

Telecommunications and Education and Training in Europe: An Analysis of Research and Practice

Betty Collis

*Faculty of Educational Science and Technology
University of Twente
Enschede, The Netherlands*

Pieter de Vries

*Parliamentary Documentation Centre
University of Leiden
The Hague, The Netherlands*

The state of affairs in Europe with respect to telecommunications as a resource, channel, and strategic instrument for change in education and training is one of many research and practical initiatives occurring within a variety of support structures. In this article, we review developments in telecommunications applications for education in Western Europe by reviewing national or regional initiatives for support of telecommunications use by teachers and in schools; we give a sampling of some of the many projects relating to telecommunications in education that are occurring in Europe, with some elaboration about a project that recently concluded in The Netherlands; and we comment on the important role of the Commission of the European Communities in stimulating research and market-building partnerships among those involved in distributed educational activities, including those making learning resources for multicultural, multinational online systems. We conclude the overview with a comment about aspects of initiatives with telecommunications in education that appear to have a stronger emphasis in Europe compared to other regions of the world, including more focus on multilanguage practice among students; more centralized

support of projects involving business and education; more focus on telecommunications as a strategic tool to help reach long-term social goals; and more research on the instrumentation of online environments.

NATIONAL OR REGIONAL SUPPORT FOR SCHOOL-SECTOR TELECOMPUTING

Telecommunications in support of learning is an area of rapid growth and major interest throughout Europe, ranging from support of "just-in-time" lifelong learning for the professional to support for specific projects involving schoolchildren. This activity could be summarized in many different ways. In this section we focus on the national or regional-level organizations that provide leadership in the provision of online information and communication services to schools, teachers, and students. We have recently prepared an analysis of central support for school-sector telecommunications in Western Europe (Collis, Veen, & de Vries, 1993) and from this review we present some examples of the diversity of activity in Western Europe and a synthesis of central support activity overall.

EXAMPLES OF NATIONAL AND REGIONAL NETWORKS AND SUPPORT SERVICES

National or regional networks and support services for school-sector applications of telecomputing are established in most of the Western European countries. The following overviews illustrate some of the variation.

Iceland

Iceland is an example of an approach that focuses strongly on teacher support and facilitation.

- Supported by the Ministry of Culture and Education, Iceland has the ICMENNT (the Iceland Educational Network), a service connecting 80% of all primary schools, 75% of secondary schools, and several higher education institutions. ICMENNT is also linked to the Internet system.

- Supervisors (with a teaching background) from ICMENNT visit every school that wishes to connect to the network, personally setting up the equipment and staying in the school for a few days to help teachers make a start with online use with as much support as possible and in their own class settings. The supervisor continues to be available for help via telephone, almost "around the clock." The Icelandic Teachers' Federation supports some of these costs.

- Local conferencing is supported and moderated; conferencing is also used for support of distributed teacher inservice and for ongoing support for teachers.

- A Gopher server has been installed to filter access to resources available through the Internet system, selecting those of particular interest to Icelandic teachers.

- Local data bases for teacher and school-administrator use are provided, including, for example, those with documents from the Ministry of Culture and Education and information from the Educational District Office about audio-visual resources.

- Student participation in local and international online projects is supported, including KIDLINK activities in which the ICMENNT takes a leadership role. (Stefánsdóttir, 1993)

Ireland

Ireland is an example of an approach where the emphasis is on information provision for teachers and schools and where telecommunications is integrated into a broader plan for integrated information service.

- The National Information Technology in Education Centre (NITEC) provides an integrated range of information services, among them an electronic network service.

- The NITEC Network offers 24-hour daily service, and the NITEC Help Line offers live assistance from 9:15 a.m. to 5 p.m. each school day.

- Secondary schools, primary schools, postsecondary institutions, and Department of Education inspectors are connected to the network.

- Teachers have been most interested in the electronic mail (e-mail) services and in using the network for reading notices and accessing data bases of information relevant to their subject areas (McKenna, 1993).

Luxembourg

Luxembourg is an example of well-developed service, combining both physical interconnectivity and a wide range of educational applications. The RESTENA Network and Network Service are the hub of the activities.

