research results as regards their use for teacher education.

⁸ Rogoff (1995) conceptualizes social interaction as the transformation of participation, a sociocultural activity carried out through cultural tools such as language, genres of communications, material technologies, routines, and practices.

participate in classroom- and school-based activities, discontinuities also appear. The way we addressed the “culture problem” mentioned by Bereiter (1999), Goodlad (1990) and others, has been to see ourselves as learners and full participants in the network of learning communities in which symmetric learning and progressive expertise are believed achievable between school learners, pre- and in-service teachers, teacher educators and researchers. Together, we undertook to design, explore, and assess ways of using the new technologies to the advantage of educational goals.

We used telelearning tools ourselves to support our inquiries, and created “collaborative shared spaces” within and between sites (Laval University/Quebec City, McGill University/Montreal, York U/Toronto, and University of British Columbia/Vancouver): virtual visits were made of more advanced participants’ discussion forums (VGroups, a feature of Virtual-U), graduating teachers stayed connected after their undergraduate studies, seminars involved participants from different sites (Breuleux *et al.*, 1999). Collaboration unfolded with the OISE/UT/Toronto site, as our respective sites used the CSILE Team’s tools (WebCSILE, Web Knowledge Forum, Knowledge Forum), for knowledge building purposes in elementary, secondary, and post-secondary classrooms.

The first set of milestones

Responding to the social demand. At first, we had to make sense of the new technology wave (1993-1996). Each face-to-face meeting, presentation, workshop, or class included some conversation about technology. SchoolNet, an Industry Canada agency determined to accelerate the connection of Canada’s 16 500 schools to the Internet, became a major partner. Time devoted to purely technical matters was considerable. With regards to pedagogy, the discourse of people from institutions primarily devoted to distance learning, did not resonate much to campus-based learners. They had to define for themselves terms such as telelearning, and online community. Newcomers asked the same questions (*Is telelearning distance education? How can a community of learners be anything else than face-to-face conversation?*), and made similar critical comments (*This learning activity can be done without a computer.*). We helped one another gain basic technical capacity, and understand the emerging possibilities of electronic-social networks (Harasim, 1993; Bereiter & Scardamalia, 1993; Silva & Breuleux, 1994; Rhéaume, 1996; Laferrière, 1997c). The first summer camps and institutes had a strong technology component.

Learning about technology. At the technology level, the use of the expression teacher training, as opposed to teacher education or professional development, appeared somewhat appropriate. The four empirically-supported guidelines we developed were as follows:

- To put the focus on the Internet and the Web.
- To select robust and user-friendly electronic conferencing and systems (Virtual-U VGroups, First Class, Web Knowledge Forum, eGroups).
- To take an inside-out-of-the-classroom perspective (starting from within the classroom and moving outside through digital networks to encounters with sources and people in other places), to use telelearning tools in mixed mode learning situations (face-to-face and online).
- To understand support materials as addressing both technology and pedagogical concerns and issues.

Attention went first to the participants involved (teachers-as-learners), especially to their awareness of the network phenomenon, and to establishing local partnerships and raising access-to-networked-computer capacity at each setting (the context). Two R&D activities were put at the forefront: the elaboration of a shared vision of the learner in the 21st Century (Henchey *et al.*, 1996), and the completion of a substantive documentary review on the contribution of new technologies to learning and teaching (Grégoire, Bracewell, & Laferrière, 1996).

In our network as in some others, when technology problems began to decline (see Collis, 1996), more attention could be devoted to pedagogy. Innovative learning activities at PDSs began where school learners, student teachers, school-based and university-based teacher educators had high access to networked computers (learners), and where administrative support was strong (context). However, it is important to note that we are not describing a linear process here, but rather an iterative one. The notion of legitimate peripheral participation (LPP) which gives coherence to the movement going from simple to complex tasks in a community of practice is applied to describe the empirically-supported learning process that all participants seem to undergo, including teacher educators/researchers.

The second set of milestones

Using the computer-as-a-tool. Attention to the working hypothesis that information and communication technologies might contribute to the creation of functional and collaborative

communities of inquiry⁹ began to make sense to participants once the technical problems related to connectivity and access were somewhat behind them. Earlier research had indicated that, where there is reliable access to the electronic network, the creative use of telecollaborative tools, from email, to computer-mediated conferences and data bases, tends to be useful for teleapprenticeship (Levin *et al.*, 1993), including journal writing (Anders and Brooks, 1994).

