COMMISSION OF THE EUROPEAN COMMUNITIES

Brussels, 27.1.2000
COM(2000) 23 final

REPORT FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT

DESIGNING TOMORROW'S EDUCATION
PROMOTING INNOVATION WITH NEW TECHNOLOGIES

**REPORT FROM THE COMMISSION TO THE COUNCIL
AND THE EUROPEAN PARLIAMENT**

**DESIGNING TOMORROW'S EDUCATION
PROMOTING INNOVATION WITH NEW TECHNOLOGIES**

TABLE OF CONTENTS

1. INTRODUCTION

Following a proposal from the Commission, the Council of Education Ministers, on 6 May 1996, adopted a resolution[1] relating to educational multimedia software in the fields of education and training. This was followed on 22 September 1997 by the Council's Conclusions on education, information and communication technology and teacher-training for the future[2].

These two texts helped to **increase awareness of what is at stake** at the European level and to pencil in the outlines of a common policy. This awareness has emerged at a time when the impact of ICT is being increasingly felt at all levels of society. The way in which people generate, build up, store and transmit information is being radically changed, along with modes of communication, exchange and work. The education and training systems have to take due account of these trends when defining the shape and content of learning.

There has been a drastic change in the situation since 1996. The scale and complexity of the area makes any attempt to provide an exhaustive inventory of experience at all levels futile. However, common pointers are emerging which need to be taken into account and these are illustrated in this report. **Numerous challenges remain**. They go beyond the issue of equipment and have a crucial bearing on actual practice, and the widespread introduction of innovation.

This report seeks to take stock of progress since the Council's Resolution and Conclusions were adopted and to lay down a preliminary marker with a view to preparing **a fresh stage** in European cooperation in order to rise to these challenges as we move into the 21st century. It is based on an analysis of the trends observed over the past three years, what has been achieved through Community programmes and the findings of specific studies, e.g. on the impact of ICT on the role of the teacher, and the initiatives of the Member States[3].

The first part describes how difficult it is to get actual practice and technology to dovetail when the situation is unsettled and diversified. The second part examines the conditions conducive to more harmonious development of actual practice and technologies: the progressive emergence of a **market**; action by the **public authorities**; training and the development of **services for teachers**. The third and last part is given over to **recommendations** in order to create these conditions. The annexes give a summary of the main initiatives in the Member States and at Community level, accompanied by statistical information.

---

[1] OJ C 195 of 6.7.1996, p. 8.
[2] OJ C 303 of 4.10.1997, p. 5.
[3] Source: Multimedia Educational Software Observatory. (http://europa.eu.int/en/comm/dg22/meso/) and "How learning is changing: information and communications technology across Europe. ICT in education policy". EENet (http://www.ecmc.de/eenet/index2.html).

There is a need to produce a political impact in that **ambitious initiatives** are needed in order to incorporate ICT purposefully in education, to generalise innovative and effective practices, and to develop the European dimension. This necessitates concerted efforts in order to plan tomorrow's education and to put ICT at the service of **innovation and the improvement of the quality of education**. What is at stake during the next decade hinges on the capacity to innovate.

2. THE PROBLEM OF DOVETAILING TECHNOLOGY WITH ACTUAL PRACTICE

The arrival of the PC at the beginning of the 1980s enabled schools to start obtaining the hardware and software which had appeared on the market mainly for professional uses. More often than not imposed on a top-down basis, these tools failed to live up to the expectations created. Since then their capacity has been enhanced substantially. The arrival of multimedia and Internet, particularly the Web[4], at the start of the 1990s, **heralded the dawn of a new era**.

There is a close relationship between the level of development of ICT and the applications made possible and gradually available to the general public. The pace of technological innovation however makes it difficult to get the distance needed to appreciate the organisational, social and cultural dimensions of these applications. The fact is that unlike the speed of proliferation of technological innovation and the phenomenon of obsolescence related thereto, education is a long-term process. Consequently, although technical trends are not entirely foreseeable and controllable, they need to be examined in order to seize the opportunities available while remaining aware of their limitations, and develop **strategies which are consistent over time**.

2.1. Technology: significant breakthroughs

2.1.1. Towards a new step-up in technology

The current turnaround rate in terms of renewal in ICT of around nine months is a driving force in the development of the information society. Digitalisation, miniaturisation, portability, the widespread availability of technical access to the Internet, enhanced performance and a reduction in costs, will considerably facilitate and diversify what can be done in practice. These developments are well under way and serve to boost the creation of educational multimedia applications which are more attractive and interactive.