- The RESTENA Network and Network Service links all schools of secondary, technical, and higher education in Luxembourg, as well as all departments, services, and institutes that depend on the Ministry of National Education. The link with primary schools is under development. All connected schools have been provided with modems and additional telephone lines.

- The network is used particularly for communication between school administrations and the Ministry of National Education, and for communication among teachers for professional information (timetables and syllabi, teaching aides, and calendars of meetings and inservice seminars).

- The WILYTEC Network, available through the RESTENA Network, or through direct dial-in, is maintained by the RESTENA Network Service and is particularly aimed at young children. Special services are available, and data bases are chosen appropriate to the ages and interests of the children. WILYTEC is supported by the Ministry of National Education and the Ministry of Youth.

- The RESTENA Service also supports a work group coordinated by the service for Pedagogical Innovation and Research to investigate the possibilities of distance learning through telecommunications for Luxembourg and the subsequent development and delivery of certain inservice courses via RESTENA Network Service (Werné, 1993).

Norway

Norwegian education is extensively served by telecommunications infrastructures and services. A major example is the KUF Network, supported by the Ministry of Education, Research, and Church Affairs, in which the emphasis is on teacher support and interconnectivity.

- KUF is focused on individual teachers, rather than schools or students.
- Operation of the host system for the KUF Network has been given to a commercial BBS firm. Its responsibilities are to keep the system running, maintained, and protected; to handle the tracking of user access and billing; to maintain a collection of files from the Internet and other sources; and to continue development of the technical infrastructure of the network.

- Service aspects of the network are maintained by educators, and conferences are moderated by teachers.

- The support of conferences for discussion among teachers is a major service of the network. Recent themes have included applications of online information in social science teaching, planning for international exchanges, stimulating more females to computer use, and environmental issues. Many online conferences also grow to include face-to-face meetings or printed newsletters (Braatane, 1993).

Spain

Spain has two major regions, each with its own service in support of telecommunications in education. The Catalan region focuses more on student projects, whereas the Madrid-based region has developed a

sophisticated system of support of local and regional centers serving teachers and the community.

- In Catalonia, the creation of the XTEC Network (Catalan Educational Telematic Network) occurred in 1988, under sponsorship of the Catalan Ministry of Education.

- Services are provided according to two basic models—collective construction of materials among students and teachers and structured gathering of data by students so that they can be accumulated in a common data base for subsequent access throughout the region.

- The service also stimulates and supports “reflective debates,” “literature debates,” “welcome activities” (for newcomers to the service), and various international projects.

- A special emphasis is given to providing teacher-support activities, organized around subject areas and to providing inservice teacher training via the network, where four inservice courses are available for teacher subscription.

- Continual work is ongoing in the development of better services; moving from a videotex format to an X400 e-mail system and providing teachers with free access to the Internet system.

- The Ministry supports the costs of equipment, the central network and those who provide its services, and specific financial support to teachers who give extra time to the coordination of online activities. Schools pay the telephone costs (Castells i Prims, 1993).

- The Spanish Ministry of Education, through the Program of New Information and Communication Technology (PNTIC), supports all schools in its jurisdiction with telecommunications services, particularly through two major initiatives:

1. The Mentor Project, providing flexible learning experiences to students, teachers, and other adults living in rural areas, through the equipping of small rural schools with extensive telecommunications and information technology resources, and providing support via telecommunications for adult self-training in 13 different courses. Clients use the school facilities after school hours.

2. The Platea Plan, a national initiative to stimulate the use of telecommunications in schools, by providing specially designed software, and connecting 109 teacher centers spread over 27 provinces. Each center receives equipment from the central PNTIC Project and has support persons to set up a local bulletin board system using the specially designed software. Thus, each center is a node for local activities, as well as being connected to the central service at PNTIC. The services offered from PNTIC to all the teacher centers, in addition to the software and technical support mentioned previously, include: (a) access to data bases, such as of Spanish experiences with IT use in schools (more than 6,000 files of examples) and of resources

available through PNTIC and national libraries; (b) e-mail and other communication services, being used by 2,000 persons belonging to all levels of education (including parents, inspectors, companies interested in education, and ministry officials); (c) teletutorials, for teacher inservice at a distance; and (d) special information about events in the Spanish educational system, with the opportunity to submit questions about relevant subjects.