Inquiring into their own effective uses of online resources and tools for learning and teaching purposes, university-based teacher educators documented how networks support, extend and transform the interaction of pre- and in-service teachers, and of teacher educators¹⁰. Themes and patterns were identified at three levels of analysis: 1) learners' interaction with knowledge and with one another (micro-level analysis), 2) the contribution of the networked learning environment in shaping emerging learning and teaching practices in a variety of educational situations (meso-level analysis), and 3) the locally conducted learning-to-teach activities that may connect with those conducted at other sites (macro-level analysis).¹¹

Adopting design principles. The iterative cycles of reflection and action led to the following twelve design principles:

- **Ease of access.** Networked computers and online resources and tools need to be accessible without losing too much time once basic technical skills are mastered.
- **Co-constitutionality.** The development of a socio-technical infrastructure relies on electronic connectivity on the one hand, and on people who value collaborative learning and knowledge on the other; one is not significant without the other.
- **Participatory design.** The development of networking capacity involves university-school administrators (partnerships), university- and school-based teacher educators, in-service/pre-service teachers, and K-12 learners.

⁹ Creative uses of networked computers go back to Merseth (1988, 1990) who pointed to the potential of the tool for beginning teachers. Bull *et al.* (1989) experimented with electronic mail and conferencing systems to support teaching internships, and implemented Teacher-LINK out of the Curry School of Education. Riel & Levin (1992) reported on successes and failures of computer networking.

¹⁰ We reported on 1) emerging patterns of connection (see Banathy, 1991) among the participants, observing extended relations among them with the support of telelearning tools (Laferrière *et al.*, 1997; 2) networked learning communities (Breuleux, Laferrière, & Bracewell, 1998); 3) online interaction in teacher learning communities and their early results (Mitchell & Wakefield, 1999, 2000; Legault, 2000).

¹¹ A parallel may be drawn here with the Telematics for Teacher Training (T3) Project, a three-year project funded by the European Union and led by N. Davis, which aimed at encouraging teachers to adopt telecommunications and new technologies in schools and universities here in Europe, and reported on the close relationship between, networking, technology, and pedagogy (<http://www.ex.ac.uk/telematics/T3/>).

- **Local grounding.** Site-based professional learning communities provide grounding. Three were established (TACT, McGill TL•PDS Net, CITE), and connected to the Knowledge Society Network (KSN). Their locus of collaborative inquiry is the networked classroom.
- **Active collaborative learning.** The networked classroom fosters active collaborative learning, rather than individual learning where students/pupils work on computers learning rote knowledge and specific skills.
- **Multi-modal social interactions.** At a local level, learners meet face-to-face, on campus or at the professional development school. Learners also meet online, pursuing locally grounded activities or geographically extended activities.
- **The classroom as-a-community of learners.** K-12 learners as well as pre-service and in-service teachers are learning in networked classrooms designed to become centers of inquiry where people, things, and ideas are valued, and where teaching for understanding is a common goal.
- **Diversity.** Learning communities are different in their local champions, circumstances, settings, tools, artefacts, cultures, and languages (in particular English and French).
- **Progressive distributed expertise.** Teacher knowledge, which is distributed among and far beyond individual participants, may be accessed. Virtual collaborative spaces provide opportunities to share resources and expertise to solve complex and ill-structured problems.
- **Collaborative reflective teaching.** The design task is that of providing a collaborative learning environment within which problem-setting and problem-solving are carried out in relation to real classroom events.
- **Collaborative knowledge building.** This refers to the design of a rich learning context within which meaning can be negotiated and ways of understanding can emerge and evolve. Student teachers engage in designing and inventing tasks such as the organization of the networked classroom, the development of learning projects, the scaffolding of online group or classroom conversations, and the creation of case studies.
- **Interrelatedness.** Knowledge objects, events, actors, artefacts, and authors interconnect in ways that add continuity and integration to student teachers' experience as they learn to teach in networked classrooms. They add as well to the experience of practitioners working in networked classrooms (see the mobius strip).

