Networking and Distance Learning for Teachers: a classification of possibilities

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ABSTRACT Computer based communication technologies, or what could be more conveniently called networking, are bringing new possibilities into teacher education in many different ways. As with distance education more generally they can facilitate flexibility in time and place of learning, but the range of persons and resources that they can bring to the teacher's computer screen are also introducing many new scenarios into what is meant by 'teacher education'. In this review, nine cases of such new scenarios are briefly considered. Issues common to them are also discussed and the paper concludes with a suggestion of a problem area for teacher education in contemporary Europe in which currently available networking could play a particularly important role.

Setting the Scene: distance education for teacher education and networking

Motivations for Distance Delivery of Teacher Education

Distance delivery methods for teacher education are well established throughout the world. For over 30 years such methods have been in formal operation (see Perraton, 1993, for a comprehensive overview). In many countries, distance education methods were taken up in order to rapidly expand the teaching force in response to public demands for more schools and teachers. The establishment of the Open University in the UK in 1969 lead the way to legitimatization and institutionalization of distance education as a higher education delivery method; now many such formal institutions exist worldwide.

Ministries of Education have supported distance delivery methods for teacher education for at least three general reasons: (a) to reach students who could not otherwise attend traditional training, thus adding more flexibility of location to teacher education; (b) to reach students who cannot or do not wish to attend full-time training, either because of already being in the work force, or for family or personal reasons, thus adding more flexibility of time to teacher education; and (c) at least in theory, to introduce economies into teacher education by reducing overhead costs. Teacher training institutions in many countries have had similar motivations for introducing distance delivery methods, and have had the added motivation of hoping to tap a broader base of students in the process.

Thus, distance education methods have:

... been used in rich and poor countries, for experienced and inexperienced teachers, at primary, secondary, and tertiary levels, to provide a general education and to improve pedagogical skills, to overcome what was seen as a short-term crisis and to serve as part of a regular system of continuing education. (Perraton, 1993, p. 3)

Distance Delivery Technologies

Various delivery methods for distance education. Distance education is traditionally defined as an educational process in which a significant portion of the teaching is conducted by someone removed in space and/or time from the learner. Historically, most distance education, not only for teacher education but more generally, uses the method of sending printed lesson materials through the mails to the students, who work in a predominately self-study manner to complete activities based on the printed materials. Typically then the student mails the materials back to a tutor, who reviews them and provides some form of feedback, again often through the post.

However, many variations on this general model exist and are increasingly present in distance education. Some variations are organizational, in terms of intermixing some face-to-face contact among students and tutors with the self-study periods. Other variations relate to the addition of communication and interaction possibilities outside of face-to-face contact, most typically via the telephone but also through local 'study center' support in which helpful humans are available, although probably not one's tutor or classmates.

A large area of variation in the method of distance education relates to the instrumentation or learning materials being used to support distance learning. Many distance delivered programmes that started with only print as a delivery medium quickly augmented their learning materials to include audiotapes, videotapes, computer software, and learning kits of specialized equipment. Experience quickly proved that distance delivered teacher

education that relied on a single medium “were most likely to fail and to be closed down” (Brophy & Dudley, 1982).

A major need in distance education is that of providing human communication and interaction as well as well-designed learning materials. Thus communications technologies, particularly computer-based communication, or what might be called ‘networking’, have gradually become established as part of the delivery infrastructure of distance education (Duning et al,1993).

Traditional forms of communication and their support technologies. In general, in a distance education situation, communication can be thought of relative to who and how many persons are wishing to talk to each other, and if they wish to be talking at the same time. We can define this as one-to-one, one-to-many, or many-to-many patterns of communication. The communication can be synchronous, (that is, occurring at the same time and interactively for all participants) or asynchronous (occurring at different times for different participants). Thus, two persons talking on the telephone is a common example of one-to-one synchronous communication, while a tutor leaving a message on a telephone answering service for any student who calls in that he is not available but that the next assignment is due a week later than originally announced is an example of one-to-many asynchronous communication.

Broadening the range: current forms of communication and their support technologies. There are many other dimensions upon which modern communication in distance education settings can be categorized:

- We can communicate by voice or sounds (audio); by text; by pictures, graphics, video, and television; and by combinations of these. Thus modern communication technologies allow the passage of different media or combinations of media over a distance. Pictures, sounds, text, even some amounts of video, can all be converted to a digital form, which means that they can be sent from computer to computer.
- In addition, different combinations of communication technologies can be used in tandem: two-way audio connections (such as via telephone lines) can be combined with television broadcast of video, and/or with interconnected flows of computer data. Thus individual or groups can communicate via text and/or visuals and/or sound synchronously or asynchronously, depending on what communication technologies are available.
- Furthermore, the boundary between communication and information is now an overlapping one, as what one reads on one’s computer screen may be the typed message from a classmate or tutor or a document from a set of resources provided for the distance delivered learning situation or a document from a library or data base.

