<u>Final Report</u>

EENet Observe -

The EENet Observatory,
a basis for synergy and transparency
between initiatives in the area of ICT
in education

Agreement no: 1999 - 1663 / 001-001 SOC 335BOD

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1 Executive Summary

1.1 Background

The European Experts' Network for Educational Technology (EENet) is an independent association consisting of institutions and organisations from 13 European countries. EENet's mission is to create a better understanding of ICT policies in European education and the processes linked to the implementation of them. To realise that, the members should generate, gather, distil and disseminate strategic information in the field of Information and Communications Technologies (ICT) in education.

The education systems are social systems with high degree of complexity. EENet therefore has adopted an approach on analytical work which best could be described as a holistic view. To describe this complexity with interweaving relations regarding ICT in school education, three levels can be analytically distinguished. These are a
a) societal or macro level - various "imperatives" which urge educational policy makers on all levels to introduce ICT and multimedia into the education system.
b) organisational or meso level - the inner-organisational structures and communication processes.
c) micro level – all cognitive and emotional aspects of learning and teaching such as the level of qualification, skill and competence of teachers or pupils and emotional barriers which prevent them from using ICT in new learning settings.

The three interrelated levels illustrate that the learning process itself is embedded in a setting determined by the competencies of all participants (pupils, teachers, headmaster), by the pedagogical content and materials used, by the organisational structure of the school, by the possibilities of access to ICT, by the educational policy and still many other factors on all levels.

1.2 Towards the EENet Observe project

EENet's work is mainly focused on the policy level of ICT and the network gathers data, information and studies relevant to all three levels described above. Due to the methodological difficulty of analysing the cognitive level (c) and the lack of consistent and transferable international research results, EENet's methodological priority lies on the societal and organisational levels a) and b). By keeping this multi-level complexity in mind, EENet seeks to avoid any unfortunate shortening of interpretations and conclusions. Despite this holistic demand, the availability and diversity of collected data in the actual Observatory shows the need for an intensive interpreting and framing process in order to get closer to the "whole picture".

These general assumptions were the framing conditions for the project proposal "EENet Observe - The EENet Observatory, a basis for synergy and transparency between initiatives at national and international level in the area of ICT in education". This project proposal has been accepted by the European Commission, Directorate-General of Education and Culture within the framework of the EU Socrates programme in December 1999.

1.3   Aims and methods in the "EENet Observe" project (SOC 335BOD)

The objective of the "EENet Observe" project is to create a platform demonstrating initiatives to introduce ICT in education systems. The information base contained on the platform should be available on the Internet to policy and decision makers, researchers and teachers and others in the field of ICT in education. The set-up, improvement and updating of this Internet platform and its linked communicative means named "EENet Observatory" is the core objective of the "EENet Observe" project.

The organisation of the EENet Observatory is based on the philosophy of 'decentralisation', thus it is organised as a distributed database. All data are collected and stored at national level in the member countries. The local servers are linked to the main EENet web server. The aim of the data collection is to identify key parameters of ICT development across the member countries.

The project work is embedded in EENet's continuing work process. Outcomes of the project served as contributions for the eWatch project in which EENet is presently co-operating with the European Schoolnet (EUN) and the MENON Network.

1.4   Results and outcomes

The Observatory Matrix: The virtual Observatory consists of a matrix where EENet members are positioned as columns and main parameters of ICT in education are depicted as rows. In the crossings between rows and columns stars represent different blocks of information. By clicking on a star, the user gets the information relevant for a specific ICT related phenomenon in a certain country. This matrix can be accessed through the EENet homepage at http://www.eenet.org. To construct the Observatory and to set into action was the main task for the EENet Observe project and that has thus been done successfully.

Trans-national Papers: EENet uses additional information files for preparing reports, which focus more on conclusions and recommendations. Such "Trans-national reflection papers" contains a horizontal cross-section of all national data referring to one theme. Three transnational reflection papers have been introduced in the appendix of this report (see chapter 6.2.1 to 6.2.3)

EENet's contribution for eWATCH: The eWATCH project (87816-CP-1-2000-1-BE-MINERVA-ODL) is an observation framework to support the understanding of innovation and change in education across Europe brought on by the widespread use of ICT. The work carried out in the project phases of the "EENet Observe" project (see chapter 4.4) has produced several valuable insights, experiences and results which contribute to the successful continuation of the eWATCH project. The identified ICT indicators and the developed methodology by EENet have already been integrated in the eWATCH methodology. Outcomes of the "EENet Observe" project will be fed into the future co-operation with the other eWATCH project partners.

Below follows a more detailed summary of the outcomes of "EENet Observe" :

- a model for a methodology to observe processes of policy integration,
- a framework of ICT indicators and parameters discussed and agreed among 13 European members in the field of ICT in school education systems,
- the EENet Virtual Observatory with an easy to navigate user interface and distributed national data files available on the Internet (www.eenet.org),
- about one hundred files in the Observatory containing national data on ICT in the school system from 10 different European countries,
- transnational Reflection Papers on different themes based on the data files in the Observatoriy,
- insights and experiences for contribution to future projects and co-operations, especially the eWATCH project.

2   About EENet

The European Experts' Network for Educational Technology (EENet) is an independent association consisting of institutions and organisations from 13 European countries. The network has been founded in January 1997.

All member organisations agreed to a series of actions and a framework for working together to generate, gather, distil and disseminate strategic information in the field of Information and Communications Technologies (ICT) in education.

EENet's mission is to create a better understanding of ICT policies in European education and the processes linked to the implementation of them.

2.1   EENet's Objectives and Activities

EENet's objectives are:
- to collect, share and analyse information regarding ICT developments, pilot projects, and implementing results beyond the core of the network,
- to advise educational establishments and policy makers at local, national, and European level.

The activities of EENet are:
- to develop monitoring and observing strategies in the field of ICT policies in education,
- to write and discuss reflections on developments and recommendations for actions,
- to inform each other on important national developments,
- to co-operate in international projects,
- to have close links to other European networks, activities or partnerships in this area,
- to stimulate a public discussion through printed and web-based publications and presentations on national and international conferences and workshops.

2.2   Members

Diagram 1: EENet member states (April 2001)

As of April 2001 EENet has thirteen active members: Austria, Denmark, Finland, France, Germany, Greece, Italy, the Netherlands, Norway, Spain, Sweden Switzerland and United Kingdom (for a complete list see Appendix 6.4). Member organisations should be recognised as central or national focal points of ICT in education. They manage significant projects, are experienced in disseminating information and advice to schools and colleges as well as users generally, and they are close to their education ministries, though not necessarily part of them. Negotiations with other countries, EU and non-EU member states, have already taken place, for example Ireland, Estonia, Poland, Hungary.

3   The EENet approach on analytical work – a holistic view

3.1   A holistic view on ICT in education

The introduction of computers in schools started in the 1980s. At that time, programmes to equip schools and educational institutions were being initiated in most European countries. Using word processing, spreadsheets or databases and learning computer science basics were the first steps towards acknowledging the educational role of ICT.

After a period of basic computer training schemes, the network paradigm enters the educational sphere. The Internet with the World Wide Web (WWW) and online services have grown exponentially and have become an integral part of public educational policies and private activities in the educational market. Ambitious objectives to connect all schools to the Internet and to set up teacher training programmes can be found in almost every national policy paper and strategy plan for the information society. National school networks, educational servers and global co-operative learning projects indicate this new shift in educational use of technology.

Due to its universal impact, ICT moves from an isolated subject area taught in a computer room to a cross-subject, methodological and organisational issue in school. ICT is not only a subject of learning, but can also shape innovative methods of teaching and learning. The level of integration of ICT in schools ranges from applying ICT as a teaching aid to being a fully networked media school where project-oriented learning in a virtual environment transcends subject borders and introduces new places to learn. In this respect, ICT is a "non-subject" and becomes "invisible" when taken for granted in every day usage. Coping with this integration process implies a great deal of organisational restructuring, additional qualification for all participants and continuos technical support. In the beginning of most ICT diffusion processes in school education, this integration work is conducted by single enthusiastic groups of teachers.

Meanwhile, it is quite clear that a reliable technical infrastructure is one important precondition for fully exhausting the potential of ICT in schools. The more ICT applications and infrastructure are available, the more a demand arises for merging financial, organisational and technical issues into a strategic and sustainable development plan on school or regional level, involving school authorities, headmasters, teachers and external public and private partners.

In order to describe these complex, interweaving relations regarding ICT in school education, three levels can be analytically distinguished.

a)   On the <u>societal or macro level</u> the integration of ICT and multimedia into the education system is a complex crossing of various needs, interests and pushes. It is possible to identify some of these interrelated "imperatives" which urge educational policy makers on all levels to introduce ICT and multimedia into the education system.

b)   On the <u>organisational or meso level</u> the school can be viewed as a learning organisation in the process of restructuring. Observing the school in its environment draws the

attention to inner-organisational structures and communication processes. A holistic view on the complexity of using ICT in school education requires an analysis of internal and external communicative structures. This includes the communication between the school management and authorities, teachers and pupils, parents and external partners. With regard to future challenges of schools in the information society, it is often mentioned that seeing the school as an open and learning unit becomes a crucial factor for successful organisational development. A further step in differentiating the social system of the school focuses on the social interaction in the classroom. ICT can support more learner-centred learning environments, and can have an influence on the shift of roles taken by teachers and pupils. All communicative and social actions transcending the individual mind's world belong to this level.

c)	On the <u>micro level</u> all cognitive and emotional aspects of learning and teaching are summarised. This refers not only to the level of qualification, skill and competence of teachers or pupils, but also to emotional barriers which prevent them from using ICT in new learning settings. Initiatives on meso and macro level have to take these reasons into account by including awareness-raising and supportive measures as well as targeted qualification schemes. Effects and impacts on this level are very difficult to observe or even to measure. They have to be converted to an observable level in order for us to judge the effectiveness of ICT in education.

When elaborating on the societal level (a), several "imperatives" can be listed which have an impact on the actual situation of ICT integration in education. They give reasons for pushing a restructuring process and - to a certain extent - can be found in most of the strategy plans and policy papers on education in the information society.

- *Pedagogical imperative:* ICT and multimedia can enrich the learning process by giving a multi-sensory impression of the content, by introducing new communication experiences or by stimulating project-oriented learning in teams. As cognitive research studies have shown, multimedia may increase the effectiveness of learning under certain conditions. These new technologies have a large pedagogical potential for developing learners' abilities, if they are embedded in an adequate communicative, social, organisational and technical context. In fact, this embedding makes it difficult to measure the effectiveness of ICT in education despite many best practice examples.