These design principles are research results in and of themselves. However, we all share a concern for cultural sensitivity and contextuality (see also McLoughlin, 1999). So the design principles reflect a culturally responsive approach to the thoughtful and effective use of network technologies: Anglophone and Francophone cultures co-exist, and the different models of implementation of the three basic dimensions of the professional development school strategy that

are developing also evidence contextuality as will illustrate the following descriptions of those models.

TACT is primarily a francophone community of inquiry based at the Laval University/Quebec City site. Its most advanced, authentic context integrating online activities is a school-within-a-school program (PROTIC) involving 8 classrooms (240 junior high and high school students), located in a large, secondary school 6 miles from Laval University's main campus. Each learner has a laptop, connected to the Intranet and the Internet, at school and at home. That PDS is part of a large network of over 150 associated schools where nearly 2000 student teachers registered at Laval U do all their field experiences and practica. About 40 pre-service teachers go to this school each year, and half of them interact with the PROTIC classrooms -- from observation hours to four-day a week practice teaching during a fifteen-week period. One of the researchers is the university-based teacher educator investing an average of two days per week in the school.

TACT is also the acronym of the interactive Web site named Technology for Advanced Collaborative Teaching¹² dedicated to supporting pre-service teachers, communications and collaborations between them, and with teachers, teacher educators and other professional educators. Given the agenda of change that networked learning entails, "pedagogical tact" (Van Manen, 1991) is a guiding principle. "At the basis of tact is a certain thoughtfulness or mindfulness that animates tactful behavior (...). Tact requires that one can 'read' or interpret social situations for what actions or words are appropriate" (p. 147). The TACT website, the Virtual-U platform, and Knowledge Forum support the activities of those student teachers (information-gathering, topic discussions, project-based collaborative learning, collaborative journal writing¹³ (early field experiences), collaborative reflective practice (student teaching), and other collaborative knowledge building activities such as case-study writing; the pre- and in-service teachers report feeling part of a larger community of learners (TACT), and have developed a sense of being co-researchers (see Breuleux, Laferrière & Bracewell, 1998; Legault, 2000; Laferrière, 2000; see <http://www.tact.fse.ulaval.ca>).

In Western Canada, **CITE** is a networked community of inquiry at the University of British Columbia (UBC) where Gaalen Erickson¹⁴ and colleagues are also working primarily with pre-service teachers (<http://www.educ.ubc.ca/courses/cite>). The first phase of the research design

¹² The French translation of what TACT means in French reflects cultural sensitivity and contextuality: *TeleApprentissage Communautaire et Transformatif*.

¹³ Laffey, Musser, & Tupper (1998) developed a tool for journal writing.

¹⁴ G. Erickson wrote, with P. Grimmett an influential book, *Reflection in Teacher Education* (1988).

involved using communications' technology to create a structure that helps integrate program components and connect student teachers and university and school-based teacher educators involved in these different program components. For example, course documents, schedules, events and assignments are published on a web-site and all program participants have access to this material. The second phase of the research involves the design of specific pedagogical practices using web-based and hypertextual media. Examples of these practices include the use of on-line discussions, contributions to electronic journals and web-based presentations and assignments. Both the design and analysis of these practices focussed on two related ideas: 1) the degree to which the technology can be used to create lines of communication that change the pedagogical relationships between and among student teachers and teacher educators, and 2) the degree to which the technology can be used to assist student teachers to become members of academic and professional communities and to make links between the ideas developed in these communities. Three key and related ideas emerged from their study:

- The technology can be used to extend the audience for student teachers' writing. An extended audience can help make work purposeful. In other words, student teachers' writing was not just a display of knowledge to be read by one instructor. They were writing for other students, for professionals in the field and academics. Thus, student teachers were learning the language of professional and academic communities and positioned themselves, with varying degrees of authority, in the discourses associated with these communities.
- Links can be made between people, texts and ideas across time and place. Participants were able to engage in a form of collective and collaborative inquiry by building on existing resources and on each other's ideas. They tested and calibrated their ideas with other students and teacher educators. In this respect, student teachers and teacher educators were able to extend the type of supports they drew on to support the ideas they were developing. This experience had the effect of changing pedagogical relationships in the classroom and creating new pedagogical relations outside the classroom. It also made possible considerable face-to-face dialogue between program participants.
- The act of writing becomes part of the process of inquiry. There is the potential for immediate feedback on the writing and the 'permanence' provides a starting point for on-going reflection (Mitchell and Wakefield, 1999, 2000).