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- Also, the way the signals are transmitted or carried can vary, in dimensions such as terrestrial (cables and wires) vs broadcast; or bandwidth.

There are now a large number of books and other references on communication technologies and their application in distance learning; (as an excellent summary, see Van Den Brande, 1993). In this paper, we shall only select a subset of possibilities. Our focus will be on computer based communication using presently available networks, such as the Internet system, and situations in which all participants interact, at times that they choose, through direct use of a computer. Within this restriction, we will look at examples of nine different categories of such networking to teacher education.

Some Definitions

It may be useful to conclude this introduction with a list of pertinent definitions, which can be then used without further technical discussion in the rest of this paper. Further elaboration of the definitions can be obtained in resources such as Bishop (1990, pp. 69-70) from whom a number of the following definitions are taken; Collis (1993); Collis & De Vries, 1993; and Van Den Brande (1993).

Asynchronous communication: two-way communication in which there is a time delay between when a message is sent and when it is responded to.

Bulletin Board Service (BBS): a computer service that allows remote users to access a central host computer to read and post electronic messages and to upload and download files, all through a common menu.

Communication and information services for education: a humanly organized service that organizes on-line communication and information handling options and offers them in an integrated way to its users, and that generally supports the users of the service; sometimes called a 'Network' or an 'on-line service' (or many other names).

Communication technologies: technologies to transmit data communication over a distance.

Computer based communication: making use of a computer as the platform for processing and transmitting communication over a distance between computers. Similar to computer mediated communication (CMC).

Computer conferencing: allows individuals at different locations to communicate directly with each other through computers, usually about a common theme, in a way that simulates some aspects of a face-to-face meeting but with access to a database or archive of the communication that has already occurred; often with someone serving as the leader of the discussion (called the moderator), and sometimes with special computer

software (called conferencing software) which makes it easier to keep track of what has been said by the various participants.

Electronic mail (email): an electronic networking system that allows users to send and retrieve messages and files via computers.

Internet: an interconnected network of networks, extending all over the world, and supporting basic functionalities such as e-mail, file transfer, remote login and a common addressing protocol, so that a user can connect to literally millions of other users as well as thousands of collections of electronic resources and many different varieties of communication.

Network: a partly physical set of communication connections that allow wide-scale interconnectivity. 'Network' is also used to refer to humans interrelated to each other through shared interests and communication channels.

Networking: in this paper, used as a generic term to describe the use of networks for interconnectivity among persons and resources via computers.

On-line databases: collections of digitally stored information accessible via communication technologies to an individual at a remote location.

Given this framework, we can now look at examples of networking in teacher education, divided into examples for initial teacher education, for in-service education, and for on-going professional development.

Examples of Computer Communication Technology (CCT) in Initial Teacher Education

Initial teacher education generally occurs in an institutional setting, with the student teacher dividing his or her time between formal courses in the higher education institution and practical experiences in a school setting. Networking is bringing new experiences and possibilities into both these aspects of initial teacher education. In this section, we briefly discuss these new possibilities in three general categories: (a) extending and enriching the traditional course environment in the initial teacher education institute; (b) extending and enriching the communication and contact between student teacher, supervisor, and sponsoring teacher in the school; and (c) and bringing new sorts of partnerships in the initial teacher education situation.

Extending and Enriching the Traditional Course Environment in the Initial Teacher Education Institute

Enriching the traditional setting. It is now becoming typical to install a local area network with support for various sorts of communication and information services within any higher education institution, including teacher education institutions. An example from the Liverpool Polytechnic (Stanley, 1991) shows some of the benefits:

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Networks in Teacher Education Institutions: an example from the UK

- Libraries of exercise files available at all times on the network.
- All software is available at any of the 26 computers located at different places in the institution.
- The system menu provides a common and familiar user interface to the many different services and packages accessible through it.
- Collaborative working can be facilitated, through students being able to individually contribute to a common task.
- Joint and co-operative production of reports and projects.
- Opportunity to leave and receive messages. (Stanley, 1991)

Comes & Kirkwood (1992) give a similar example, from the United States. They note how students in initial teacher education can make use of the integrated information and communication resources at their institution (Ball State University) to access each other, the instructor, electronically stored library resources, external data bases and discussion groups, all from their dormitory rooms. The same communication system that extends to the students' residences also connects all the 200 classrooms at the University, so that transfer of text, voice, and/or video data can occur through the network as it is wanted during class instruction.