- *Educational policy imperative:* Educational policies determine the conditions under which ICT can be integrated in the learning process. The autonomy of schools, the role of teachers, the policies of using digital content and the extent of ICT integration in the curriculum are relevant factors in a possible educational reform. Media form the way we communicate in an organisation, and they can promote organisational reforms of educational institutions and change administrative procedures.

- *Economic imperative:* The skills and competencies in ICT and multimedia taught in the education system secure economic competitiveness and employment in the future. If education is to prepare for future life in the information society, ICT and multimedia have to be integrated into the classroom at some point. Not only the investment in human capital of the future, but also the development of a European and national educational multimedia and ICT market, represents a strong economical imperative.

Underlying economical interests are also present when introducing distance learning, and computer-based learning offers cost-effective ways of delivering learning content. This imperative may be stronger in vocational training and higher education than in general education. On the other hand, the introduction of ICT in education is not only a large one-time investment, but requires ongoing financial support for maintenance. Zones in which the economic imperative merges with public interests often yield to various forms of public-private partnerships.

- *Political imperative*: Modernising the education system by providing access to new technologies is a topic on every political agenda. From an international perspective, the comparison of national financial efforts and equipment status with that of another "higher ranking" country has always been a useful political argument for action (charts showing pupils-per-computer ratio by country are typical examples here). Within an education system, the equal distribution of access to ICT is a strong political imperative to avoid social disadvantages for certain geographical areas or school sectors ("digital divide" or "information rich" and "information poor"). Acting against any forms of "knowledge gaps" forms a social-political imperative based on societal values.

- *Cultural imperative:* Culturally specific content has to flow into the world of new media. ICT and multimedia provide new ways of cultural reproduction and of presenting cultural identity. This imperative is - in combination with the economic imperative - visible in European strategies of ICT and in the establishment of software markets with national respective European content.

- *Technological imperative:* This imperative is often explained as the opposite of pedagogical responsibility: the driving force should not be the available technical possibilities or potential, but what is socially and pedagogically reasonable and wanted. Nevertheless, new technology changes the ways of storing, organising and distributing information. With the arrival of the computer, technology even processes information, which provokes pedagogical questions about whether certain skills should be taught and learned with or without the support of information technologies. This debate started with the pocket calculator in mathematics, but nowadays, more complex cognitive processes can be executed by computers. It is the "mediality" of all communications, be it oral speech, printed books or multimedia that needs to be reflected upon in concepts of a "new literacy".

These imperatives are not isolated, but interrelated and linked. Learning takes place in a specific environment, be that institutionalised in a school or in a virtual space on the Internet accessible from home or from school. To a certain extent, existing structures like the content of the curriculum, the integration of media in the curriculum or the inner organisation of schools can be regarded as effects of these imperatives.

The three interrelated levels - a) the societal, b) the organisational and social, and c) the individual-cognitive level - should help illustrate the complexity of ICT in education: the learning process itself is embedded in a setting determined by the competencies of all participants (pupils, teachers, headmaster), by the pedagogical content and materials used, by the organisational structure of the school, by the possibilities of access to ICT, by the educational policy and many other factors on all levels.
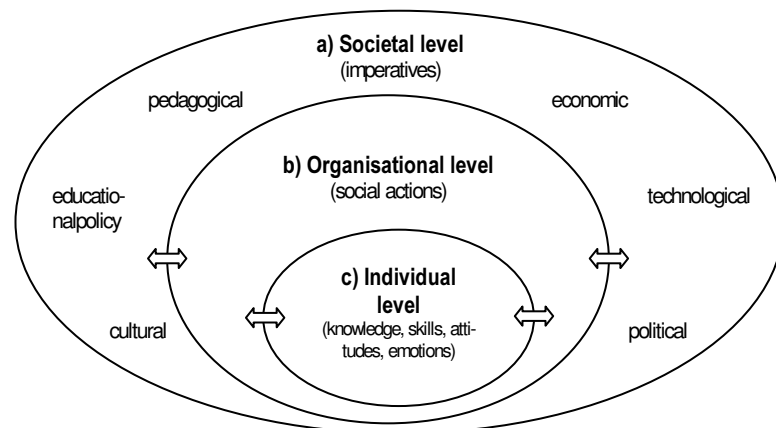
Diagram 2: Three levels of observation

This sketch is not intended to be a theoretical model, but a way of structuring the levels of complexity. In order to depict developments in ICT in education adequately, it is not sufficient to focus on single parameters such as access to equipment or teacher training. From a holistic point of view several levels, including both cognitive, organisational and societal factors, need to be taken into account.

3.2   The historical development of EENet's work

In EENet's first working phase, country status reports were written in a common structure, then shared among the members for discussion before serving as a basis for the first EENet report *"How learning is changing: information and communications technology across Europe"*, which was published in 1998. The report can be downloaded as a PDF-file from the EENet website at http://www.eenet.org/index_publications.html.
Soon it became clear that strict formalisation and standardisation does not yield an adequate depiction of the status of ICT in the field of education, where education systems and settings vary from country to country or even from region to region.

Due to the rapid developments in the field of ICT in education and the complexity of interweaving and interdependent factors like accessibility of ICT, teacher qualification or policy issues, EENet members decided to set up a more dynamic "Observatory" with descriptive parameters on the Internet, to complement the written reports.
The brief summary above of the development of the network highlights an important issue. The network started with something best described as round table discussions where representatives from different countries described ICT developments in the respective country. In search for a more systematic format country reports were written and to reach further an ambition to develop a survey form for data gathering grew in the network. Thoroughly explored this latter strategy showed to be unrealistic. The education systems in the countries represented in EENet are very different from each other and all data gathered has to be contextualised to be clearly understood. Therefore, also all comparisons between countries are an advanced task in need of very much information in many different variables. EENet

found that some of these could easily be described quantitatively but to a large extent EENet had to rely upon qualitative information to meet our tasks. EENet decided to work in another way than with a traditional survey research tool. The solution EENet found was to build a distributed virtual observatory, which allowed the user to work with both quantitative and qualitative information and which would cater for a holistic approach when analysing the information.

3.3   Towards the "EENet Observe" project

EENet's work is mainly focused on the policy level of ICT and gathers data, information and studies relevant to all three levels. Due to the methodological difficulty of analysing the cognitive level (c) and the lack of consistent and transferable international research results, EENet's methodological priority lies on the societal and organisational levels [a) and b) see diagram 1]. By keeping this multi-level complexity in mind, EENet seeks to avoid any unfortunate shortening of interpretations and conclusions. Despite this holistic demand, the availability and diversity of collected data in the actual Observatory shows the need for an intensive interpreting and framing process in order to get closer to the "whole picture".

These general assumptions were the framing conditions for the project proposal "EENet Observe - The EENet Observatory, a basis for synergy and transparency between initiatives at national and international level in the area of ICT in education". This project proposal has been accepted by the European Commission, Directorate-General of Education and Culture within the framework of the EU Socrates programme in December 1999.
The following chapter describes the "EENet Observe" Project, its objectives and outcomes.

4   The "EENet Observe" Project (SOC 335BOD)

4.1   Objectives of the project

The objective of the "EENet Observe" Project is to create a recognised platform for synergy and open for transparency between initiatives at national and international level. To provide this, it is necessary to make the information base available on the Internet to policy and decision makers, researchers and teachers and others in the field of ICT in education or related areas and inviting them to use the data at a basis for cross-national reflections and to give feed-back to EENet on the usability of the data available. The set-up, improvement and updating of this Internet platform and its linked communicative means named "EENet Observatory" is the core objective of the "EENet Observe" project.

The organisation of the EENet Observatory is based on the philosophy of 'decentralisation'. The Observatory is thus organised as a distributed database, i.e. all data are collected at national level in the member countries; the data are filled into style sheets by the member in each country, and the national material is stored on a local server placed in each member country. The local servers are linked to the main EENet web server, presently placed at and maintained by ecmc, the German member. This decentralised organisation has been established to ensure a minimum of administration and maintenance on the part of the member administering the EENet web server and to enable each member country to update and make changes in the national material flexibly and independently.

The aim of the data collection is to identify key parameters of ICT development across the member countries, enabling the hallmark of EENet work, i.e. qualitative and strategic analyses on the basis of which, among other things, qualitative and relevant input can be prepared on different aspects of ICT in education and offered to specific target groups at both national, European and international level.

The project is parted in three phases which are described in more detail in chapter 4.3. With regard to the Grant agreement (No 1999-1663 / 001-001 SOC-335BOD) the project started on 20 October 1999 and shall end on 30 November 2000. Due to the transformation of the project managing organisation CTU (Denmark) to LLD (Denmark) and shifts in personal responsibilities within these organisations this final report and the date of completion have been delayed.

The duration of the project is embedded in EENet's continuing work process. Outcomes of the project served as contributions for the eWatch project in which EENet is presently cooperating with the European Schoolnet (EUN) and the MENON Network.

4.2   The responsibilities of the Partners

Project management:

The project management was placed with The Danish National Centre for Technology-Supported Learning (CTU), who also had the function as Secretariat for EENet up until 24 March 2001. During the duration of the project CTU was transformed into Learning Lab Denmark (LLD). In November 2000 Learning Lab Denmark announced change in project management for the CTU project SOC 335BOD. The project manager is analogous to the acting director of Learning Lab Denmark (at that time Ms Susanne Panduro).

Web development and maintenance:

The responsibility for developing and maintaining the EENet website (www.eenet.org), including the "Observatory" was placed with ecmc, the German member of EENet. Based on the sponsored prototype, ecmc developed a new navigation scheme for the website by integrating pull-down menus and new buttons. All tasks related to the virtual presentation of EENet and the observatory, except the decentralised data files with national data (see below) were carried out by ecmc, including:

- hosting of website
- programming and design of web pages
- developing and updating of templates according to the EENet decisions
- installation and maintenance of communication tools (email listserv, discussion board, news section).

Activities on national level undertaken by EENet member:

Each EENet member is responsible for

- collecting relevant data and sources according to the templates of the Observatory,
- publishing these templates on a local webserver which will be linked to the EENet Observatory,
- updating these national data files regularly or at least half a year,
- writing a national summary report and publish them in the observatory,
- attending EENet meetings to present and discuss the results,
- promoting the EENet activities on national level.