In the Montreal area, educators in the **McGill TL•PDS Net** built on the learning organization and school renewal literature, as well as on a partnership approach. Colleagues Norman Henchey, Alain Breuleux and Edward T. Wall (McGill) showed strong educational leadership in the development of a pan-canadian vision statement that put forward the idea of interconnected learning communities (Henchey et al., 1996). At the local level, they are developing a practical understanding of on-line discussion and information tools. For example, 70 student teachers and practicing teachers in the McGill TL•PDS Net have engaged actively in web-based electronic discussions during, and following, the 1999 Summer Institute: they have exchanged close to 500 messages starting in August and up to November, 1999. The messages

served a variety of purposes such as information sharing, interpersonal support, team building, and knowledge building. These educators also are learning in practical and experiential ways how on-line knowledge-building communities are formed, and what purposes can be achieved by such communities. For example, teachers in three schools of the McGill TL•PDS Net created, and are monitoring, their own on-line groups for students and/or colleagues. Therefore, there is an emerging practice of on-line collaboration that extends learning in powerful ways, but most importantly there is a growing ownership of the tools, with an associated sense of efficacy on the part of the teachers. However, while technology is precipitating new practices, it is also an obstacle in the sense that the lack of awareness of the network phenomenon and basic ICT skills prevent competent teachers from using the networked computer in their teaching.

The McGill TL•PDS Net has established a design team composed of a cross section of teachers, student teachers, and faculty members; through meetings and on-line discussions they are developing the next iteration of the Phase I and Phase II Summer Institute for returning participants in August 2001. Phase II allows practicing teachers who have already achieved a certain familiarity with digital networks in their class to develop advanced uses of the technology. These advanced uses concern mostly: a) achieving a more systematic integration of ICTs in the new reformed curriculum¹⁵, b) using ICTs to support advanced pedagogies such as collaborative knowledge-building and, c) teachers becoming leaders on issues of ICT integration in their school or school board. The research team is expanding to include more participation by practitioners; one current project involves collecting and assembling a series of "cases", based on the experiences of lead teachers, and preparing a case-discussion web-site for the on-going interpretation of emerging practices. Such activities are contributing to the development of a community of interpretation, and point to "settings for action" where participants can gather (on-line and face-to-face, see <http://www.education.mcgill.ca/olit/institute>).

Through their previous studies, Carl Bereiter, Marlene Scardamalia and Mary Lamon (OISE/UT, Toronto) demonstrated the power of notions such as **knowledge-building communities**, progressive expertise, and progressive discourse (Bereiter & Scardamalia, 1993). These notions influenced the telelearning tools they develop; these tools are now making their way into pre-service teacher education programs, and professional development activities (at OISE/UT, at Laval U, at UBC, at York U, and at McGill U). At OISE/UT, the research team works in school-based classrooms experimenting on computer-supported intentional learning environments (see the concept of knowledge-building communities (<http://csile.oise.utoronto.ca>)).

¹⁵ This refers to the specific local context of the curriculum reform engaged by the Quebec Ministry of Education (see http://www.meq.gouv.qc.ca/virage/m_ques_rep.htm).

Virtual and on-site visits involving Quebec teachers began last year. For two consecutive years, Knowledge Forum Summer Institute clearly demonstrated that social and geographical distance is reduced when researchers and teachers want to meet over issues of mutual concern. Bereiter (1999) suggested that *teaching for understanding* is a problem that may have potential for fusing the traditional craft culture and the research culture cultures. Their own attempt at such fusion is through the Knowledge Society Network (KSN, see the databases being demonstrated at the following URL address: <http://csile.oise.utoronto.ca/demo.html>).