This example can be extended, so that the networking connects multiple sites of an institution, or so that it allows a student, via a modem, to access the network from a remote location without always having to come into the institution. Hedberg & Harper (1993) give examples of this in Australia.

Reaching new groups of students. There are many examples of CCT being used to bring initial teacher education experiences to groups of students who find it difficult or unattractive to come to traditional institutional settings. One such initiative is going on the UK, where the Open University is attracting university graduates into a distance delivered programme of initial teacher education. The first cohort of 1,000 students began in February 1994. The programme is part-time over 18 months, entirely offered by distance methods, with every student receiving not only texts, video and audio cassettes, a 'School Experience Guide', and a computer (loaned to the student during the course and then given to the sponsoring school), but also a modem as part of the programme so that regular communication can occur between the student and the OU tutor, both while the student studies at home and when the student undertakes the required practice teaching in a school. The teacher mentor in the school is also included in the computer conferencing (for information, see Banks, 1995).

The LOTE Project in Australia is another example of the use of networking to reach new groups of clients for initial teacher education. In the LOTE Project, the emphasis is on the development of modern language teachers, especially in remote areas. The same materials that were developed

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for initial teacher education are also being used for teacher in-service in the same remote areas (Hedberg & Harper, 1993).

An institutional BBS. Another example of the use of networking in initial teacher education is that of the institutional BBS (bulletin board system), facilitating student and instructor interaction through the sending and reading of messages. One such system is that of the School of Education at California State University (Slovacek & Doyle-Nichols, 1992). In this example, a BBS was set up and a users guide was created, modems were given on loan to the students, and a fax board was installed in a computer available on a cart for classroom demonstrations. Students could obtain a variety of types of information about their courses, could upload files and assignments, could connect to the Internet system, and could communicate with each other and their instructors. Usage increased steadily, with students becoming more and more likely to send messages to their instructors with regard to their assignments. This was seen to be important, not only to improve course performance, but also to “breaking down the barriers” between students and faculty.

Providing new types of course assignments. In many initial teacher education institutions networking is being used to provide new types of course activities and assignments. The following example is an illustration:

Using Networking in a Teacher Education Course on Critical Reading:

- Students used a computer conferencing environment (called the ‘Round Table’) to enter their comments and responses to various case studies made available in the course or directly through the network.
- The Round Table software offered various options: a message facility with a flashing signal to show that a message was waiting; a pencil icon to be used to open a space for writing a comment; an ‘instructor area’ where instructions on the cases to be read, an explanation of the issues in the cases, and key vocabulary could be found; a ‘brainstormer area’ where students could enter their observations and link points electronically; an ‘argument analyzer’ in which a structured organization was required for comments; and an ‘overview’ function, where students could get a repeat of the entire conversation that had gone before, either in entirety or by scanning the first lines of the students’ various comments.
- Students used the system to engage in these discussions whenever and from wherever they wished within a certain period.
- The students were highly enthusiastic about the activity, and invested considerable energy in the discussions. (Pugh, 1993)

These are just a few of the many examples of the use of networking to enrich or extend access to existing coursework in initial teacher education. Using

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networking to enrich the practice teaching aspect of initial teacher education is also proving to be a powerful application.

*Networking and Improved Communication
and Support during the Practical Experience*

It is now becoming common in many regions for networking to be used to link students, instructors, and supervising teachers in regular communication during the practice teaching component of initial teacher education. Such electronic linkage eliminates the frequently long stretches of time between visits of the faculty instructor to the school setting because of difficulties in time and organization confronting plans to organize such visits to the school. Such a problem becomes critical in remote areas. The following is a typical illustration:

Using Networking for 'Teleapprenticeships':

- At the University of Illinois (USA) faculty, student teachers, and teacher mentors make use of regular computer conferencing.
- Sometimes both student teachers and teacher mentors entered reflective comments on their own teaching.
- Wide ranging e-mail discussions are held concerning classroom experiences and their relation to theory; this occurs on a daily basis while student teachers are in the practical situation, through the loan of laptop computers and modems.
- Student teachers shared their lesson plans and experiences with each other on a daily basis and got quick feedback and comment from both their teacher mentor and faculty supervisor, who could enter their observations at times convenient to themselves but within a short time after the practice lesson.
- Student teachers very much appreciate the rapid feedback, the on-line discussion among themselves and their supervisors, and the chance to keep in touch with each other when 'in the field' (Levin, Waugh, Brown & Clift, 1994)