One of the main problems is the **limitations of software** and the relevant user interfaces. Designers have always given priority to technical control of the

---

[4] The World-Wide-Web was developed in Europe at the CERN in 1991 for the purposes of cooperation, exchange and dissemination of information in the area of scientific research. The origin of Internet dates back to 1969 and American military programmes (http://www.w3.org/).

development process because of the very heavy technical constraints imposed upon them by the material platforms at any given time. Applications fields are broadening out and successive versions of software are becoming enhanced as technical specifications and the intensity of exchanges with users improve. However, educational software must meet requirements and constraints which are considerably higher than word processing, spreadsheets and games, which remain the industry market leaders. Falling costs, the increasing success of Internet and tools for the 'bottom-up' creation of multimedia applications suggest that **a threshold will soon be crossed**, which will allow the use of ICT in education to take off in a significant way.

2.1.2. *From the Web to interactive multimedia services*

The appearance of the Web on the Internet has been the **big event** of the 1990s. With it came the possibility to generate, disseminate and exchange information, to communicate, to cooperate and to access a vast range of services and multimedia contents without any constraints of time or place. There are problems of performance, security, confidentiality, etc., which prompt numerous initiatives in terms of self-regulation by the players involved, adjustments on the legislative front, improvement of infrastructures, and development of systems for indexing, searching, translating, protecting, evaluating and filtering information[5].

The Web currently allows people to exchange and access contents which are mainly made up of text, graphics and pictures. It constitutes a huge library which everyone can enrich and peruse as they please, and an unprecedented forum of communication. Developments are now moving towards a second phase with the addition of video, which will require the availability of high speed networks at an

public authorities is to gradually give everyone the opportunity to get to grips with ICT and to access the Internet from all forums of learning.

However, with a virtually unlimited quantity of information and resources accessible, where the best is to be found alongside the worst, pupils and teachers could well find themselves quickly at a loss after an initial flurry of enthusiasm. The problem is how to apportion time effectively. Education presupposes **quality and consistency** of information. That information has to be identified, sorted, structured and combined in a relevant way in a specific context. It is also important to **structure exchange** of information and experience if it is to be useful. The process must have an educational aim and the technology-based interactions must have a teaching dimension.

Education and training sites on the Internet which will attract the highest number of users should be those capable not only of supplying contents and services of good quality, particularly in terms of communication, but also guide their users and help them **to find their way** through a phenomenal amount of information. They could provide people with the keys to access knowledge and thus represent an **ethical challenge** for public authorities and the private sector inasmuch as by incorporating e-commerce solutions these sites could charge for their use, or make it conditional upon the showing of advertising messages, the exploitation of personal data, etc.

2.2. Use of ICT : Understanding the situation

ICT is no panacea, but can be conducive to active teaching methods, contribute to better quality teaching and act as a catalyst for change. However, the potential on offer is not always mirrored in actual practice. As a study[6] conducted in the field has shown, use of educational multimedia is still based essentially on video, TV programmes and software. Use of Internet, electronic mail and videoconferencing is still lagging behind.

Furthermore, the situation is very difficult to circumscribe both in terms of quality and of quantity. Quality-wise, it is still complex to analyse actual practice because it is constantly changing, because of the diversity of a huge number of **one-off experiments**, and more generally because of the increasingly blurred borders between education, work, culture and leisure. Actual use must also be assessed in relation to the teaching contexts and methods into which it fits. **Analysing actual practice does not always receive enough attention** from the various players concerned.

From a quantitative point of view, **the data available are still rudimentary**. Information sources are dispersed, the frequency of collection and the definition

---

[6] Source: "The Impact of Information and Communication Technology on the Teacher". Institute for Applied Social Sciences (ITS) University of Nijmegen, The Netherlands; University of Leuven, Belgium; University of Cologne, Germany; Nexus Europe Ltd., Ireland; University of Barcelona, Spain. 1998.

of indicators are very variable and imprecise. The statistical report published in November 1998 in the United Kingdom is a notable exception[7]. But it is still impossible to find information on matters which are so relevant with regard to actual practice, e.g. the location and accessibility by pupils of PCs with an Internet connection in schools, the comparison of actual practice in the classroom and actual practice at home or elsewhere, the rate of use of equipment, software, informatics laboratories; teacher attitude as a function of age, etc.

Despite the growing awareness of the implications of using ICT, an extra effort is needed to **obtain reliable indicators** to provide regular information for decision-makers, the education community, the industry and the citizenship of progress made, and to identify and disseminate best practice.