Trans-national papers:

A smaller group of EENet members have been responsible for the preparation of trans-national papers based on the data gathered within selected themes (see examples in chapter 6.2.)

External contacts of the project and presentation:

The Chair has been responsible for the external contacts in relation to the project, and has together with other EENet members presented the project at different occasions across Europe (see dissemination activities, chapter 6.3).

4.3 Developments – Report on the work

The following chapter deals with the developments in the projects, divided into three phases.

4.3.1 Phase 1: Further development of virtual Observatory

The fist phase of the project (15.11.99 - 15.01.2000) concentrated on the improved technical implementation of the Virtual Observatory. Two technical options have been discussed:
1. One large database with a precisely defined structure and format: a database management system ensures input and output of information, access rights, lay out design but has limitations with regard the format of the data.
2. Decentralised and distributed static web pages, located at the servers of the EENet members. A matrix functions as a switchboard (connecting point or jump table). The members are responsible for the publication of the web pages and have more freedom in formatting the data.

In this phase it has been clear that the input categories and ICT indicators will be subject to constant review, discussion and adjustments with the aim to continuously refine the data structure. Due to the ongoing discussions concerning the input parameters and the variety of educational systems/national structures in the member countries the members decided upon the decentralised and distributed web pages (option 2).

The following diagrams illustrate the rows and columns of the Virtual Observatory:
The columns contain the national data concerning the indicators and parameters. The flexibility of decentralised web-pages allows also federal country structure to be represented the matrix:
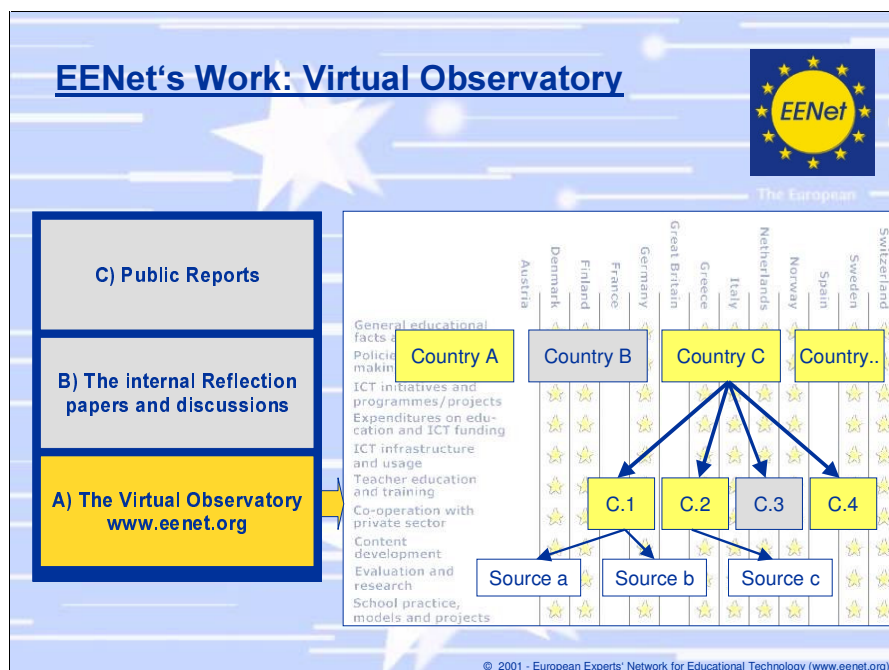
Diagram 3: Country columns in the EENet Observatory

In the rows of the Observatory ten major issues have been identified and differentiated. The parameters listed in the Observatory are a result of an extensive definition process among EENet members during phase 1. They are intended to

- reduce the variety of different national educational frameworks in Europe to a common denominator (issues or parameters), be specific enough to depict relevant information and developments,
- be adequate for providing a holistic and informative platform for further interpretations and recommendations in the field of ICT in Europe.
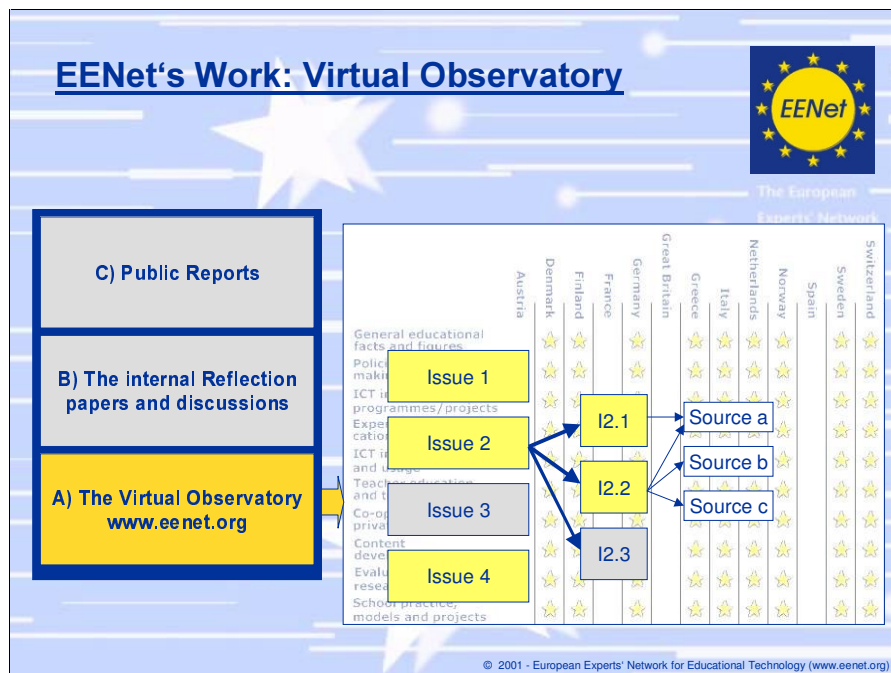
Diagram 4: Issue or parameter rows in the EENet Observatory

Outcomes:
Templates have been developed in order to ensure a homogeneous way of presenting the data gathered and filled in the Observatory.

The members download the templates, rename them and store them in their own server. Below the description of the installation process is shown (accessible through the "members' area":

How to Edit the Observatory
Each file ("xy-nnnn.html") represents one "star" in the Observatory and has to be adapted by each country (column). Please follow the steps listed below in order to install the files and to link them to the Observatory home-page:

1. Please let me know the full adress (URL) where the template-files will be located (e.g. the French member uses the directory: "http://www.educnet.education.fr/eenet/"

2. Download all listed xy-files.

3. Rename all files by replacing "xy" with your Internet country code, e.g. the member from France renames the file "xy-0100.html" to "fr-0100.html". Please do NOT use capital letters. Please use "html" as file suffix.

4. Edit each file by using a Web-Editor e.g. Netscape Composer.

5. Publish (copy by using "ftp") the files (e.g. "fr-0100.html" ..."fr-3000.html") to the directory listed in step 1. Please use ONE directory for all files.

6. If you are a "Transnational Editor" please also save the file "tn-xxxx.html" in the same directory folder (free text - no template).

The next step for the members is then to adapt the templates to the data and input according their needs.

Working with the web the inconvenience of the original navigation tools, e.g. not having the possibilities of going from one data item to another in the matrix, and the need for new and improved navigation tools, such as pull down menus was realised. The pull-down menus were programmed and implemented in this phase.

In the process of setting up and updating the Observatory some observations were made:
-   EENet partners need to adapt their web pages to the templates: whenever the template changes each file has to be changed by the member.
-   A decentralised Observatory pushes more responsibilities to the members – they have to handle the web publication themselves.
-   During the first phase, the prototype was opened to a restricted reference group (EENet members, the European Commission, as well as 2-3 external experts) for a review. The access was restricted by password.
-   The result of this review led to more rows and columns and better defined and improved input parameters.

4.4.2   Phase 2

An adjusted observatory in terms of comparable standards for representation, input categories and ICT indicators, tables etc. was developed in this phase 2 (15.1.2000 - 1. 4.2000). With regard to the refinement of input categories and ICT indicators, this was subject to constant review and adjustments also during phase 2 of the project. Altogether 10 major issues and indicator with about 80 sub-categories have been identified:

- General educational facts and figures
- Policies and policy making bodies
- ICT initiatives and programmes / projects
- Expenditure on education and ICT funding
- ICT infrastructure and usage
- Teacher education and training
- Co-operation with private sector
- Content development
- Evaluation and research
- School practice, models and projects
- Summary

The full description of these parameter rows can be found in chapter 4.5.1.
The reference group established during phase 1 acted as reviewers also in this phase.
Furthermore, efforts were put into building up a full and comprehensive content base, comprising collected and up-dated data from all EENet member countries.
During the members meeting (Oslo: 4-5. February 2000) analytical notes and reflection papers were discussed based on data from the EENet Observatory.
The database was made public at the end of phase 2. Thus offering an open accessible source of information on the web. The Observatory was duplicated to the public area, except the transnational papers and the reflection papers.

Problems occurred:
Members need to find within their organisation persons who are familiar with the web and have the resources to produce the relevant information items in English language. The continuity of the work can be threatened by changes among the persons working in the network.

New EENet member in Phase 2:
EENet's first working meeting in 2000 took place in Oslo (Norway). The "Ministerie van Onderwijs, Cultuur en Wetenschappen" (the Netherlands Ministry of Education, Culture and Sciences) is welcomed as a new member of EENet. The Netherlands completed their national data columns shortly after becoming member of EENet.

4.4.3   Phase 3

The workflow in the third phase of the project (1.4.2000 - 14.11.2000) has been complicated. The heavy workload and the major changes in organisational structure during the transformation of CTU into LLD affected its possibilities to act as project management and the secretariat of EENet. The final report has therefore not been completed in time and some activities have been continued after the end of phase 3 with own EENet resources.

During this phase analytical notes and reflection papers based on data from the EENet database have been written, discussed on the emailing list and during the EENet members meeting in this phase. The meeting took place on invitation of the National Board of Educa-

tion in Helsinki (Finland). Three transnational reflection papers have been written (see chapter 4.5.2 and Appendix 5.2)

The early EENet report was made available on the web in addition to the printed version.

Furthermore the methodology report "Observing how learning is changing" can be downloaded from the EENet website. This report describes results from the working phases 1 and 2. The report has been published in print in February 2001 with EENet's own resources.
(see http://www.eenet.org/index_publications.html)

An objective of phase 3 was also to promote the accessibility and use of the Observatory and the information available there. This phase therefore comprised further promoting activities targeted at different user groups at both national and international level (see dissemination activities, chapter 6.3). For example, results of the project have been presented at the EDEN Conference "Open Classrooms in the Digital Age" in Barcelona (Spain) on 21 November 2000.