New Partnerships

A particularly powerful application of networking in initial teacher education is in the facilitation of new sorts of new partnerships in learning experiences for the student teachers. The PLUTO Project (see, for example, Libotton, 1994) is a major example. This project, with industrial support, linked as many as 19 initial teacher training institutions in 14 European countries with each other and with schools in their regions for various on-line collaborative projects, so that the student teachers could get a feeling of what such

projects can offer to education and also a beginning sense of a didactic for such projects.

In another example of extending the partnerships available to the student during the initial teacher education period, networking can be used to facilitate partnerships among the still campus based teacher trainees and actual groups of students in the field. For example, 31 fifth and sixth grade children in Canada participated in an on-line project with 17 student teachers in California. The student teachers not only got to experience the management of an on-line activity while still on their own campus, but also had to develop strategies for tasks such as evaluating children's writing, and tailoring their language to be appropriate for discussion with a child. The on-line setting let this be done under the supervision and comment of the faculty instructor, something much harder to replicate in the full-scale practice teaching situation (Zinck, 1989).

Examples of Networking in In-Service Teacher Education

As was the case with initial teacher education, there are many new possibilities emerging in in-service teacher education through networking. In this section we give some examples relative to networking in in-service courses. In the following section, we extend the concept of in-service teacher education to include less-structured and more ongoing sorts of professional development.

Network Supported Courses for In-service

Networking can augment a course which meets occasionally in a face-to-face manner, or it can be the major vehicle through which the teachers involved participate in the course.

Combining face-to-face and CMC contact. There are many examples of in-service courses which relieve some of the time and travel burden on teachers by replacing some of the time to be spent in the course on a face-to-face basis with study done at a distance, using networking. The following is an illustration:

Networking as Support for In-service Teacher Education in Catalonia

- Teachers want to participate in various in-service programs, but find it difficult to travel from their homes and working centres to Barcelona for these courses and to pay for their travel and expenses.
- Thus networking became not only a topic to teach about in some of these courses, but also a training communication channel.

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- The region had set up a Network and its associated service, with an on-line data bases of educational resources for teachers to use in their lessons; the Network also supported a computer conferencing system called AGORA.
- Teachers received a variety of materials: text materials, a computer-based tutorial on how to use the on-line system, complementary readings and software on disk, and a user handbook.
- Face-to-face meetings continued to be held, for example, to give the teachers instruction in how to use the different media and particularly the conferencing and e-mail options, but at a much-reduced frequency than before (Simón, 1992)

Other examples similar in various ways to the Catalanian illustration can be found in many countries. In the USA, for example, the 'Mathematics Learning Forums Project' involves a particular institution (the Bank Street Center for Children and Technology and Graduate School of Education) leading a series of 24 on-line seminars in which teachers across the country can take part. Each on-line seminar lasts about two months. Participating teachers are first sent videotapes to give them "a vivid picture of the aspects of teaching about which they are learning", as well as various print materials. In this sense, the videotapes and print materials replace the face-to-face sessions for the teachers. However, the teachers are still in extensive discussion with the instructor and their peers through the on-line conversations that go on throughout each seminar. During these conversations, faculty at the Bank Street institution will guide their teacher students as they try new teaching strategies in their classrooms. The teacher students will discuss with each other, via computer conferencing, their experiences with the new teaching strategies. Approximately 750 teachers participated in 1993 in the on-line seminars (Honey, 1993).

Supporting distance education through an 'information network'. The LEARN Project in Denmark is a good example of a situation in which networking is being used in a comprehensive way to support a number of distance delivered teacher education courses, involving not only Danish teachers but teachers in other countries. The next illustration gives more detail:

LEARN: Comprehensive Support of Distance Education

- LEARN is a Network Service offered in co-operation with the Royal Danish School of Educational Studies and Computer Resources International.
- LEARN provides a number of facilities which make it easy for students, tutors and administrators to participate in distance in-service education.
- From the student's point of view, LEARN is seen as a software package which makes it easy for the student to get and send mail, assignments, and other course materials; which includes an integrated text editor for editing responses, notes, and e-mail; which offers menu driven access to various

file handling tasks; and which supports a BBS and various communication options. Students study off-line.