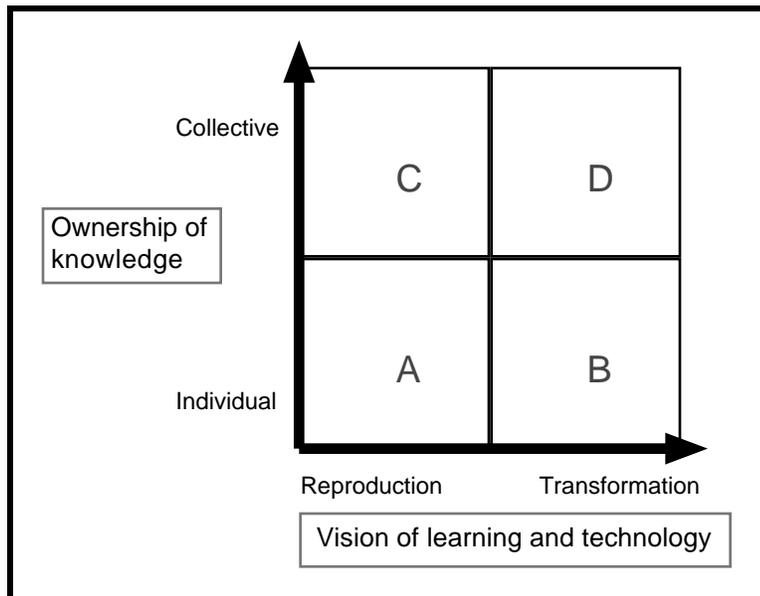
The third set of milestones

Identifying obstacles to teaching for understanding. The teach-for-understanding approach (Bereiter, 1999) is a promising alternative to the teacher-centered classroom, but teachers' deep understanding of the approach, its sustainability and scaling up are major issues¹⁶. As Cuban pointed out (1986), new technology waves go by, and the teacher-centered classroom remains the favorite when it comes to maintaining order and dispensing large amounts of information. Factors that support the status quo are: lack of access (equipment), and lack of administrative support (e.g., technology integration plans, including time release for basic technology training, pedagogically-oriented professional development, and students' learning projects). When teachers consider the risks associated with classroom organization and management, the results of standardized testing as well as the lack of administrative support and access, technology integration does not appear to them to be very cost effective. Therefore, unless the teach-for-understanding approach, or any other instructional approach that takes advantage of network technologies, demonstrates convincing learning outcomes (e.g., Lamon *et al.*, 1996), governing bodies are unlikely to include higher-thinking and social skills in exit-performance expectations, or to reallocate resources for equipment and professional development (Bracewell *et al.*, 1998). Constructivistically-minded teachers more than others see the Internet as adding value to classroom processes (Becker & Riel, 1999).

Inquiring into mental representations. Our inquiries into the value of network technologies (or digital networks) for educators of educators, professional educators and educators to be, give us plenty of opportunities to better understand the relationships between knowledge, learning and teaching. Figure 1 captures shifting representations as we ask ourselves how the activity, purpose, and people's roles may be transformed when using information and communication technologies (ICTs)¹⁷:

¹⁶ Websites supporting our collaborative communities of inquiry contain artefacts of this preoccupation.

¹⁷ See Breuleux, Laferrière, & Bracewell (1998).



Teachers-as-learners engage in collaborative reflective/critical use of information and communication technologies in the classroom. The focus of their inquiry is on telelearning pedagogies which enhance the interaction between the learners and knowledge. They are involved in the integration, application, enhancement, and communication of the resulting knowledge and skills.

Figure 1. Shifting representations of learning, technology, and knowledge¹⁸

Inquiring into networked classrooms. Learning to teach in the networked classroom through collaborative inquiry¹⁹ is the current focus of our design experiments, now that we have established functional teacher professional communities at each site. The established settings (TACT, CITE, McGill TL•PDS Net) all have networked classrooms at the elementary, secondary or post-secondary level, and are the locus of our collaborative inquiries. We envision classrooms as communities of learners that interconnect, and move slowly in this direction.