2.2.1. *Current practice in teaching*

In higher and post-university education, the borders between distance training provision and traditional training provision are becoming gradually blurred and thus contribute to the emergence of a mixed mode. Conceptual and methodological investment made in the past as part of the development of open and distance learning is proving particularly useful. What we have therefore is **increased convergence**, virtual mobility and new flexible forms of access to knowledge stemming from the gradual disappearance of technical barriers and the proliferation of partnerships and pilot experiments at the European level.

While there have been clear advances in the most prestigious institutions, the **weakness of institutional strategy remains a cause for concern**, as is stressed by the European university association[8]. University schools and departments are developing specific strategies for educational multimedia and this maintains the traditional divide between subject areas and intensifies rivalry within the same university. In addition, the question of certification and equivalences has still not found an unambiguous solution.. Nevertheless, a **joint declaration** was signed in Bologna on 19 June 1999 by the ministers of 29 countries[9] providing for the gradual introduction of a European area of higher education and proposing an action plan to be implemented during the next decade.

Secondary education has received priority attention from the public authorities[10]. For instance, expenditure on ICT in the UK in 1998 was £15 per pupil at primary level, compared with £ 46 per pupil at secondary level. At the beginning of the 1980s, the accent was on planning and then on the use of word processing and spreadsheet software. Word processing remains the most widely used application, followed by exercisers, simulation software, spreadsheets and

---

[7]   Source: "Survey of ICT in schools 1998". Dfee Statistical Bulletin Issue 11/98.
[8]   Source: "Restructurer l'université. Les TIC dans l'enseignement et l'apprentissage. Pistes stratégiques pour l'université". CRE Guide N° 1. ISSN 1028-9291. Avril 1998.
[9]   The 15 Member States of the European Union, the 10 associated countries of central and eastern Europe, Iceland, Norway, Malta and Switzerland. (http://www.europedu.org).
[10]   Source: Dfee Statistical Bulletin Issue 11/98.

databases. The activities are defined and supervised by the teacher and more often than not carried out in groups of two. The secondary level continues to suffer from serious pitfalls such as the acquisition of items of knowledge not linked with one another and a focus on exam preparation. These pitfalls can be eliminated as several projects have shown, particularly by using local adjustments to foster team work.

The uses of ICT for the most advanced teaching purposes are to be found in primary education. This may be because a single teacher is responsible for a whole group of children and because the use of multimedia software in that context is more diversified, attractive and game-oriented. Pupils frequently use exercisers, word processing and games as a break. The applications are more pupil-centred than at secondary level. They do not revolve solely around the school's teaching functions, but also around functions of socialisation which the school pursues implicitly[11]. It is particularly useful to take on board these functions for education in communication and its intercultural dimension.

Nevertheless, observations in the field often stress the dynamism of small schools situated in rural areas. Their prominence in the descriptions of ICT use is immeasurably greater than their level of representativeness. Despite a positive perception of the role of ICT, **it is still difficult to establish scientifically a correlation between ICT investment and school performance**, and efforts should be made to identify and evaluate the most effective practices in more precise terms.

2.2.2. *Teaching methods and organisational aspects*

Given the opportunities for interaction via the Internet and the gradual generalisation of e-mail, actual practice is no longer determined simply by access to software and multimedia resources. It is linked to the fresh opportunities for exchanges between pupils, teachers, external partners, experts and other "resource persons".

The pupil gets greater autonomy, while the teacher has to motivate and supervise exchanges between pupils, geographically near or far, so that they become a part of the education process. The teacher also has to use the catalytic effect provided by the use and generation of resources on the Internet by pupils. A broad consensus seems to be emerging against this backdrop that ICT can be conducive to learning based on **curiosity, discovery and experimentation**. Nevertheless, as stressed by the teachers taking part in the ACOT programme[12] they need to practice team work, make numerous adjustments and adopt **stringent approaches for each project**.

---

[11]   Source: Projet MAILBOX financed by the ODL action of the Socrates programme.
[12]   Apple Classrooms of Tomorrow (ACOT) programme conducted since 1985 in the USA and since the mid-1990s in Europe.

The conditions needed for developing the role of the teacher are progressing slowly. The most innovative projects are often the result of the work of enthusiastic teams of teachers who have accepted to devote considerable time to experimentation in this area. Regular individual use of the computer, team work, exchanges between colleagues, are the most effective ways of improving teachers' skills. However, the resources allocated to teachers for this purpose remain very limited in many countries and the resulting increase in workload is seldom taken into account. Many projects rely on volunteers[13].