- From the tutor's point of view, LEARN is an environment in which it is easy to add and take away materials and edit the BBSs.
- From the administrator's point of view, LEARN offers facilities to register students, teachers, courses, enrolments, available materials, etc., on the host.
- The general model for the use of LEARN is: retrieve material on-line, logoff and work off line on materials, go back on-line to send materials back or discuss the materials.
- Since 1990, in-service courses have been taught with LEARN support. (Larsen & Malmberg, 1991)

Extending the In-service Course with Subsequent On-line Interaction

One very powerful application of networking to in-service teacher education is to extend the contacts and interaction that have been made in a face-to-face in-service course after the course is officially 'over'. Such follow-up is a way to consolidate the in-service course for the teacher once he or she gets back to the home setting. There are many examples of this network-based model, such as the following:

CAWP On-Line: Extending an In-service Course

- The CWAP is a method for improving the teaching of writing which involves a 90 hour Summer Institute or a 30 hour site-based course. The method has been delivered to over 3,100 teachers in the USA.
- A major intention of the method is that the participants become expert teachers of teachers after they finish the course, but this expectation means that there is much contact and follow-up needed after the course.
- Thus a computer conference was established, called 'CAWP On-Line', specifically for the teachers who had finished the method training.
- The service offers e-mail, 45 "general discussion centres" (conference topic areas), file transfer, access to an on-line information resource that provides access in turn to data bases and other resources.
- Approximately half the potential users do in fact become high users of the service, predominately the e-mail aspects. (Fine, 1993)

This example also leads into the last category of networking and teacher education: that of support for on-going professional development.

Networking and Support for On-going Professional Development

By on-going professional development we mean a variety of activities, with a common characteristic that the teacher chooses the activity him or herself, not because it is part of an in-service course assignment, but because the

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teacher finds the activity in itself helpful and/or stimulating. Sometimes these activities may be directly focused on a particular problem or task; at other times they will be more diffuse, a response to a feeling of general interest, or more theoretical, such as the desire to reflect over one's professional practice. In this range of ongoing learning activities, networking also can play an important role.

Supporting the Teacher's Information Needs

Teachers more and more often are turning to on-line network based services for their specific information needs. Sometimes information comes from stored collections of materials, at other times from specific persons. But in either case, an on-line service, or access to the Internet itself as a collection of potentially relevant sources of contact and information, is increasingly popular among teachers. Honey and Henríquez (1993), in their survey of US teachers using telecommunications, found that the responding teachers valued very highly the ongoing sorts of professional support that they could acquire through networking activities. Teachers indicated they appreciated accessing educational research, downloading curriculum materials, accessing libraries, and researching subject-specific data bases.

Educational network services. In many countries and regions there is a particular Network Service specially organized for teachers. In The Netherlands, requirements for these have been studied extensively (Collis, Veen, & De Vries, 1993). In research which we have recently carried out, we have analyzed these types of network based services in countries throughout Europe and beyond (see Veen, Collis, De Vries, & Vogelzang, 1994, for a summary of 24 case studies relating to 15 European countries). We have found that the majority of European countries, US states, and other Western educational jurisdictions have such a service, usually supported by the Ministry of Education, but with many variations on partnerships.

An educational network service can be described by its functionalities - what it offers its users - or by its organizational and strategic aspects. An example of the first approach is shown in the following illustration:

A Network Service for Teacher Education and Support:

- In the state of California in the USA a Network Service called OTAN has been established. OTAN stands for Outreach and Technical Assistance Network. The Service is focused on support for teachers working with students have special needs.
- OTAN combines a computerized communications system with regional resource libraries that disseminate commercial and teacher made materials, including training packets with accompanying videotapes, resource documents, and public-domain software.

- OTAN is both an electronic archive and a distribution source for materials, reports, and studies.
- Options to choose from in OTAN include: The Master Calendar, Who's Who, Department of Education Information, Resource Centres, Current Articles, Course Outlines, Curricula Resources, Lesson Plans, Public Domain Software, Demo Software, Legislative Information, Reference Materials, Educational Funding Sources, Job Opportunities, On-Line Discussions, and an Upload Area. (U.S. Congress, Office of Technology Assessment, 1993)

Sometimes such educationally oriented network services emphasize the support of information searching as was the general case with the OTAN example above. At other times the focus of the service is more on facilitating communication among teachers (see, for example, a Norwegian example, Braatane, 1993). In many cases, the network service offers both, and teachers react enthusiastically (Collis et al, 1993).