3. Each school can receive a modem from PNTIC and can receive direct help from an expert in its nearest teacher center (San José, 1993).

Switzerland

The emphasis in the Canton of Geneva is on providing a well-integrated, centralized resource center for teachers, other educational specialists, and the community at large. The Centre Informatique Pédagogique (CIP), supported by the Department de L'Instruction Publique, serves the Canton of Geneva for its various needs related to information technology.

- These include teacher inservice, the organization and support of multisector working groups, the diffusion of information, the organization of demonstrations and conferences and special-interest groups, and the support of an online videotex bulletin board service.

- Every school in the Canton is connected to the CIP via a private network and leased lines, and all administrative and procedural information is conveyed via the network to and from the schools. Thus, it is regional policy that very few printed materials are circulated.

- The videotex service is used not only by schools and teachers, but by members of the community and contains a broad range of local-interest information.

- Included in the options available through the online service are e-mail, data bases, and a specialized network called Kalimera. Kalimera is designed for use by 8- to 15-year-old students, for collaborative activities, in any of the three official languages of the Canton (Swann & Morel, 1993).

The Nordic School Network

The five Nordic countries, after a number of years of joint initiatives in telecommunications in education as well as each having extensive telecommunications activities in their own right, have developed a plan for the further development of telecommunications services for Nordic Country schools. The major components of the plan, called the Nordic School Network, are as follows:

- A Nordic School Network will be established to be operational by spring 1994, serving all five Nordic countries and linking their existing national telecommunication services.

- The network will be accessed through a menu-driven interface in which relevant educational institutions can give short full-text information about available funds, programs, hints, and schools contacts. The service will also support e-mail communication, bulletin boards, conferences, file transfer, and a file library.

- The Nordic School Network Technology shall be based on the already existing Nordic part of the Internet system, which links all Nordic higher education institutes. Thus, the intention is that all schools will be interconnected and will also be connected to the research world. Accessing information over the system will be done using Gopher as a tool.

- Schools must pay running costs. The Nordic Council will support central costs and gateway costs to link existing networks and services.

- A strategy for inservice training has been carefully worked out. The inservice procedure works on a 2-day model, in which participating teachers will meet on the first day, in their different locations, and have an introduction to online use, and then the second day spend their time being connected with each other in their different locations.

- The phase-in period of the network will be 3 years and will involve a first group of 500 teachers from throughout the five Nordic countries. Teachers will be chosen because of their interest in modern language teaching and communication; pioneer telecommunications users already in the school will not be chosen as part of the first group of 500 teachers.

- Programming work is being done to solve problems with the special Nordic characters and the use of non-Nordic networks.

- The focus of use is to be language training and environmental studies projects. Existing projects in the different Nordic countries will be built upon.

- Three teams have been established to run the phase-in of the network: a team responsible for finding interesting information to put on the network, a team responsible for technical issues relating to the network, and a team of educational specialists responsible for putting the Network into use in instructional settings and evaluating what happens (Ranebo, 1993).

SUMMARY OF THE STATE OF AFFAIRS WITH CENTRAL SUPPORT OF SCHOOL-SECTOR TELECOMPUTING IN EUROPE

From the aforementioned examples and also those from the other Western European countries, the following conclusions could be drawn about support of school-sector telecomputing in Europe (see Collis et al., 1993, for an elaboration).

- In most countries, central initiative and funding is necessary for the support of the network, its service structure, and some of the costs of local connection to the network. In general, this initiative is the responsibility of

the Ministry of Education. There are many examples of contributory funding from businesses or professional institutions or other groups.

- A definite trend is evolving toward major use of networks and their services for the support of professional development of teachers and school administrators, for information exchange among ministries and schools, for opportunities for educational professionals to engage in discussions and exchange information with each other, and for more flexible and distributed provision of teacher inservice.

- Student use of networks is generally through well-organized short-term projects, usually with reference to foreign-language practice or cultural-sensitivity development.

- Connection of local services to external networks, via the Internet system, is seen as a natural expectation and evolution. A seamless movement, from the perspective of the user, among different networks and services is important.

- Full-time staff, both technical and educational, are needed to maintain network services and to facilitate their use.

- Teachers and schools need help in initial use of a network and in ongoing use. Costs to the individual must be kept as low as possible, ideally with no cost to the individual.