Documenting inquisitive activities about learning and knowledge in networked classrooms. We envisage this third set of milestones to later reflect the move to more inquisitive activities about the nature of learning and of knowledge into the context of the networked classroom. As a consequence of the learning process in a TL•PDS, the tension between a view of telelearning as primarily about tools and a view of it as primarily about pedagogy allows participants to progress towards gradually expanding views of both "tools" and "pedagogies". In fact, this dialectical tension can be seen as a series of *ripple effects* that are

¹⁸ The quadrangles in the figure (A, B, C, and D) allow researchers to characterize different communities, and professional development in terms of movements across the quadrants (e.g., from A to C, and from C to D).

causes and effects of one another at the core of the "reflective practice": awareness of the new technologies that give rise to a reconsideration of pedagogies, which in return will create affordances for new uses of the technologies, and so on. What we have achieved as milestones now give us the opportunity to tackle more substantive issues about both technologies and pedagogies, and about how we can build understandings of their inter-relations. We posit that the TL•PDS community can develop as a *community of interpreters*, engaging in activities to make sense of networked emerging practices and provide joint definitions of what constitutes the center and what constitutes the periphery in a classroom renewed by digital networks and reformed by advanced pedagogies. As communities of interpretation, we can elaborate on such epistemological issues as: the level of our knowledge inquiry, the nature and the scope of our data sources, the definition of research methods and analysis procedures, and what constitutes evidence in ill-defined domains. Having established a consistent epistemological corpus, we can then try to define and explain results obtained in the TL•PDS research project. The telelearning dimension brings to the core of our inquiry a more complete set of issues, for example:

- How desirable and feasible is the move from "teacher networks" in their face-to-face version (Lieberman & Grolnick, 1996) to their digital network version? From a design experiment perspective: How best can this move be achieved?
- How do we define successful induction and tenure processes in a profession where pedagogies and technical systems are transformed dramatically?
- What does "being digital" mean for educators: having identity and presence, individually and collectively, in the digital landscape?
- How do we provide sound principles and processes for the on-going design and interpretation of emerging practices in these new contexts?

We understand the data sources to support our inquiries as artefacts of the networked-classroom culture, as well as cultural representations of the outcomes of learners', educators', and other researchers' participation. Cultural artefacts are preserved in the form of digital images, written dialogues in online discussion forums, databases intending to knowledge building, and various students' and teachers' knowledge products.

Those outcomes constitute evidence of the TL•PDS achievements. In relation to the learners, they might include indicators of deep understanding and conceptual change in relevant academic areas, and of long-term capabilities for learning and collaborative knowledge building. In terms of the educators, outcomes might include indicators of superior teaching and leadership, collaborative knowledge building, improved capacity for joint inquiries, and of teacher professionalism. Last, but not least, our TL•PDS is producing knowledge concerning its own

¹⁹ This R & D project is one of the 32 projects that were granted Phase II funding (out of 56 Phase I projects) within the TeleLearning NCE.

design and providing a concrete experience about how such TL•PDS can be realized in different contexts.

Below, we illustrate emerging networked-classroom processes in junior-high school and higher education that relate to the TL-NCE's taxonomy of learning (June 2000):

- **Achievement, or impacts upon student grades.** At one specific site, all learner categories (school learners, pre- and in-service teachers, and teacher educators) made team presentations at the same major professional teacher development activity (over 2000 people), at different times and on different topics (see AQUOPS's Conference program, 2000). The quality of the arguments developed by biology students is described in Campos (2000), the expanded professional identities of graduating teachers (Benoit & Laferrière, in progress).
- **Motivation, or evidence of an active learning experience.** Collaborative action research into the networked classroom led to a publication involving pre- and in-service teachers as well as teacher educators (Partenariat Protic-Fcar-Tact, 2000). Student teachers engaged in reflective practice in such a way as to demonstrate socially distributed cognition and deep understanding of the importance of their work in renewing teaching practice with collaborative project-based learning and the support of network technologies (Benoit & Laferrière, in progress).
- **Student voluntary involvement in online discussions.** Cohorts of over 100 pre-service teachers doing field experiences within Laval University's Network of Associated Schools engaged in collaborative problem-based learning (Legault, 2000). A dozen student teachers engaged in collaborative reflective teaching of an intensive nature while doing their practice teaching (Benoit, 2000). Student teachers do virtual visits of their peers' discussion forums as a way to prepare for student teaching, and read content analysis of such forums.
- **Collaboration.** In-service teachers collaboratively share information and build upon one another's contributions as they develop materials on the WebKnowledge Forum to support basic skills learning at the different elementary schools where they teach. CollabU (Breuleux *et al.*, 1999) modeled collaborative teaching and learning among graduate students and professors from five different universities in North America. Virtual visits, including those of online collaborative spaces, developed at the Quebec City/Laval U, OISE/UT/Toronto, and McGill/Montreal sites have begun; they involve pre- and in-service teachers, graduate students, teacher educators and other researchers. Some traveled to meet others' in their own physical space.
- **Understanding of the content of the course.** The content referred to is: 1) the basic knowledge about technology and skills as well as project-based classroom organization and management, and 2) teacher learning pertaining to the use of collaborative-knowledge-building tools, and to communities of learners. The professional development model developed (Laferrière, 1997c) is being considered viable.
- **Knowledge Building.** Using the Web Knowledge Forum, junior-high school learners inquired into the concept of heat in science, and energy in geography. Using the same knowledge-building tool, another group studied the Renaissance period while studying history (Scardamalia *et al.*, 1999; Gerardin, in progress, 2000).
- **Behavioral change in students or teachers.** New patterns of communication were observed within and between classrooms (Laferrière *et al.*, 1997; Breuleux *et*