Smaller-scale Support Systems Making Use of Networking

The above illustration involved a network service organized to serve a broad public, via access through public telephone lines. There are many other sorts of 'electronic performance support systems' being used by teachers for both the support of their work and also their ongoing professional growth, that usually are based in one computer system but allow connectivity to external networks. The following is an example:

A Teacher Toolkit: performance support involving networking

- In British Columbia, Canada, a software environment has been created for teachers to help them in their work. This integrated environment continues many different sorts of aids useful to them in categories such as: Accessing and developing lesson strategies; Recording, evaluating, and reporting student progress; Planning and scheduling; and Accessing and developing resources.
- Options often involve automatic use of networking to connect the teacher to collections of information or resources available not in the computer itself but in district or regional centres.
- Teachers can add material themselves to the regional collection. They can also use the Toolkit to make contact (simply through the click of an icon that looks like a telephone) to a specialist in a regional centre or to colleagues in other schools. (Hoebel & Mussio, 1990)

Such performance support environments for ongoing teacher professional development are becoming very popular, and have many variations. They may include access to an interactive videodisc of visual resources, for example of video clips of different sorts of lesson activities in actual

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classroom settings. The boundary between getting information and learning overlaps when a teacher uses such a resource.

*Ongoing Teacher Education through
Computer Supported Networking*

By networking in this sense we mean the teacher becoming part of a supportive and interacting group of colleagues who interact with each other, giving each other support and ideas. Networking technologies are rapidly enlarging the range and composition of the groups with which a teacher can network. The following illustration (discussed also by Muscella and DiMauro in this issue) shows this kind of networking:

**LabNet: A Network to Develop a Professional Community of
Practice among Science Teachers**

- The LabNet Project in the US was a three-year, multi-part project whose overall goal was to improve classroom science teaching. But building a “professional community of practice” among teachers involved in the project was seen as a major aspect.
- The 562 teachers involved were from 37 US states. They interacted with each other occasionally in face-to-face small groups in their own regions but most generally through computer conferencing.
- The goal of the conferencing was to increase the teachers’ self-reflection about their classroom practice, but they also used the computer conferencing to exchange ideas about classroom activities and to interact with professional scientists who were also part of the Network community.
- Occasionally teachers would be sent new sets of software and learning materials and then would use the computer conference to receive instructional help from Project Leaders and to support each other in their problems and experiences in trying new computer based activities in the science classroom (Gal et al, 1993)

This illustration shows an electronic/human network for professional development being guided by a professional project leadership team and integrated with a range of other types of in-service activities. There are many examples of such network communities, with varying degrees of formality and of associated professional development activities. We saw an example earlier (Fine, 1993), relative to the teaching of writing; there are examples in many disciplines and in many countries. Often a special feature of such a network community is the presence of persons who the teacher in his or her ordinary practice would never have the opportunity to meet. For example, physics teachers in California involved in such a network community were able to interact electronically with the authors of the textbook they used in their teaching. They were thus able to ask the authors informally and in an ongoing way questions about the text and its support activities. These types

of contacts can grow into 'telementoring' relationships which are not likely to occur in the teacher's ordinary range of contacts (Wighton, 1993). Such use of computer conferencing for networking among teachers is being seen as a major stimulus for teachers' professional development, as

...teachers, like students, [who participate in co-operative on-line communities] acquire knowledge, develop teaching/learning strategies, increase self-esteem, and develop meaningful relationships with their peers. (Riel, 1990, p. 452)

Anticipating Constraints and Seeking the Most Effective Possibilities for Networking and Teacher Education

Anticipating Constraints

The illustrations above have only touched the surface of many new types of teacher education experiences now being facilitated by computer based communications throughout the world. But such activities, like all innovations in educational practice, bring with them many different constraints to their implementation. There are predictable problems in many areas:

- finding sufficient support and financing to connect teachers to an appropriate and affordable telecommunications infrastructure;
- organizing and managing a Network Service so that it offers timely and well-conducted information and communication settings for teachers;
- helping teachers learn how to use such an environment;
- providing adequate access to such an environment so that teachers can use it for sometimes lengthy periods of time as they engage in discussions and look for resources on-line;
- designing software to support teachers' on-line activities;
- anticipating the amount of time and the steps that will be needed for teachers to adopt such an innovation into their practice;
- searching for strategies to moderate on-line discussions so that they proceed productively;
- searching for ways to locate and organize resources that will be obtainable on-line;
- helping teachers have the time and motivation to engage in reflective, self-directed learning activities outside of a formal in-service structure; and
- motivating faculty in teacher education institutions to become aware of, and to participate in, electronically supported communities of practice.