In addition, while there is now in Europe a comparative consensus on the need to redefine school programmes, it does not extend yet to **the nature and scale of the changes** to be made to the contents and organisation at classroom level. While the contents of primary teaching are not exam-orientated, the same is not true of the contents of secondary teaching. When ICT is used across the different subject areas, it does not fit easily into the context of examinations.

The question of certification of skills is, in this respect, fundamental. The Commission's Communication "Strategies for employment in the Information Society" suggests that accreditation systems specifically destined for the needs of teachers, for the purpose of enabling them to learn how to make use of ICT, must be identified and be the subject of approval mechanisms, and that full benefit must be derived from them.

Alongside consideration of the use made of ICT, debates are therefore looming on the outlook, priorities and objectives for education systems, but these go beyond the framework of this report. Education and training are areas for which different ways of contemplating and preparing for the future are being devised and consolidated in Europe. These prospects should be gone into in depth and be the subject of regular exchanges and consultations, particularly as part of the **forecasting activities** by the Member States and by the Commission, in conjunction *inter alia* with the Council of Europe, the OECD and Unesco.

3. THE CONDITIONS CONDUCIVE TO THE DEVELOPMENT OF ICT USE

3.1. The gradual emergence of a market

3.1.1. *Increasing the provision of equipment*

The indicators most frequently quoted remain the number of pupils per computer and the percentage of schools which have an Internet connection. In the Scandinavian countries, which are the most advanced in Europe, the average ratio is around one PC for eight pupils and one PC for two teachers, and most

---

[13]   E.g. the sites created on the Web by teachers such as the De Digitale School in the Netherlands (http://digischool.bart.nl/) and *Premiers pas sur Internet* (http://www.momes.net/) in France.

secondary schools already have an Internet connection. The figures are given in the annex.

However, **these indicators are not perfect**. One incorporates several generations of equipment of which a minority has multimedia functions. For instance, over 45% of desktop PCs installed in British schools are over five years old[14]. The other includes very different levels of infrastructure quality. They reflect very diversified situations with regard to frequency and duration of use by pupils and teachers. A final point is that they mask in each country and in each region growing disparities. **There are major differences in Europe** particularly as regards the infrastructures offered to primary schools. Around 10% of primary schools had an Internet connection in France at the start of 1999, compared with 90% in Finland. Similarly, between 12 and 83% of German schools have an Internet connection according to the Länder. The United States[15] are hoping to connect all classrooms to the Internet in the year 2000 whereas most Member States have as their target the connection of all schools by 2002. At the end of 1998, the average was six pupils per PC in the USA, with 89% of schools having an Internet connection and 51% of classrooms. Be that as it may, there is great disparity between states.

Innovative teaching practices on either side of the Atlantic are still largely experimental in primary and secondary schools. By contrast, in higher and post-university education, **the USA have a significant lead**, as most traditional European institutions have embarked on nothing more than an exploratory phase whereas their American counterparts have moved on to an operational phase, with new commercial enterprises setting up in partnership with the most famous universities. For example, the UNEXT company groups the universities of Chicago, Columbia, Stanford, Carnegie Mellon and the London School of Economics, along with several Nobel prize winners[16]. Despite the dynamism shown by European ODL universities, this is worrying in a context of **increasing competition** in the provision of education and training internationally and the emergence of a **"franchising" model**. The increased opportunities for choice and autonomy for learners will challenge the status quo.

3.1.2.   *Structuring of provision of educational software and services*

The growth of the market for educational software in schools is somewhat piecemeal because of a **still uneven pattern of equipment issue**. It does not justify innovative developments in trough periods, as operating costs swallow up the bulk of available budget resources. While recent public authority policies are gradually making it possible to equip schools for multimedia, the market remains very fragmented as a function of age group, language and subject area. Building up a provision of educational multimedia software and services of good quality presupposes **partnership** between the public authorities and the industry,

---

[14]   Source: Dfee Statistical Bulletin Issue N°11/98.
[15]   Source: U.S. Department of Education, Office of Educational Technology.
[16]   (http://www.unext.com/).

increasing investment and a change in practices. It is a **complex process** which is simultaneously technical, cultural, economic, social and institutional.