The individual EENet members are responsible to establish contact with relevant ministries, bodies and initiatives at national level as part of the promotion of the EENet Observatory. As an example it can be mentioned, that a number of contacts have been made to e.g. the Danish and Swedish Ministries of Education, to both the State and the Federal Ministry of Education in Germany.
Promoting activities in Italy include for example the translation of the EENet Report *How Learning is Changing* into Italian, being very active in supplying information on EENet to all relevant parties, etc.
Also, contacts between EENet and other data collecting initiatives like for example the EUN has taken place.

EENet has been approached by the Commission and has been invited to take part in discussions with other networks and associations about key indicators of ICT and education. Presently EENet is co-operating with the MENON Network and the European School in the eWatch project. EENet will continue to focus on a continuous reflection and evaluation process on policy level.

4.5 Results and outcomes

4.5.1 The Observatory Matrix

Organisation and structure

The virtual Observatory consists of a table or matrix where EENet members are positioned as columns and main parameters of ICT in education are depicted as rows. Each member takes care of his own data gathering and of the updating and publishing process on the Web. Each star in this matrix represents a block of information relative to its position in the matrix. By clicking on a star, the user gets the relevant information, which is usually structured in further sub-headings. This decentralised matrix can be accessed through the EENet homepage at **http://www.eenet.org**.
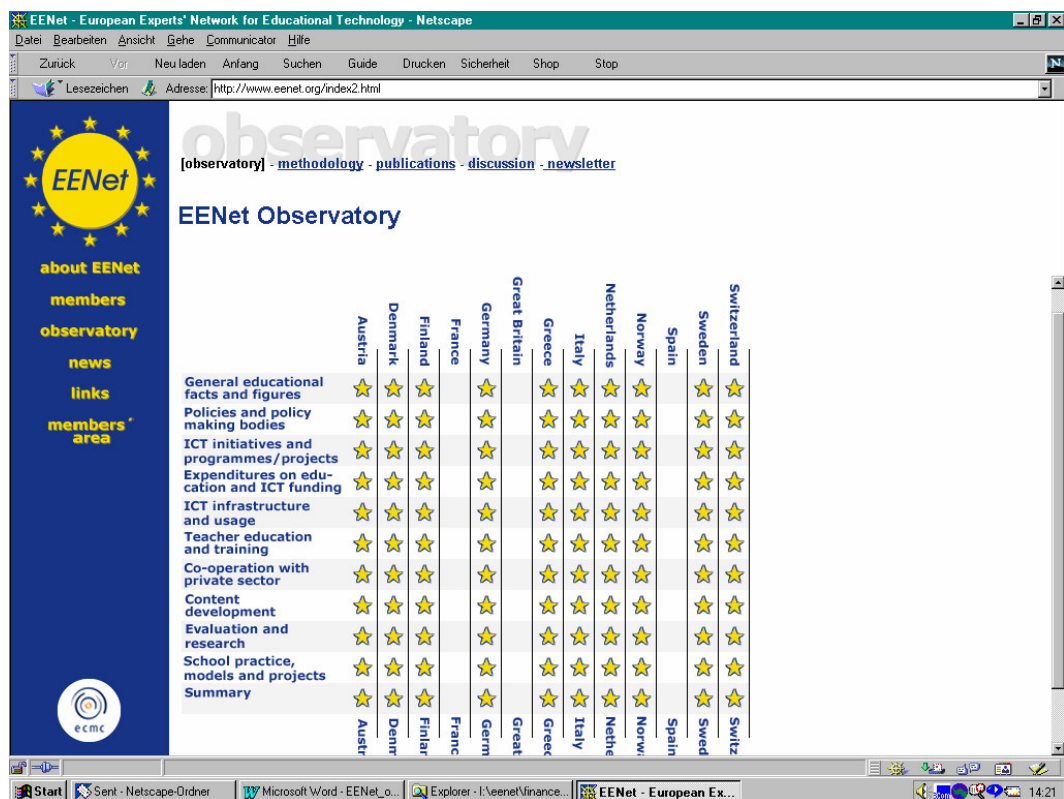
Diagram 5: Screen Shot of the Observatory at http://www.eenet.org (August 2001)]

EENet members are responsible for the content in their country column. This open and decentralised structure can be expanded with new members' columns. On a lower level, additional sub-columns could be introduced to illustrate federal structures inside a national column.

Parameter Rows

The rows in the matrix of the Observatory contain the main parameter categories. Ten main parameters relevant to ICT in education have been identified by EENet members:

(a) General educational facts and figures
(b) Policies and policy making bodies
(c) ICT initiatives and programmes / projects
(d) Expenditures on education and ICT funding
(e) ICT infrastructure and usage
(f) Teacher education and training
(g) Co-operation with private sector
(h) Content development
(i) Evaluation and research
(j) School practice, models and projects
(k) Summary

These ten content parameters contain sub-categories, which will be described in more detail below. All these categories and sub-categories make up the templates. All information in these categories should carry a reference and source (WWW link).

(a) General educational facts and figures
A basic introduction to the general education system is given in the first row of the matrix. Most of this information can be quoted from ministerial servers, national statistics agencies and Eurydice - The Information Network on Education in Europe.
- Structure of the national educational system
- Numbers of schools (in each sector)
- Numbers of teachers (in each sector)
- Numbers of pupils (in each sector)
- Links and sources

(b) Policies and policy making bodies
This row identifies policies and policy making bodies relevant to ICT in education. Ranging from centralised in one national ministry to decentralised in federal states, local European educational policies are defined in different ways.

In general
- Are there national aims, policies and strategies for ICT in education?
- Where are they defined ?
- Links

Policies and policy making bodies
- Main bodies
- Key documents
- Addresses
- Links

(c) ICT Initiatives and programmes / projects
All EENet member countries have introduced special initiatives, programmes or projects for promoting ICT in school education. These programmes are usually linked to national action plans describing strategies for moving towards the information society.
- Description of national / regional initiatives / programmes / projects
- Research and evaluation

- Key documents
- Partners
- Funding
- Links

(d)   Expenditures on education and ICT funding

Financial figures on ICT in school are separated into a national level and a local school level. Figures may differ greatly between different types of schools, and even between regions in one state. Some figures may not be available for certain types of schools.

Furthermore, the costs for telecommunications and Internet providers have an impact on the diffusion of ICT in education.

National
- Educational budgets
- ICT funding
- Links

Local
- School budget / authorities
- Expenditures on ICT - hardware / software
- Expenditures on networking / telecommunications
- Expenditures on teacher training
- Expenditures on support / maintenance (personnel)
- Links

Networking / telecommunication costs
- Companies and providers
- Rates
- Special rates for education
- Links

(e)   ICT infrastructure and usage

Although a figure like the pupils-per-computer ratio is only one parameter among many others, it often occupies a dominant position in status presentations of a successful integration of ICT in education. The diversity of existing statistics on ICT in schools throughout Europe makes it hard to define one unified framework. EENet has tried to identify some parameters, which describe the actual accessibility and usage of ICT. It shows that many of the data items listed below are not available in some countries, or they are not compatible as to school type or specification of technical equipment.

All statistical data should refer to usage both in school and at home, since usage in a non-institutionalised setting has a feed-back on the usage of ICT in the learning setting at school.

Hardware
- Computers (numbers, explanation of types and operating systems, types of networks (LAN))
- Internet connections, if possible with details on:
  - Type of Internet connection (modem, ISDN, router-LAN / single PCs)

- Location of Internet access points (classroom, library, computer lab, access at home, teachers' room)
        - Percentage of schools connected to Internet (from all classrooms and from teachers' study room)
        - Percentage of schools with a homepage
        - Internet Service Providers (ISP)
- Other available technical infrastructure (video projector, server etc).

Software
- Types of available applications (word processing, databases, spreadsheets, Internet, E-mail, CD-ROM, games / edutainment, video conferencing, other programmes).

Usage
- Time spent with specified applications and infrastructure at home and at school.
- The use of ICT in different subjects (integrated into the whole curriculum, ICT used in parts of the curriculum).
- The use of ICT on different class levels.
- Technical maintenance and support (by teachers, by external partners, managing services)

Budgetary items
- Amount of money allocated for
        - new hardware and software investments
        - maintenance and technical support
        - staff development.
- School tariffs for Internet use or educational software.

(f)   Teacher education and training
In general, initiatives and programmes on ICT in education also include teacher qualification schemes ranging from courses of a few days to extended long-term qualification programmes. Both teacher education (pre-service training) and in-service training should be covered.

Pre-service training
- Initiatives and programmes
- Bodies and partners
- Statistics on pre-service training
- Duration
- Costs and funding
- Evaluation
- Links

In-service training
- Initiatives and programmes
- Bodies and partners
- Statistics on in-service training
- Duration of training
- Costs and funding

- Evaluation
- Links

(g) Co-operation with private sector

The development of educational markets and products, the ICT skills needed in the future and limited financial resources are often cited arguments with regard to co-operation between the public and private sphere. Possible relations range from one-time sponsoring to long-term co-operation of mutual benefit. In every case, the management of these relations requires sensibility in terms of the different imperatives involved (pedagogical versus economical imperatives).

- Types of co-operation (national agreements / initiatives, regional projects, foundations etc)
- Description of public-private partnerships
- Links

(h) Content development

Content, regarded as one of the bottlenecks in the successful integration of ICT in education, is especially challenging for smaller language markets. The development of content in digital format merges cultural, educational and economic imperatives.
- Policies
- Programmes / initiatives and financing
- Language versions
- Private content providers
- Public content providers / educational servers
- Educational software market / facts and (financial) figures
- Key and critical factors
- Links

(i) Evaluation and research

Results of evaluative studies and research programmes give important feedback on the effects and problems regarding the introduction of ICT in schools. This row indicates larger programmes without going into methodological details, and provides links for further reading.
- Large research programmes on ICT in schools
- Partners
- Publications
- Links

(j) School practice, models and projects

While all the previous nine parameter rows describe information on the macro level of developments, this last content row provides examples of school practice, models and projects. The first sub-category links to existing national databases of schools and projects. Before giving a few illustrations of single schools and projects, reasons for selecting these are given.