- Offline activities, such as seminars, newsletters, and demonstrations, are needed to stimulate and support online activities. These are generally the responsibility of the online service organization.

SAMPLING OF PROJECTS RELATING TO TELECOMPUTING IN EDUCATION IN EUROPE

In the previous section, attention was focused on the infrastructures that provide overall support of school-sector telecomputing in Europe. Many different projects are also going on, some of a long-term nature, others operating in specific time ranges, that focus on experimentation with different applications of telecommunications. The situation in Denmark is a good example of a number of long-term projects, which are gradually becoming interlinked within a country; the European Schools Project is an example of a well-established international initiative for support of "teletrips"; and the Dutch CISO Project is an example of a national research study looking at overall implications of telecomputing in education.

Denmark

- The Schools Data base Service, supported by the Ministry of Education, now serves more than 500 schools. The objectives of the service are:

to provide all educational institutions (from university to primary/lower secondary schools) with access to a number of external data bases and conference facilities at the lowest rate possible; to optimize accessibility to the data bases/conference systems; to ensure user-friendly operation of the facilities; and to provide help and assistance in the considerable educational work required for integrating the use of data bases and the conference system in teaching. (Weidemann & Dalgaard, 1993, p. 2)

- LEARN is a Danish electronic online service providing teachers, young students, members of the community, and clients from more than 80 countries with the communication support needed to facilitate learning at a distance (Anttila & Eriksen, 1993).

- The Schools in Network Project, which stimulates and supports collaborative online curriculum-related projects, particularly those offered through the European Schools Project (Sligte & Meijer, 1993), has, over a 5-year period, involved students from more than 60 Danish schools and 20 other countries.

- TESS is a distance-delivered inservice training project for teachers and an online communication project for disabled children.

- DIN-BASE, an "electronic information and communication system" developed by teachers, contains lesson experiences, results of student online projects, and support for projects among the children in the 180 schools connected to it.

- Leadership in many of these projects is provided by the INFA Group at the Royal Danish School for Educational Studies (Anttila & Eriksen, 1993).

The European Schools Project

The European Schools Project (ESP) was initiated in 1987 with leadership at the University of Amsterdam. Since then it has evolved into a worldwide, voluntary partnership of teachers interested in their students participating in "electronic field trips" or "teletrips." A *teletrip* is an educationally structured way of using computer-mediated communication in the context of well-designed learning activities.

- The ESP Project has evolved to being a support system for schools that wish to design, perform, and evaluate the educational benefits of these teletrips. Not only are schools brought into contact with each other and supported in their planning of teletrips, but ESP also provides a printed newsletter, online communication support, and runs a yearly face-to-face meeting of teachers to stimulate planning for the next year's teletrip topics.

- In March 1993 more than 200 secondary schools in 20 countries were involved in ESP.

- Approximately 30 teletrips are conducted each year, each involving considerable preparation interaction among the teachers involved, and considerable offline work by the students. Most of the teletrips have a language-

practice focus, primarily in German or English. A recent teletrip on wa quality involved 75 teachers and 1,500 students (Sligte & Meijer, 1993).

The Dutch CISO Project

The CISO Project in The Netherlands is an example of European research projects relating to the implementation of school-sector telecomputing. The purpose of the CISO Project was to make recommendations for an integrated online service for the overall Dutch educational system (up to higher education). The project was sponsored by PTT Telecom and PRESTO. PRESTO is a project group under the framework of the Ministry of Education and Science. Its focus is primarily on the application of new technologies in vocational education in The Netherlands. The project team included researchers from groups associated with the Universities of Twente, Utrecht, and Leiden, and also teachers from four different middle-level vocational schools. From mid-1992 until the end of 1993, the team investigated a broad range of issues and considerations relative to an optimal online service for Dutch education. The project had four major components of research:

1. A study of school-sector telecomputing outside of The Netherlands. Some of the major conclusions of this research are indicated earlier in this article (Collis et al., 1993).

2. An analysis of the particular Dutch context relative to an optimal online service for education. Previous and current experiences with or without such activities in support of education in The Netherlands were studied. Opinions and ideas relative to the characteristics of an optimal coordinating service for school-sector telecomputing type were gathered from a large number of persons and groups. Also, factors particular to the Dutch educational system, in particular the move toward the self-responsible school, were also studied.