Each one of these points is being addressed by various research projects in many locations throughout the world (see, for example, those described in Veen et al, 1994).

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*Identifying Effective Applications of Networking for
Teacher Education in the Current European Context*

In order for a complex innovation such as the use of networking for teacher education to gain acceptance and momentum, some sorts of applications of it must be identified that are most likely to capture support (we call these "trigger events", Collis & De Vries, 1993). In the current European context there seem to be at least two such types of applications that could be good candidates for stimulating the use of networking in teacher education. One application relates to developing the European dimension in education, and the other to strengthening language teaching.

Developing the European dimension. Throughout Europe, both within the Community and more broadly, there is a great interest in developing the 'European dimension' in education. The new Community Programme 'Socrates' is based on this motivation. A major way this occurs is through exchanges, both of teachers and of students. But despite the efforts of many different programs such as ERASMUS to stimulate such exchange, doing it physically is not possible for the majority of teachers and students, or for the majority of faculty at teacher education institutes (Delmartino, 1993; Miller & Taylor, 1993). Constraints on mobility are financial, institutional, and practical. On-line activities via networking can compensate for physical restraints and thus become a powerful parallel activity to physical exchanges in the European context.

Focusing on language teaching. A particularly important educational need in Europe is the development of multiple language facility, not only among students, but also among their teachers, and teacher educators. The 1994 "Expolangues '94" language-teaching exposition, held in Portugal, attracted more than 30,000 visitors. A number of projects and activities involving distance education methods for language teaching and the support of language teachers are in operation at the international level (see for example, Larsen & Malmberg, 1991); the national level (see, for example, the project 'Foreign Language Learning in Relation to New Technology and to Strategies for Teaching On-Line' (Loretsen, 1991), and the professional level (for example, a recent international conference for language teachers which was supplemented by a World Wide Web page on the Internet and also by the opportunity for teachers to join in a scheduled real-time discussion via the Internet with 'guest speakers' and with each other).

There is a particular need for language upgrading among teacher educators and foreign-language teachers in Central and Eastern European countries (see, Stanchev et al, 1994). In these countries the widespread lack of

knowledge of Western European languages is frustrating teacher educators' integration into many activities with a 'European dimension'. Thus it would seem that a concentrated focus on a variety of applications of networking for co-operative teacher education activities involving Western European languages could be a particularly productive strategy. The gradual development of Internet connectivity among Central and Eastern European institutions of higher education will make such applications feasible.

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References

- Banks, F. R. J. (1995) A first contribution to the discussion. Email message sent to an international mailing list of teacher educators, 22 February 1995. For a copy or contact, email to F.Banks@open.ac.uk
- Bishop, C. D. (1990) *Technology Integrated Educational Delivery System: a K-12 master plan for the infusion of technology into Arizona schools in the teaching/learning environment*. Phoenix, AR: Arizona Department of Education.
- Braatane, K. (1993) Teachers in network, in G. Davies & B. Samways (Eds) *Teleteaching '93*. Amsterdam: North-Holland.
- Brophy, M. & Dudley, B. (1982) Patterns of distance teaching in teacher education, *Journal of Education for Teaching*, 8, pp. 152-162.
- Collis, B. (1993, October) Electronic links to enrich the life of the school. Keynote paper prepared for the Council of Europe Conference on School Links, Stockholm.
- Collis, B. & De Vries, P. (1993) *The Emerging Trans-European Network for Education and Training: guidelines for decision makers*. Report under contract to the Task Force Human Resources, Education, Training and Youth, Commission of the European Community, Brussels.
- Collis, B. & Nikolova, I. (1994) (Eds) *Proceedings of the Conference 'Teacher Education and Communication and Information Technologies: issues and experiences for countries in transition'*. Enschede, Netherlands: University of Twente, Faculty of Educational Science and Technology.
- Collis, B., Veen, W. & De Vries, P. (1993) *CISO: Recommendations for an On-line Service for Dutch Education*. The Hague: PTT Netherlands.
- Comes, J. F. & Kirkwood, J. J. (1992) Electronic information files and resources assist students and teachers: one day to organize and present a topic, in N. Estes & M. Thomas (Eds) *Proceedings of the Ninth International Conference on Technology and Education*. Austin: Morgan Printing.