Databases of school projects
- Sources

Illustrations of school practice, models and projects
- Key factors for selecting the following schools

Illustration 1..3
- School community and setting
- School as an organisation
- Background to development and projects
- Physical setting
- Technical setting
- Competence development and knowledge
- Project description and activities
- Contact and address

(k)   Summary

This row sums up all the previous ten parameters and gives an overview of the national status of ICT in school education. The sub-categories are identical with the headlines of the main rows.
- General educational facts and figures
- Policies and policy making bodies
- ICT initiatives and programmes / projects
- Expenditures on education and ICT funding
- Statistics on ICT
- Teacher education and training
- Co-operation with private sector
- Content development
- Evaluation and research
- School practice, models and projects

4.5.2   Transnational Papers

Apart from these ten categories and a summary row, EENet uses additional information files for preparing printed reports, which focus more on conclusions and recommendations. "Trans-national reflection papers" contains a horizontal cross-section of all national data referring to one theme. Trans-national editors are appointed by EENet, and summarise major developments in each parameter row. Conclusions drawn from this trans-national perspective will be discussed in the EENet group before being integrated into the published reports. While the summary reports compile central information vertically in a column, the trans-national reflection papers reflect upon parameter related developments in the different countries, horizontally.
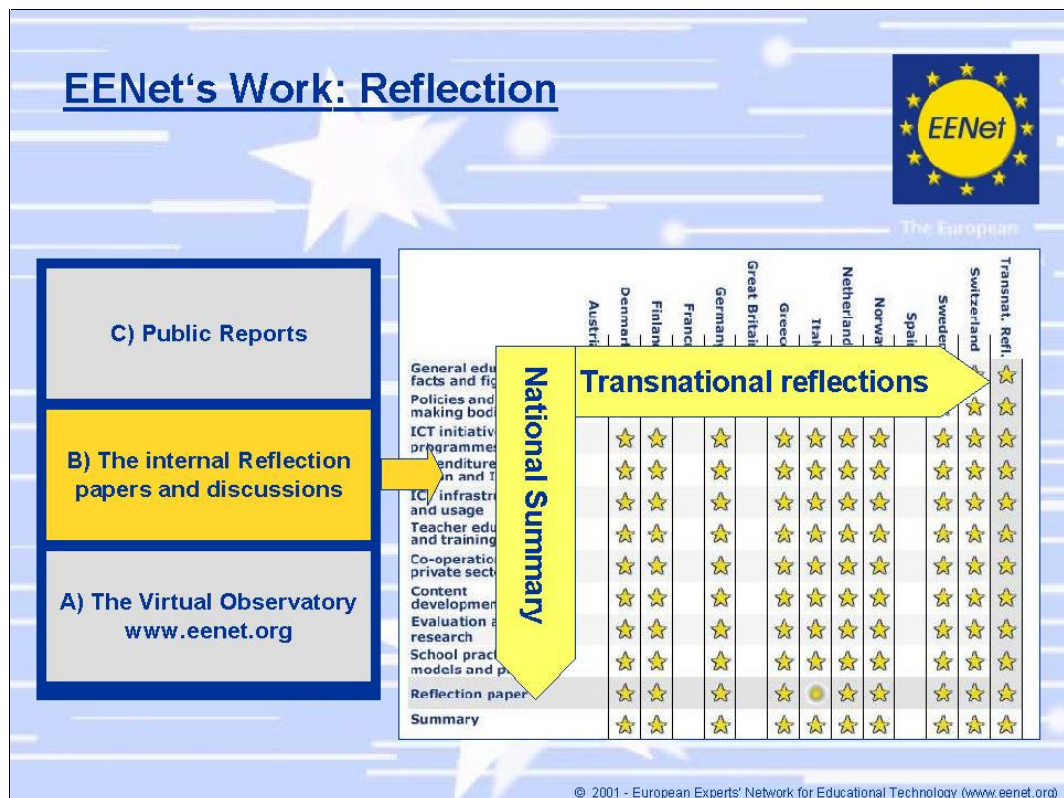
Diagram 6: Transnational Reflections and Summary files in the Observatory

As long as trans-national reflection papers are in progress they are stored in the EENet members' area, whereas when they have been discussed in the group and have been agreed, they will be published in the public part of the web page.
Three transnational reflection papers have been introduced in the appendix of this final report (see chapter 6.2.1 to 6.2.3):
   ▪ ICT in Education. Research and Evaluation across Europe.
   ▪ Public Education and Co-operation with the Private Sector
   ▪ How teachers and teacher training are changing

Furthermore, there is an EENet e-mailing list and a discussion forum only accessible to the members of EENet. These virtual tools support and document EENet's work and are used in between the physical working group meetings.

5 EENet's contribution for eWATCH

The following text - taken from the original SOCRATES/MINERVA Proposal - describes the objective of the eWATCH project (contract no. 87816-CP-1-2000-1-BE-MINERVA-ODL):

"The eWATCH project is an observation framework to support the understanding of innovation and change in education across Europe brought on by the widespread use of Information and Communication Technologies (ICT) and the emergence of the Information Society. eWATCH will provide support to the SOCRATES/MINERVA Action and other interested parties in the analysis of change affecting education. The eWATCH project identifies the following activity areas of interest:

- Monitoring public policies at national, regional and local level across Europe as regards the use of ICT including information on school markets and indicators
- Harvesting Field and Innovation Intelligence in the area of ICT-based learning
- Cataloguing innovative practices in schools and higher education establishments
- Promoting the dissemination and sharing of gathered knowledge, including policy and project results.

The aim of the eWATCH observatory is to provide an integrated perspective and a clearer support profile to observation activities related to ICT in education. Observation, evaluation and dissemination activities will aim at contributing to the monitoring of policies and practices in school and other learning communities across Europe. In order to foster the exchange of knowledge and to better monitor the implementation of educational policies, connections and collaborations with similar and complementary projects and networks will be established. The collaboration of the key "actors" in the field of learning-supporting technologies, namely the European Experts Network for Educational Technology (EENet), the European SchoolNet (EUN) and the MENON Network, will not only ensure a comprehensive and multi-perspective picture of ICT in education and of the overall changes that Information Society brings to education "market", but also they will guarantee a widespread dissemination of the results as well as the successful research "up-link", the "mainstreaming" of the results of pilot, research and development projects supported by the SOCRATES/MINERVA Action.
The eWATCH Project will involve networks of prominent European experts in the field of the use of ICT and related policies and interests in Education, across Europe. The scope of the project is to address the already identified needs for a consistent, well justified framework of documentation and analysis of the status and the change originated from the "maturity" of the existing educational models and the radical changes that Information Society brings to our everyday life."

The work which has been carried out in the three project phases of the "EENet Observe" Project (see chapter 4.4) has produced several valuable insights, experiences and results which contribute to the successful continuation of the eWATCH project.

The following table summarises some differences between EENet's observatory (see chapter 3) and some characteristics of the eWatch observatory from the EENet's perspective:

	EENet Observatory	eWatch Observatory
Purpose	Webpages to support the reflective and interpretative work of EENet which is summarised in written reports.	Database tool to support ▪ Monitoring of public policies regarding the use of ICT in educational systems, ▪ Harvesting Field and Innovation Intelligence in the area of ICT-based learning ▪ Cataloguing innovative practices in schools and higher education establishments ▪ Promoting the dissemination and sharing of gathered knowledge, including policy and project results .
Organisation	decentralised content pages (see elements) accessible from a centralised website (www.eenet.org): a Matrix with parameter rows and country columns	centralised knowledge management documentation and information system with web-interface
Elements	static but fairly free formatted webpages with parameter and subparameter headlines	strictly formatted data records with references to the source and annotations about the data.
Updates	decentralised and independently by EENet members (editing of static html pages)	editors who edit data records in a form accessible from the web
Technology	several Webservers of the EENet members	a modular, database-driven dynamic application platform.
Search function	no free keyword search, access via the matrix	key word search

The identified indicators and the developed methodology by EENet have already been integrated in the eWATCH methodology. Outcomes of the "EENet Observe" project will be fed into the future co-operation with the other eWATCH project partners.

6 Appendix

6.1 National Summaries

In the following the "Summary" row of the Danish column in the EENet Observatory is printed as an example. More national summaries are available on the Web at www.eenet.org.

Example: Denmark
General Educational Facts and Figures
The Danish educational system consists of three levels: basic school (the Folkeskole), youth education (gymnasiums, business colleges and technical schools) and higher education (universities and other institutions of higher education). The total number of schools was 3,375 in 1998 and there are both public and private institutions. The total number of teachers was 81,000 in 1997 and there were 807,220 pupils in 1997/1998. 40-45,000 students are admitted to higher education per year and for adult education the number is 50,000 per year.

Policies and Policy making Bodies
The aim of the Danish ICT policy is to ensure that the labour force is well educated in the area of ICT. Therefore the Danish government's policy is to integrate ICTs in all activities in the educational sector and to create an educational environment in which the individual citizen learns to take an active and critical attitude to technological developments.
The Danish ICT policy is carried out on a national, regional and local level in accordance with Parliament resolutions. The Ministry of Education and the Ministry of Research implement these decisions. Independent centres/bodies have been established in order to give advice on ICT educational matters to the Parliament, the ministries and the educational sector. The two major bodies are the CTU and the CIT.

ICT Initiatives and Programmes / Projects
The major national educational ICT initiatives and programmes are co-ordinated in the Ministry of Education, the Ministry of Research and the Ministry of Labour and in some educational and/or research institutions and centres. The most significant are the CTU, the CIT, the UNI-C, the Sector Network, the IT University and the Skole-IT.
Furthermore, there are several supporting services set up to help the ICT integration process in various ways. These are co-ordinated in different institutions, mostly public. The most important are the FC Skolekomm, the SkoDa, the EMU, the Orfeus and the Vidar.
Evaluation is usually carried out by an independent body on behalf of the Ministry of Education and research is taking place mainly in higher educational institutions or research establishments and is carried out in co-operation with the business community.

Expenditure on Education and ICT Funding
The Danish government plans to spend € 4,606.1 billion on education in 2000. The educational budget is equivalent to 7.5 per cent of the GDP and 13.1 per cent of public expenditure. The Danish government has appropriated €10.67 billion for ICT in the education sector on the Budget for 2000. The main responsibility for education lies with the Ministry of Education but responsibility for the gymnasiums, adult education and the basic schools is

delegated to the 14 county councils and the 275 municipalities respectively. The development of ICTs results in additional expenditure for the municipalities on the purchase of new computers and other expenses in relation hereto. In Denmark, the large majority of schools are connected to the Internet through the Sector Network which is provided by Tele Danmark. Other providers of Internet are Telia and UNI-2. Technically, the Sector Network can be seen as the electronic transport route that binds the educational sector together providing different services. About 75 % of the schools are entitled to subsidies from the Ministry of Education to cover some of their expenses related to ICT.