3. Eight teachers from four middle-vocational schools participated in an extensive examination of their experiences and ideas about the educational use of telecommunications. The experiences of the teachers, beginning with their reactions to initial inservice activities and extending through their reflective opinions about the overall implications of telecommunications in education, provided an important range of insights for an education-oriented online service in The Netherlands. Among the many considerations that emerged were the particular benefits of a focus on telecommunications use for professional support of the teacher and school, and the problem areas and needs that teachers will have, both in the school and at home, in obtaining adequate access to online use for their own instructional preparation and professional activities.

4. The ongoing process of consideration, analysis, and synthesis that occurred with respect to the awareness of the factors and characteristics that would be most productive to consider in terms of recommendations

integrated online service for Dutch education. Using a methodology based on "responsive multi-participant illumination" (Melton & Zimmer, 1987), the project team worked continually throughout the year in an iterative search for an effective set of recommendations for an integrated service for telecomputing support for Dutch education.

Recommendations

Highlights of the Dutch CISO Project's final recommendations include:

- A centralized service, coordinating and providing leadership for the many different types of educational applications of telecommunications that are already occurring in The Netherlands, is recommended.
- Although students benefit from well-managed online activities, a major value for such a central telecomputing service in The Netherlands at this time is in support of the professionalism of the school and teacher.
- Accessibility is a critical barrier to telecommunications use in education.

Reducing accessibility problems should underlie all phasing-in activities of the centralized support service. Teachers and the school administration will need particular help in finding ways to access the online service, from both school and home, to realize its capacity for supporting professional growth (for the full study, see Collis et al., 1993).

There are many other projects that could and should be reported in an overview of European activities with telecomputing in education. Major sources of information about such projects are available (see Van den Brande, 1993, for a focus on higher education and training; for an overall view, see the proceedings of the August 1993 "Teleteaching" Conference, sponsored by IFIP and held in Trondheim, Norway [Davies & Samways, 1993]).

INITIATIVES OF THE COMMISSION OF THE EUROPEAN COMMUNITIES: THE DELTA PROJECT

The Commission of the European Communities (CEC) is expending considerable effort on stimulating the potential contribution of telecommunications to the strengthening of the levels of skill and technical expertise of its citizens and to the reduction of the so-called "training gap," which is seen as a serious problem for the present and future. This problem is considered severe for the millions of Europeans who, for various reasons—being homebound, handicapped, or wishing to reenter the workforce after a long period of absence from it—are cut off from traditional educational facilities. Thus, pushed by the need for new types of training and ongoing professional

development, and in the context of a strong social drive for equity of opportunity throughout the countries of the European Communities, many initiatives in Europe are focusing on the implementation of telecommunications-based learning, to "enable learners to access learning whenever and wherever needed" (e.g., see the planning that is occurring for a "Trans-European Network for Education and Training" [Collis & de Vries, 1993]). There has been a particular focus on adults, rather than schools and children, in the projects that have been sponsored thus far by the CEC, although this focus is broadening to teachers and schools during the next round of research activity (1995-1998).

The DELTA Project is perhaps the major project of its sort in the world. It is a large-scale initiative supported by the CEC to stimulate cooperative activity across Europe through 27 projects with the common goals of "improving the access and performance of learning services in Europe based on the optimal use of information technologies and telecommunications" (Roselló, 1993, p. 24). There is a particular emphasis on providing remote access throughout Europe to learning resources; on providing optimum support to learners, trainers, producers of learning materials, and providers of learning services; and on the development of a strong market for telecommunications-available educational resources in Europe. This phase of the DELTA Project (there have been earlier ones) extends from 1991 to 1994 and has a budget of more than \$100 million from the CEC itself and about as much again from European industry, telecommunications providers, and universities.

There are 174 organizations participating in this phase of DELTA, from the 12 CEC countries (Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom), Switzerland, Norway, Sweden, and Finland. The 174 organizations include universities, telecommunications companies, industry, and small and medium enterprises, relatively small companies in the business of the development of learning materials and the delivery of training. Many hundreds of people are involved, and the strong relationships being formed among universities and business are an important side benefit of the project.