al., 1999; Mitchell & Wakefield, 2000). Secondary school students “cultivate” the notes they wrote or the illustrations they created by building upon their own, those of their teammates, and those of the learning community as a whole. During final exam preparation, students spontaneously went back to the database they had created on Web Knowledge Forum. Pre-service students’ relationship to their learning place is changing: new patterns of access are emerging as they work not only from any place where they have access to the Internet, but before and after formal course and practicum schedules (Laferrière, 2000).

- **Organizational change.** To have pre-service, in-service teachers and teacher educators using telelearning tools in an authentic way is a valuable result in and of itself. The resources that are created serve research purposes, and also become integrated into regular teaching and learning activities. For example, multiple-task classroom organization models co-exist with single-task models in secondary and post-secondary networked classrooms. Structural fragmentation is overcome when campus-based courses are linked through online activities, when a campus-based course is linked to field-based experiences, and when student teachers working at different schools go online to engage in collaborative problem solving (Mitchell & Wakefield, 2000; Legault, 2000).
- **Productivity changes through the application of online learning methods, and attitudinal change resulting from the application of online methods.** For example, collaborative reflection on action was found to be more stimulating than individual journal writing for reflective purposes (Legault, 2000), and students and supervisors mentioned they wrote more than those who did individual journal writing. The networked classroom also improves opportunities for inquiry because of the important text that it makes available (mostly in digital form) from the online productions, web projects, databases, forums, etc. (Breuleux & Laferrière, in progress).

To gather evidence such as the above, we are developing collaborative analysis processes, methods, and tools. We view the analysis of data sources as an ongoing collaborative process of interpretation supported by digital information and tools. Intranets are particularly adequate for interpretation because they allow practitioners and researchers to share digital images and discourse built in the networked classrooms. They also allow them to underline aspects that make sense to members of the interpretation community (or that puzzle them), and to construct discourse and additional implications from such joint inspection of the data. The collaborative interpretation involving practitioners and researchers reduces the usual problem of dissemination of results, where the translation into practice of new knowledge emerging from research is problematic. In our model, the explanation of results is facilitated by the fact that the results already are "in practice", and that the authors of the results include practitioners. It is at this specific point that we see hope for the emergence of a hybrid culture of teaching and research.

The idea of connecting apprentices and tenured educators in a context that promotes reciprocal teaching (beyond the "practicum", in which the centre is clearly occupied by the

tenured, mentoring teacher) has existed before, but was it only supportive technology that was lacking. A more symmetric arrangement and reciprocal affordances would be key features of network-enabled teacher learning communities and communities of practice.

Implications for in-service education

While computers are rolling into schools and classrooms as well as into private homes and companies, campus-based teacher educators' response might be to first recognize the changing social context: learning requirements are on the rise, and traditional teacher-student(s) patterns of interaction called into question. In North America, faculties of education are expected to take a leadership role (technology planning, curricular integration, and performance-based assessment). Thus, professors must seek special opportunities to gain knowledge and skills. Building on what we have learned up to now in developing the McGill TL•PDS Net, CITE, and TACT, we suggest addressing technology training and pedagogy as the two faces of the same coin.

On a daily basis, however, as in the case of school teachers, it is through informal learning with colleagues and students that progress may be made²⁰. Thus, one's community of practice may play the most instrumental role. I am very grateful to my colleagues and students, from Laval and from other sites, for what I learned from them when it comes to technology.