Statistics on ICT

On average there are 6.7 pupils per computer in the various Danish educational institutions and between 70 and 100 per cent of these have an Internet connection. All schools have access to the Sector Network. 65 per cent of Danish households have at least one computer and 45 per cent have an Internet connection. As to operating systems, it is estimated that about 90 per cent of Danish schools use Windows NT/95.

Most or all schools on and above the upper secondary school level offer access to ICT after school hours and the computers are usually found in computer rooms. 20 to 40 per cent of teachers in any type of school use ICTs in connection with teaching and even though about 90 per cent of all teachers have access to ICTs at home, only a little more than half of them use ICTs preparatory to teaching.

Teacher Education and Training

Future basic schoolteachers must complete a four-year education at the colleges of education and there are special courses for teachers in the vocational schools carried out by the DEL. For teachers in other types of schools there are specifically developed pedagogical courses preparing them for training in their professional areas.

A focussed ICT strategy was issued in 1998 with an action plan covering 1998-2001. In the Act on the Folkeskole (basic school) it is stressed that in the training of teacher students there must be a thorough integration of ICT in all subjects. For teachers teaching in other types of schools there are no acts or circulars regarding particular ICT qualifications for teachers but it is expected that teachers master the usage of ICT in general.

There are several national initiatives carrying out research on the kind of ICT know-how and integration strategies that are relevant for teacher education and the basic school.

As regards in-service training, it is taking place either in the individual institutions or externally e.g. at the DLH offering up-grading courses to teachers in basic school and in vocational schools.

As regards ICT courses, several programmes have been implemented in order to spread the knowledge about ICTs to the teachers on how to use ICTs in their teaching.

Co-operation with Private Sector

The private and public sectors have started co-operating in the educational area in order to enhance the cohesion between qualifications and skills and what is actually needed on the future Danish labour market. Private/public co-operation can be done in many ways as both public and private organisations receive funding for both public and private projects.

In the field of research there is close co-operation between large enterprises and higher educational institutions.

In the ICT area, the Ministry of Education and the CTU have set up a variety of actions due to the decisions in the Danish parliament. These initiatives are: the CTU Round Table Dis-

cussions, the Media Section Programme Subsidies, the Pioneer Project, the Futurekids Denmark, the Orfeus and the Sector Network.

Content Development

Being a small language area with only 5.5 million citizens it is considered necessary to provide the educational institutions with high quality digital educational software in Danish language. Therefore national and regional initiatives in this area have been initiated not only to make publicly produced materials, but also to stimulate and motivate private producers to make quality material by supporting them with e.g. free guidance or financial support.

The programmes and initiatives are: the Media Section which co-ordinates the Programme Subsidies, the Orfeus and the CTU with its call for project proposals in 1997 called "Teaching Materials in Networks".

There are several private content providers e.g. publishing houses producing and/or taking part in or just selling educational software and the Futurekids Denmark. The public content providers are the Ministry of Education with the implementation of the Pioneer Project and the Orfeus which is an independent institution.

On the Danish educational software market more and more traditional teaching materials are coupled with educational software. This is often offered and distributed via the publishing houses or the organisations that distribute educational teaching materials.

Evaluation and Research

In May 1998 the Committee on the strengthening of ICT research was established. The Committee has found that a focused effort in the educational area is needed and has made a number of recommendations aimed at improving ICT qualifications. The results have been the opening of the IT University in 1999, the establishment of the Danish IT University, West, and along with the IT University a number of projects related to ICT have been carried out in co-operation with the private sector.

School practice, models and projects

In this file, there are three examples of ICT projects carried out by Danish education institutions. The first is a project from a general upper secondary school, the next is from a technical upper secondary school, and the third is from a university. All these projects have received funding from the CTU.

6.2   Transnational Reflection Papers

6.2.1   ICT in Education. Research and Evaluation across Europe.

POLICY- AND PROGRAM-ORIENTED RESEARCH AND EVALUATION

Policy makers have the last decade set a new agenda for educational research. Through the sharp focus on ICT-related issues in new policy-making for the educational system, the need for systematic knowledge on how ICT can contribute to learning and school development has become acute. To a large extent the efforts to connect ICT and learning, ICT and teachers and ICT and educational institutions have been through large-scale programs. These programs have been initiated either on national, regional or local level situated in a context very much under influence of – at the time for starting the programs- the latest technological devices, versions, genres and formats.

In Europe there seems to be a main focus on research-based evaluation as the research strategy in relation to ICT in education. Such research activities are to a large extent commissioned or controlled by governmental authorities and carried out on short-term contracts. A majority of activities can thus be characterised by a top-down educationally-, led approach reflecting the importance of focusing more on educational criteria or educational policy rhetoric than technological ones. These activities are supplemented by research and evaluation activities connected to projects or program focusing more on innovation. The latter could both be focused on technological innovations for educational use, innovative uses of existing technologies applied to education or methodological innovation applied to education with (or without) the use of technology.

Many of these activities also seem to be of a short-term nature expected to deliver near-market results in terms of " best practice", software tools or methodologies.

What seem to be lacking are complementary activities that are defined more in the context of practice reflecting the opportunities and possibilities given today (bottom-up opportunity-driven research and evaluation) and long-term research independent of policy-making and program-implementation.

THE RESEARCH CHALLENGE

The main research initiatives seem to be driven by policy initiatives and reflect the need to evaluate reform policies as well as how they are implemented in practice.

The issues that confront research and evaluation in this new agenda are broader than technology. They are e.g. about:

- New visions of education of which technology is but one part of it. A vision may include curriculum, school and classroom organisation, technological infrastructure, administrative procedures, time- and space- issues, school- community relations and logistics and social factors.
- Learning and the need to find new ways to identify and assess the skills and knowledge that student gain from using technology.
- Teachers motivation for and the capacity of teachers to reflect on the use of technology resources and to align their uses with the learning goals and content standards of the curriculum.
- Evaluating technology implementation practice, curriculum integration strategies, and learning processes in order to make sound decisions for continual improvement
- Involving key stakeholders about what makes ICT effective.

Learning is never limited to a student's experiences with an educational system, a school, but extends to and is frequently dominated by interactions at multiple levels within educational institutions and by interactions outside these institutions like the community, family and peer groups.

These nodes of influence are not only lodged at different levels of aggregation, but they are also interrelated and in flux.

Thus same programs have been found to be fundamentally different at different school sites. And programs found effective after thorough evaluation have been found ineffective – and changed- when evaluated again after two or three years.

Although such observations and experiences are part of lessons learnt in educational research, they do not render educational research a hopeless enterprise. They do mean, however, that findings are inherently contingent.

Social phenomena such as the use of ICT to enhance learning contain so complex interacting factors that traditional research designs seldom yield valid and reliable information. Research designs should penetrate the effects of implementing technology at both individual, organisational or at system and community level.

Good research thus reflects its own methodological limitations and qualifies its conclusions. However, the high stake decisions linked to technology implementation press educators to demonstrate that technology makes a difference in learning. Many educators' fear that evaluation places their technology programs at risk if they cannot produce measurable results in a relatively short time. The message that needs to be conveyed about the effectiveness of technology is that implementation of any sort produces outcomes. These outcomes, however, will be different at different stages of implementation and has to be regarded in a long-term perspective.

Internet, multimedia and networked capacities of the technology infrastructure are radically changing the face of technology-related practices in education. However, this rich and constantly changing diversity of technology complicates nearly all research and evaluation in the field as well as policy making and implementation. When technology tools undergo rapid cycles of innovation, the types of questions that need to be asked or practices to be implemented are changing all the time. Policy-makers, researchers and practitioners struggle to keep up with the new innovations.

In order to cope with new developments, stakeholders from the policy level on down to the home, need information on how ICT changes teaching and learning, its organisational impact and the outcomes to be expected at different levels in school and at different stages of implementation.

"We cannot survive the random story anymore."
(Linda Roberts)

Throughout Europe governments has commissioned evaluation work as a follow-up activity of their national programs or ambitions in connecting Learning and ICT. Although research seldom offers more than ambiguous direction to policy, the transaction that is offered to policy-makers is research for legitimacy.
Researchers` reputations are enhanced when their ideas are realised in action and programs. In return, policy makers are able to claim that their initiatives reflect what the research "say an they gain a stamp of scientific approval for the causes they champion. These transactions are particular powerful when it comes to educational reforms since decisionsmakers routinely embrace findings that have not been tested or confirmed by practical application in classrooms.
The difference in data needs of policymakers and educators is particularly acute. While policymakers want to see data on the isolated effects of technology, educators need information that is tied to systemic practices. Most countries in Europe e.g. collects data on the number of PC`s in schools without relating this kind of data to how learning activities are organised in schools. Policymakers tend think of ICT as an additional to existing practice in schools, while educators see how the implication of ICT is systemic change. Policymakers tend to value summative evaluation reports documenting student achievement while teachers and administrators value formative reports reporting implementation results in or-

der to make sound decision about their implementation of ICT in classrooms and creating sustainability in the connection between learning and ICT.

Many kinds of data and analysis are important, but each has a tendency to fail to satisfy the other. The best hope of stimulating a holistic approach lies in motivating all stakeholders to see:

- The importance of technology as an effective component of the educational system
- How technology is and isn't capable of making a difference in curriculum and teaching
- How innovative practices of teaching and learning with technology require multiple measures in order to verify its impact.

Dialog among stakeholders plays a central role in research and evaluation efforts. Stakeholders must be attuned to common goals for the uses of technology, information needs, cultural terms, and methods for measuring outcomes. They must have consensus around roles and a clear vision of where they are going and the steps they need to take to get there. The existing research on ICT in education in Europe has so far documented that the process of integration is a slow one. A limited number of teachers can be characterised as frontrunners. The case is the same with the numbers of innovative schools. Questions are being raised around how the ongoing research and evaluation activities should change in order to bring forward knowledge that could increase the penetration of ICT in education. One has, however, to bear in mind that research itself might not be the answer. Although educational practitioners are the targets of reforms and the ongoing research and evaluation activity, they are not heavy consumers of educational research. As a result, researcher's insights on how to change educational practice is rarely communicated directly to the practitioners themselves. How to change this situation, is a great challenge for European researchers in the field.