The 27 projects (which together involve approximately 300 subprojects) include:

- The TRIBUNE Project, which is creating relevant information flows about issues related to DELTA, and more broadly, to telecommunications-related applications to education and training in Europe.
- The OSCAR Project, which is developing tools to be used throughout Europe for the collaborative and distributed authoring of multimedia courseware.
- The SMISLE Project, which is developing multimedia simulation systems for use in education and training.

- The ILDIC Project, which is developing CD-ROM based interactive hypermedia and multimedia resources for education and training.
- The JANUS Project, which is bringing together universities from throughout Europe into new partnerships for telecommunications for distance and flexible learning and is leading to an eventual "European Electronic Open University."
- The MATHESIS Project, which is building a common "stand-alone workbench" for learners and teachers throughout Europe, through which they will have convenient access to telecommunication services beginning with e-mail and access to distant multimedia learning resources.
- The ECOLE Project, which is focusing on cooperative learning and group work at a distance, using telecommunications, particularly for training.
- The JITOL Project, which is focusing on supporting "just-in-time" learning and computer conferencing among professionals throughout Europe, through the combination of specially designed computer conferencing environments and access, through those same conferencing environments, to online sources of multimedia learning and reference material.
- The SMILE Project, which is setting up study centers throughout Europe for employees of small- and medium-sized businesses to obtain high-quality retraining, and where telecommunications is used to share resources and expertise and to help learners find what is available and where, to meet their job-required needs.

Many reports are being written about the DELTA Project and all its activities. Major sources are *The DELTA 1993 Annual Report* (CEC, 1993), the book *Flexible and Distance Learning* (Van den Brande, 1993), and a set of case studies recently published by the TRIBUNE Project (TRIBUNE Consortium, 1993). Mailing addresses for all of these are given with the references at the end of the article. Plans are well under way for the next phase of DELTA (1995–1999).

The major benefits of the DELTA Project have been to provide coordinated funding and support to university researchers involved in telecommunications in education; to companies developing learning resources and services that can be made available via telecommunications; and to the telecommunications companies themselves, to encourage them toward a coordinated infrastructure and cooperative approach for the providing of integrated telecommunications services to schools, communities, workplaces, training centers, and even homes throughout Europe. The opportunity for researchers from faculties of education to be funded to participate in these sorts of initiatives have brought telecommunications in education to a high level of interest in the educational research community. The strong involvement of industrial partners is a particular benefit of DELTA, bringing educators and educational researchers in partnerships with business and training on a scale and on a level of coordination probably not occurring anywhere else in the world.

PARTICULAR EMPHASES IN EUROPEAN
EDUCATIONAL TELECOMPUTING

In one short article, it is not possible to summarize the wealth of activity going on in Europe with telecommunications in education. Some aspects are similar to North America, particularly when comparing the national support infrastructures for telecommunications in schools sponsored by Ministries of Education in a number of European countries with those in some of the United States and Canadian provinces and when comparing the enthusiasm of those teachers and students who get involved in telecommunications projects. However, cross-border initiatives involving researchers, industry, and policymakers are more established in Europe than perhaps anywhere else in the world. Also, there is a much stronger focus on telecommunications for lifelong learning of adults, "just in time" and in open and flexible ways, than there is in many other regions of the world. More evidence of projects is perhaps focused on the design and development of software and learning materials for telecommunications use in Europe than in other regions of the world, partly because of high-level financial support and of the value given to such research in faculties of education (see de Vries & Collis, 1993, for an example of how the national telephone utility in The Netherlands has funded the design, development, evaluation, distribution, and redevelopment of data communication software for schools, simulation software to help students and teachers get familiar with online work before going online, and many other projects). There is also probably more systematic use of telecommunications for multiple-language experiences than in other regions of the world (e.g., see Rasmussen, 1993). Conversely, there is still less grass-roots use of telecommunications in schools and homes than occurs in countries such as Australia, Canada, and the United States, in that affordable access to large-scale networks is still difficult and still varies considerably from country to country. Also, there is less use with younger children than is occurring in the United States and Australia.

Thus, Europe is in the forefront of projects, research, and other types of ongoing activities in the support of telecommunications in education and training. The remainder of the decade promises a continuing escalation in this type of activity, as multimedia distributed computing becomes well established as a tool for professional education and training, and then, in time, for schools.

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