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- Delmartino, M. (1993) *Teacher Education and the ERASMUS Programme*. Brussels: ATEE.
- Duning, B. S., Van Kekerix, M. J. & Zaborowski, L. M. (1993) *Reaching Learners through Telecommunications: management and strategies for higher education*. San Francisco: Jossey Bass Publishers.
- Fine, C. S. (1993) CAWP On-Line: enhancing collaboration through technology. in G. Davies & B. Samways (Eds) *Teleteaching*. Amsterdam: North Holland.
- Gaf, S., Ruopp, R., Drayton, B. & Pfister, M. (1993) *LabNet: toward a community of practice*. Hillsdale: Lawrence Erlbaum.
- Hedberg, J. G. & Harper, B. (1993) Supporting and developing teachers through telecommunications, *Educational Media International*, 30 (2), pp. 88-93.
- Hoebel, M. & Mussion, J. (1990) *Educational Reform and Tools for Change*. Victoria, British Columbia: Education Technology Centre.
- Honey, M. (1993) *The Mathematics Learning Forums Project. Internal report*. Bank Street College, New York.
- Honey, M. & Henríquez, A. (1993) *Telecommunications and K-12 Educators: findings from a national survey*. New York: Center for Technology in Education, Bank Street College of Education.
- Larsen, I. B. & Malmberg, A. C. (1991) *LEARN Network: education via network*. Copenhagen: Royal Danish School of Educational Studies.
- Levin, J., Waugh, M., Brown, D. & Clift, R. (1994) Teaching teleapprenticeships: a new organizational framework for improving teacher education using electronic networks, *Journal of Machine-Mediated Learning*, 4, pp. 149-162.
- Libotton, A. (1994) Computer networks in teacher education: realisations in the framework of the Pluto Project, in B. Collis & I. Nikolova (Eds) *Proceedings of the Conference 'Teacher Education and Communication and Information Technologies: issues and experiences for countries in transition'*. Enschede, The Netherlands: University of Twente, Faculty of Educational Science and Technology.
- Lorentsen, A. (Ed) (1991) *Foreign Language Learning in Relation to New Technology and to Strategies for Teaching Online*. Aalborg: Aalborg University Department of Foreign Languages and Intercultural Study.
- Miller, S. & Taylor, P. (1993) *The Teacher Education Curricula in the Member States of the European Community*. Brussels: ATEE.
- Perraton, H. (1993) *Distance Education for Teacher Training*. London: Routledge.
- Pugh, S. (1993) Using case studies and collaborative computer-assisted communication to support conceptual learning in a teacher education course on critical reading, *Educational Technology*, 33 (11), pp. 30-38.
- Riel, M. (1990) Cooperative learning across classrooms in electronic learning circles, *Instructional Science*, 19, pp. 445-466.
- Simón, C. (1992) Telematic support for in-service teacher training, in A. R. Kaye (Ed) *Collaborative Learning through Computer Conferencing*. Berlin: Springer-Verlag.

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- Slovacek, S. P. & Doyle-Nichols, A. R. (1992) Enhancing telecommunication in teacher education, *Journal of Research on Computing in Education*, 24, pp. 254-264.
- Stanchev, I., Nikolov, R. & Nikolova, I. (1994) Perspectives on teacher training related to information technology in Central and Eastern European countries, in B. Collis & I. Nikolova (Eds) *Proceedings of the Conference 'Teacher Education and Communication and Information Technologies: issues and experiences for countries in transition'*. Enschede, The Netherlands: University of Twente, Faculty of Educational Science and Technology.
- Stanley, N. (1991) Networks for teacher training, *The CTISS File*, 11, pp. 32-33.
- Veen, W., Collis, B., De Vries, P. & Vogelzang, F. (1994) (Eds) *Telecommunications in Education: the European case*. De Lier: Academic Book Centre.
- Wighton, D. J. (1993) Telementoring: examining the potential for an educational network, *TIE Newsletter*, 4 (3), pp. 13-16.
- US Congress, Office of Technology Assessment (1993) *Adult Literacy and New Technologies: tools for a lifetime*. OTA-SET-550. Washington, DC: U.S. Government Printing Office.
- Van den Brande, L. (1993) *Flexible and Distance Learning*. Chichester: Wiley.
- Zinck, R. A. (1989) *Distant dialogs: telecommunications in teacher training*, in *Proceedings of NECC '89*. Eugene: International Society for Technology in Education.