6.2.2   Public Education and Co-operation with the Private Sector

Traditionally, the public sector has bought teaching and learning materials such as books and blackboards from the private sector (publishers, companies). The introduction of technical teaching aids has been steered by forms of public regulations, licensing and recommendations. Borders between the public and the private sphere had been more or less precisely defined in these traditional "client relations".

It seems to be that new forms of relations between the two spheres are rapidly evolving due to the progressing integration of ICT in educational systems. "Public-Private Partnerships" (PPP) became a buzzword in nearly all European action plans on ICT in education and a keyword in recently founded organisations such as the European Education Partnership (E.E.P.). Private engagement in the educational sector becomes more and more visible through campaigns, sponsorships and public-private initiatives (PPI).

Generally speaking, two groups of reasons can be distinguished: One deals with the general societal developments such as

- the transformation from the industrial society to the information or knowledge society which includes to some extend a convergence of economy and education. Knowledge and competencies become key factors in the society and the development of these open key qualifications is linked to the availability and the usage of ICT.
- The globalisation and concentration of media and ICT companies which operate on a world-wide level and represent a strong economical imperative. The private sector de-

velops the educational market not only with regard to selling products but also to long-term investments in education and training to ensure accessibility of human resources in the future.

- The transformation of the educational system responds to these societal transformations by increasing the school autonomy, by regarding school as a "learning organisation", and by opening the institution school to external partners. These concepts also lay the foundation for intensified contacts between the public and the private.

The other group of reasons, which pushes the idea of Public-Private Co-operations refers to ICT itself:

- ICT is expensive. In contrast to low-budget teaching aids such as books and blackboards, ICT are cost-intensive devices, which require full budgetary integration. Not only first time investments but also the ongoing costs and the "Total Cost of Ownership" require financial resources, which often exceed public budget limits.
- ICT requires continuous support: public schools usually do not have the staff and the resources to manage IT infrastructure professionally. In fact it is often argued that teacher should not be responsible for technology but for pedagogy. On the other hand IT companies have had experience in IT-management for decades.
- The integration of ICT needs pedagogical content. The development and production of quality content is labour and cost intensive. Alliances with professional content development firms can provide the educational sector with learning content; the private sector develops an educational content market.
- ICT requires training and qualification: technical equipment is not sufficient. Private Sponsoring oftentimes includes training courses for teachers as well. This brings up the question how to draw a line between instrumental qualifications (possibly carried out by private companies) and pedagogical qualifications (carried out by public teacher training institutions).
- The potential of ICT is not always obvious. Especially the high investments and the necessary restructuring of educational institutions provoke questions regarding the importance and benefits of ICT in education. Awareness-raising campaigns and initiatives such as "Netdays" demonstrate the potential of ICT usage in education and provide a platform for public-private co-operation at the same time.

The public educational sector is challenged to change and rethink its relation to the private sector: "The education system is not the only producer of knowledge - how can a co-operation be established and structured between producers of knowledge?" (Danish report) The complex societal upheavals in the context of the emerging information society require new strategies for shaping the relation between the public and the private sector. These strategies are not restricted to one-time sponsoring but include a variety of different forms and approaches. Different and intertwined economical, pedagogical, political, and cultural imperatives influence the framework in which public private co-operations emerge.

From the public sector perspective some reasons for co-operating with the private sector can be summarised:

- In times of low public funding, relations with the private sector such as sponsoring or price reduction enable public schools and school authorities to enhance their technical equipment and support.

- Content development as a Public-Private-Partnership has the potential to combine pedagogical know-how and needs with professional production technology.
- The educational system could import experienced and documented strategies for ICT management in schools from the private sector. Techniques like change management, IT Management and strategic planning have been used in private companies over decades. Although there are significant differences between schools and private firms, problems concerning ICT management are similar.
- By co-operating with private companies schools could enrich their school programme or profile in the region. The co-operation could facilitate the transition from school to work by offering students internships or additional insights in the work field.

From the private sector perspective some reasons for co-operating with the public sector are:
- The educational market is emerging and growing. ICT and multimedia at schools and private usage at home (in German: "Nachmittagsmarkt" - "the afternoon market") represent a great market potential for the hard- and software industry. The specific conditions of a national market (language, population, educational system) set the framework for public-private partnerships and for the stimulation of a market through public funding.
- Due to the number of parameters, which determine a possible market development (pedagogical usage, language specifications, target age group, technical limitations of older school computers, number of sellable copies, licensing) the private sector needs detailed data on the market framing conditions.
- Sponsoring activities and engagement in ICT events for education demonstrate investment in human capital for the future, which, at the same time, can be used for marketing purposes.

It has been pointed out that there are not only mutual benefits in the relationship between the two sectors. The public sphere carries the traditional pedagogical objectives, which transcends simple skills and qualifications needed for work. Pedagogy is grounded in a humanistic system of values (self-determined, critical, creative, responsible) and preparation for the future life in society is not restricted to the working sphere (Danish report). "Ambivalence and scepticism of the public opinion in regard to Public-Private-Initiatives" (Greek report) and the fear that private interests take control over the public good might characterise this difficult relation. The "friction" between the public and the private sector is regarded as an effect of their different ways of operating internally:
- The public sector often lacks consistency in policies, quality assurance mechanisms, and managerial competence. Creative approaches and innovative solutions sometimes become "stifled from the public sector's inertia and bureaucracy" (Greek Report)
- The private sector operates on economical basis, seems to be more effective and dynamic, but does not necessarily create solutions, which suit the pedagogical objectives and needs.

Dialogues between the public and the private side are necessary to develop commonly shared and supported action plans and programmes. Nevertheless one cannot neglect the fact that each side operates with different operations, based on pedagogical objectives on the one side or economical growth on the other.

In all EENet member states the co-operation between the public and the private sector is gaining importance although it is still a fairly new phenomenon in the field of public education. Several forms of co-operation between the public and the private sector can be observed. These forms can be analysed with regard to their field of application (e.g. awareness raising, content development, consultation), the type (e.g. one-time donation, project, institution), the partner involved (Ministries, private global players or small companies and local schools) and the spatial setting of co-operation (e.g. local, regional, national, international). The following table summarises possible co-operations between the public and the private sector.

Type	Sponsoring and Donations	Project development	Dialogue and Awareness	Institutionalised Partnership
Form	• ICT donations, • discount rates • used computer donations Directly to schools or establishment of institutions which organise the	Financial support to public/private bodies which carry out: • content development • qualification / training • research • consultation • Best practice models	Public and private actors carry out • Campaigns • Round table Discussions, • presentations • social advertisement	institutionalisation of a PP relation as a body (association, company) based on formal contracts. These bodies often serve as "interface"-institutions in between public and private interests.
Driving force	more product driven	driven by project objectives and content development objectives	politically driven by societal transformation and international "competitiveness"	politically initiated in order to exploit mutual benefits and develop future prospects
Duration	One time actions or limited time frame	mid term commitment depending on project duration	One time events or series of actions	permanent
Objective	Increase the level of ICT equipment (sometimes including skills training)	• stimulate content development • Set up of best practice models	• public awareness raising, • recommendations for actions, guidelines, • policy papers	• utilise potentials and synergies • conduct projects • stimulate developments
Public interest	Enhancement of ICT equipment and support in order to guarantee "modern education"	Stability and continuation of ICT integration, innovative and useful educational settings	Reformation of education, development of pedagogical values and aims	independent bodies which can act in fields where governmental bodies cannot. Access to private resources and expertise
Private interest	PR and marketing, long term market development, new user acquisition	Access to new markets, research results; lowering R&D investments	awareness raising as preparation for market developments promoting ICT and qualification in the information society, competitiveness	defined and reliable project development; marketing; market opening
Challenges / Problems	supporting the time after sponsoring, creating reliable support structures for an heterogeneous ICT mix which remains after sponsoring	market intervention; PP-agreements; know-how transfer	Converting results of dialogues into feasible and fundable action plans or projects	construction of contracts; balancing imperatives and opposing interests
Examples	• RAI funded installation of satellite dishes in Schools (Italy) • Apple initiative: "Schools can't wait", one free Mac for 2 bought. (Italy) • Deutsche Telekom sponsors free ISDN connections for all schools (Germany)	• Programstotteordning supports development of educational aids (Denmark) • InterActie!: PPP on educational programmes (Nederland) • TRENDS (European PPP project on in-service teacher training) • ETÄKAMU research on multimedia distance learning (Finland)	• CTU round table discussions in (Denmark); • Netdays Europe, ThinkQuest.	• Initiative D21, SAN e.V.: associations with public and private members (Germany) • ecmc: company with public and private shareholders (Germany) • Orfeus (Denmark)

6.2.3   How teachers and teacher training are changing

Information and Communication Technologies (ICT) are modifying our ways of communicating, sharing information, co-operating and learning. In the near future, teachers' competence will have to be enriched to reflect these changes.

The traditional pillars of teachers' competence

Knowledge of subject matter and basic pedagogy are the traditional pillars of teachers' competence in today's school. The importance of these two elements changes according to the school level. While pedagogical issues are extremely important for elementary schools, those related to subject matter become more and more important for secondary school as the students' age increases. Although the situation is changing, in some European countries elementary teachers continue to start their student teacher curriculum at secondary school, focusing mainly on pedagogical issues, while secondary school teachers are simply graduate in a given subject matter, without any specific teacher training.

As to subject matter, the problem is how to cope with the rapid growth of knowledge in specific curriculum areas and consequently what teachers need to learn about it. "Knowledge is changing or becoming obsolete so rapidly that teachers can hardly manage to keep updated. Knowledge is not static but dynamic, and it moves at lightning speed in the information society. The very speed with which the amount of knowledge is increasing globally poses further demands on the teachers of today and of the future. Therefore it is necessary to revise traditional understanding of the teacher role in the education system of the information society." [1]

As to pedagogical issues, the focus in schools is more on teaching than learning. The transmissive paradigm not only affects approaches and methods, but also determines the layout of premises and classrooms. The higher the school level increase, the more the transmissive paradigm determines school structures. In an information society, a new interpretation of the traditional distribution of roles between teacher and pupils is necessary if the pupils are to take greater responsibility for their own learning and have the opportunity of displaying greater independence in the learning process.

How children's learning changes with ICT

Computers and the Internet change the ways children learn. With the exception of some specific applications, using the computer requires autonomy and independence. Novices continuously face problems posed by computer use. Depending on their individual learning style, children either ask for help or try to solve problems by themselves autonomously.