On the other hand, teachers-to-be or beginning teachers wanting to explore alternatives to the transmission model of teaching are likely to find minimal help and even resistance in a traditional school setting. The community of practice at work has been influencing student teachers, beginning teachers and experienced teachers wanting to renew their teaching with the support of ICTs or through other means. (See also Wideen, Mayer-Smith, and Moon, 1998). Thus, belonging to a teacher network may be key for related professional development.

Within our Network, inquiries into designing thoughtful and effective uses of information and communication technologies led to the adoption of an inside-out-of-the-classroom orientation²¹. The development of new pedagogies (one of the four goals of TL-NCE) meant our participation in the re-conceptualization of the teaching-learning process. The network-supported

²⁰ See the notion of legitimate peripheral participation (Lave & Wenger, 1991).

²¹ Pedagogical designers that adopt an outside-in-the-classroom orientation rely on the increasing interactivity capacity of today's computers to develop learning activities and courses. Content is pre-organized, not constructed. Attempts are being made to encourage education systems and school teachers to adopt the educational materials created. Research is beginning to show that student perform as well in online courses than in face-to-face ones (Wideman & Owston, 1999), and the latter perspective is likely to become more popular.

learning community became the basic unit, not the classroom and neither a specific program of study. This means that the structure provided by classrooms and programs is fading in importance as we appraise what collaborative-knowledge-building tools can do for classroom learning and teaching.

In theory and in practice, we know that telecollaboration tools alone do not create a participative classroom. We also know from experience that they may spark, support and extend teachers' pedagogical intents. For a networked classroom to become a learning community, the teacher has to demonstrate democratic leadership. Thus, a teacher must be inclined toward classroom processes that foster the sharing of power (Laferrière, 1997d) and student autonomy, and work in a school that is supportive of these values. Professional development activities that provide opportunities for reflection on personal and contextual characteristics are relevant here.

The networked-classroom-as-a-learning-community is a transitional and evolving concept, applied thus far in only a few classrooms. Education systems have developed with an older technology, and in-service education fostered the alignment between teachers' beliefs, and the cognitive, technical, and social infrastructure along yesterday's choices. For example, Vygotsky's theory became known in North America only two decades ago. Applications of his conception of learning as socially mediated, the development of telecollaboration tools, and societies' expectations for lifelong learning at work belong to the new suggested alignment.²² Related in-service education is part of the new choices that present themselves to education leaders and systems (see Doubler et al., 2000).

Applications of the networked-classroom-as-a-learning-community concept are bound to differ from site to site, and collaborative action research is encouraged. This advanced form of teacher learning requires shared vision, commitment, local support, and easily accessible online tools and resources. Participants who are willing to share their *artefacts* and learning results are contributing to the emergence of a new professional culture, one in which learning communities publish their work online (intranets and Internet), and connect with others for specific inquiries.

²² Rogoff (1986), Newman, Griffin & Cole (1989), Lave & Wenger (1991), Moll & Whitmore (1993) shed new light on learning and teaching. Pea (1993), Bereiter & Scardamalia (1996), and Harasim (1995) and others have developed technology-based tools. Riel (1992), Campione & Brown (1992), and others have made creative uses of technology in learning communities.

Conclusion

As we design the TL•PDS, we try to make sure that there is no breaking down of context into component parts, but the establishment of contexts (at each site) wherein individuals follow their own learning path, and wherein knowledge, skill, and complexity exist naturally. Perrone (1997), stressed that:

one means of creating a fully generative learning community, intellectually and socially challenging environments in which teachers' learning and commitments to the learning of their students grow deeper by the day, is for schools to be reciprocally engaged in a collaboration with colleges and universities" (p. 646).

The TL•PDS is becoming a convenient way of semi-public access to distributed expertise, a virtual place of support, communication, and collaborative inquiry. The professional development continuum, from pre-service, to beginning teaching, experienced teacher, school-based and university-based teacher educators is supported in new and powerful ways when graduating teachers and in-service teachers stay connected through online activities after a program, a course, or a workshop. Distributed leadership and expertise are ideas that begin to ripen. And, then, the exchange and sharing of visions, cultural *artefacts* of what renewed teaching might look like, become a viable alternative to the top-down or bottom-up change initiatives.

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