However, in the long run, a frequent user acquires strong autonomy, which allows him/her to solve most of the problem at hand without any help. It is likely that this independence is applied not only to problems posed by computer use, but more in general to most cognitive issues. Moreover, using a computer application affects the way in which the related cognitive activities are performed. For example, a word processor changes writing styles. A browser or a search engine affects the ways of searching for information. A graphic editor affects the ways of drawing. A database or a spreadsheet influences the ways of organising data, a music editor those of composing music, electronic mail and computer conferencing systems change ways of communicating via written language, and so on. It is likely

that children who use computers and the Internet acquire new powerful learning skills which are developed through frequent interaction with virtual environments (computer games, editors, courseware, e-mailers, etc.). In this way, learning by doing and reflecting on ways of operating becomes the main learning mode. This is in stark contrast with what happens at school, where the main learning activities often involve listening in class and performing pencil and paper tasks at home. Thus, the gap between school and children's daily life increases, as does that between children who use computers and the Internet and those who have no access to these resources.

ICT: a new pillar in teachers' competence

As teachers need to come to terms with the new ways of learning and tools for improving individual productivity, communication and co-operation, their competence should be upgraded so as to embrace a new fundamental pillar: skills pertaining to ICT. This competence will involve the ability to use the computer and web as individual productivity tools for writing, storing data, communicating and sharing information, but also for improving and facilitating children's learning.

Computers and the web are becoming everyday tools for people who deal with information and knowledge. Thus, they should also become fundamental thinking and working tools for teachers, who should use them both in class with their students and for course management tasks like writing reports, compiling statistics, communicating, collaborating with colleagues and parents and so on. The systematic use of computers and the Internet will enrich teachers' competencies in directions not yet fully explored. Computer skills will soon become a prerequisite for any intellectual profession, especially for teachers, whose role it is to facilitate children's learning processes.

Teachers' ICT competence needs to involve aspects strictly connected with their role, which regards both the curriculum area and ways of learning. Teachers also need to become aware of how their particular subject area is changing with ICT.

But the specific aspect most closely related to teachers' work is the capacity to use computers to improve and facilitate learning within their own subject area. This use entails changes in both content and methods. One example of such change in content regards physics: numeric calculus allows topics to be tackled that were not previously dealt with since they required analytical calculus. In mathematics, evaluating the correctness of results will become more and more important in relation to calculus ability. In science, the ability to build computational models will become more important than recalling specific facts and figures. Historical databases will allow open questions to be answered and hypotheses to be made about connections between events. The other aspect of ICT and pedagogy pertains to the ability to use both applications for individual productivity and specific courseware to improve and facilitate personal reconstruction of knowledge. Teachers should know how to use the most effective courseware related to their subject, but also how to exploit fully personal productivity tools in their curriculum area.

The new role of teachers

Teachers will also need the capacity to reflect about their own role and how it changes when the boundary conditions are modified. ICT develops children's autonomy and creates conditions for independent reconstruction of knowledge by means of interaction with a so-

cial and bio-physical environment. Teachers' task will increasing become that of adapting and developing learning environments so as to accommodate different learning styles. This task will be accomplished through reuse of existing learning material available in different forms (printed, offline and online, local or remote, etc.) or via production of new material which can be shared with colleagues. Teachers' explanations will be replaced by rich audio-visual presentations available on CD-ROM or the Internet. Unsolved problems could be discussed with peers or eminent scientists interacting via the Internet. Students who are unable to perform an assigned task could ask peers for help or access a database of solutions. Formative tests could be automated to diagnose the student's strengthens and weaknesses along with possible reasons for failures and hints about what material to use as a remedy, and so on.

In summary, teachers' competence will change to involve knowledge and mastery of ICT, in such a way that they will become able to use and/or develop learning environments which both reflect how children learn outside school and facilitate understanding in curriculum areas. This change is required now and we cannot stand by and wait for a new generation of teachers to emerge. But how can several hundred thousand teachers be retrained? Decision-makers have to tackle the issue of how to promote quality learning processes in such a way that ICT skills become a basic component of the competence of hundred thousand in service teachers. The solution entails many different strategies and those based on ICT seem to be very promising.

Teacher Training

ICT has been introduced both into initial and in-service teacher training in practically all European countries. Besides basic skills in ICT, like those described in the European Computer Driving Licence, there is a general consensus that teachers should acquire ICT skills related to their specific role as educators. In many countries (as for examples in Denmark and Finland) a "Digital Driving License for Teachers" or an "Educational IT Driver's Licence" has been proposed, setting out how ICT can be used to improve students' learning, and, more in general, to perform the activities related to the teaching profession (the teacher as educator, as member of school staff, etc.). Introducing ICT into initial teacher training often results in modifying the curriculum in teacher training institutions. However, in such institutions there is increasing awareness that student teachers' ways of learning should be changed as well, in such a way that ICT becomes an ordinary tool for studying, learning, and performing intellectual work in general. Indeed, teachers can use ICT effectively in education only if they have been using ICT to study, learn and work.

Given the huge number of people involved, managing in-service teacher training is a very hard problem. Many governments state that in a few years, in their country, all in-service teachers will be retrained to use ICT in school (England, France, Sweden etc.). Large scale training programmes are promoted for that purpose. Some programmes provide a multimedia computer and Internet access for participating teachers (Sweden). Here the idea is that teachers will use computers in their classroom if they use computers in their daily life, i.e. if they have got and use a computer at home with Internet access. In some interesting programmes teachers bring to the course their own professional and pedagogical expertise. Teacher training courses are often based on interdisciplinary subjects and teachers are organised in teams

working co-operatively to design and implement a project to be carried out in the classroom (Sweden).

Beyond the national programmes, a new awareness is emerging of teachers' professional growth. In a society characterised by very rapid technological and socio-economical change, teachers' competence must continuously develop to keep pace and avoid a gap opening up between school and society. Life long learning is not an occasional or marginal activity for teachers, but should be a basic task; policy-making bodies should provide environments and means to enhance independent and flexible learning. Teachers should recognise themselves as members of a community of practice that systematically shares methods and objects. The school system should contribute the creation of such a system by means of the new opportunities offered by ICT. In this context, Open Distance Learning, co-operative working and online education will play a crucial role.

[1] Information and Communication Technologies in the Education System, Action plan for 1998-2003, Danish Ministry of Education 1998.

6.3   Dissemination activities

6.3.1   Presentations

On national level
Presentations at seminars and meetings to regional and national bodies (Ministries, Agencies) have been made. Furthermore, information about the project and project results have been displayed in different ways at numerous conferences, seminars, and meetings by the individual EENet members.

On European level

Date	Subject
10 - 13 June 2001	At the 10th anniversary jubilee conference of the European Distance Education Network (EDEN), co-organised by the EENet member organisation Distum (Swedish Acency for Distance Education), EENet will show results of its "Observatory" work on ICT in European School Education. This EDEN conference takes place at the Royal Institute of Technology in Stockholm (Sweden) on 10 - 13 June 2001.
02 April 2001	At the 20th ICDE World Conference on Open Learning and Distance Education "D-2001" in Düsseldorf (Germany), EENet will present the extension event "Observing how learning is changing".Dates: ICDE Conference 01 - 05 April 2001:
12 - 14 February 2001	EENet members discuss latest national developments in their countries at the tecnologie didattiche innovative (ted) in Genoa (Italy).
21 November 2000	Carl Holmberg and Harald Gapski present "European Education Policies and ICTs - EENet Experience" at the EDEN Conference "Open Classrooms in the Digital Age" in Barcelona (Spain).
26 September 2000	Carl Holmberg and Harald Gapski present EENet at the Representation of the German Land North Rhine-Westphalia (NRW) before the EU in Brussels (Belgium).
July 2000	The first draft of the methodology report "Observing how learning is changing" can be downloaded from the EENet website (see section "observatory").
16 - 17 June 2000	By invitation of the National Board of Education, EENet's second working group meeting takes place in Helsinki (Finland).
04 - 05 February 2000	EENet's first working meeting in 2000 takes place in Oslo (Norway). The Netherlands, represented by Pieter Hogenbirk from the Ministerie van Onderwijs, Cultuur en Wetenschappen (Ministry of Education, Culture and Sciences), are welcomed as a new member of EENet. Now EENet comprises representatives of 13 European countries.
January 2000	The EENet "Observatory", a basis for synergy and transparency between initiatives at national and international level in the area of ICT in education has been granted as a complementary measure by the European Commission in the framework of the Socrates Programme.
01 January 2000	Carl Holmberg (Sweden) has been elected as the new chair of EENet for 2000. Vittorio Midoro (Italy) has been re-elected as vice chair.
25 - 26 November 1999	The third EENet members' meeting in 1999 is scheduled to take place in Athens (Greece).

6.3.2 Publications

EENet (1998): How learning is changing: information and communication technology across Europe. ICT in education policy. Published by Becta (printed)

EENet (1998): How learning is changing … (available online: http://www.eenet.org/index_publications.html)

EENet (2000): "Methodology report" (1. draft, available online: http://www.eenet.org/index_publications.html)

Holmberg, Carl / Gapski, Harald (2001): Observing how learning is changing... The EENet Observatory - an Information Platform for ICT in European School Education Systems. In: tecnologie didattiche e scuola. Atti del convegno TED a cura di Donatella Persico. Genova 12/14 febbraio 2001. p. 37-49.

EENet, "Come cambia l'istruzione: le tecnologie dell'informazione e della comunicazione in Europa", TD Tecnologie Didattiche, 15 n. 3 - 1998, pp 4-20.

EENet, "Come cambiano i modi di apprendere", TD Tecnologie Didattiche, 23 n. 2, 2001, pp 4-13.

Sigmund Lieberg, Ricerca e valutazione delle ICT nell'educazione in Europa, TD Tecnologie Didattiche, 23 n. 2, 2001, pp 19-21.

Harald Gapski, Istruzione pubblica e cooperazione con il settore privato, TD Tecnologie Didattiche, 23 n. 2, 2001, pp 21-25.

EENet (2001): EENet Flyer. (available online: http://www.eenet.org/index_publications.html)

EENet (2001): Observing how learning is changing... The EENet Observatory - an Information Platform for ICT in European School Education Systems. February 2001.

Holmberg, Carl / Gapski, Harald (2001): Observing how learning is changing.... [PDF] Presentation at the ICDE conference, Düsseldorf, April 2001.

6.4   List of EENet partners

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6.5   EENet contacts (2001)

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