At the end of 1998, European publishers felt that the sums earmarked by the public authorities were too small to allow a genuine market to get off the ground[17]. **The growth is driven essentially by private individuals** who make up the boom segment. This is partly due to the practice of sales grouped and/or combined with the hardware, which is a threat to the diversity of provision and freedom of choice for consumers. The equipment in European households, over 50% of which will have a computer in two years time[18], should speed up the establishment of promising **synergy** around products such as cultural, science, geography, history software, along with dictionaries, encyclopaedias, exam preparations, etc. As time goes by school manuals could be targeted as encyclopaedias have been, resulting in the paper medium being replaced by the digital medium. This is a context in which the publishers give priority to certain flagship products or profitable niches in order to cover the increase in investment needed. The budgets for creating, marketing and promoting the most sophisticated products and services increase rapidly.

In the long run, one of the economic models likely to emerge could be comparatively close to that of the audiovisual industry. The scale of investment in multimedia creation, the fragmented structure of the sector in which each of the players must have a leading-edge competence, and the complex management of intellectual property rights, offer similarities. This could suggest a move towards an **oligopolistic type of market**. If that event, the question of controlling the "distribution circuits", i.e. the conditions of access by ordinary people to educational multimedia resources and services, would warrant in-depth analysis along with the possible role of digital libraries.

At the same time, the costs of digital distribution tend to fall drastically and design software becomes accessible for the general public. **Openings outside the mainstream market** emerge rapidly and could play a very important role in the years to come with the creation of a wide range of software and resources which do not conform to the usual market logic. In this context, the pooling of resources, the interacting of knowledge and know-how at all levels have a very appropriate medium in the form of the Internet. The development of these "free" spaces presupposes the support from and recognition by the public authorities of the remarkable work already carried out in this area.

---

[17]   Conclusions of a workshop organised by the Socrates programme on 27 November 1998 in Brussels.
[18]   Source: MESO.

3.2. Action by public authorities

3.2.1. *Capitalising more effectively on experience*

As long ago as 1983, the Council had adopted a Resolution[19] on measures to introduce ICT in education at a time when the inroads made by micro-informatics heralded vast opportunities. The inconclusive results of the actions launched at the time stressed the need for closer evaluation of experience, deemed disappointing by some and instructive by others. All in all, the main shortcoming was an inadequate awareness of the context in which computers would be used. There were nevertheless certain encouraging points, particularly the **human investment**

contributions of national and regional networks, and developing services with a specific European dimension.

The many initiatives which have been launched by the public authorities stress the very great endeavour made to make these new tools available to as many people as possible. Nearly all secondary schools now have multimedia equipment and an Internet connection. In 2002, most primary schools should have a connection, too. The drive to familiarise teachers with ICT and to provide them with appropriate training has intensified. The accent henceforth is to be more on content and teaching innovation. The decision-makers at the various levels have given priority to the use of ICT in order to **familiarise pupils and teachers** with these tools and, more generally speaking, to prepare them for the information society. There is evidence of an increasing resolve to promote the overhaul of teaching methods and to carry out a **broader-based reflection** on institutional programmes and organisation.

3.2.2. *Setting priorities with regard to equipment and infrastructure*

Given the size and the diversity of the education community[23], no plan for infrastructure can wholly satisfy demand. The management, securing and renewal of vast pools of computer-related equipment would be prohibitive, particularly for local authorities. The need to be able to keep up with the pace of renewal of platforms entails appropriate funding and partnership arrangements, and above all concentrating investment on infrastructure and services rather than being obsessed with the number of users per PC.

With the availability of multimedia configurations at affordable prices and the achieving of a quality threshold in a comparatively near future, there should be assistance to help families purchase or hire computers, to foster the emergence of a second-hand market, and to focus public investment by way of priority on the quality of **access infrastructures** to use the Internet (fast connections, local networks), and the development of quality **on-line services and content**. Specific measures for disadvantaged families and handicapped persons will be essential in promoting equality of access. The equipping and connecting-up of homes is generally proceeding at an increasing pace. In actual fact, ICT is used by way of preference – more intensively and for longer – outside timetable constraints, particularly at home. It should therefore be possible to limit the quantity of PCs for collective use in educational establishments to a reasonable number, which should make it possible to renew them regularly.

3.2.3. *Strengthening the European dimension*

The funding of European-level pilot projects is part of a twofold logic. Some projects give priority to undertaking in different countries similar experiences in

---

[23]   There are approximately 4 million teachers and 80 million pupils and students in Europe, distributed throughout 320 000 establishments, including 5 000 universities and higher education establishments.

the use of ICT, which makes it possible to make comparative analyses and to evaluate the respective progress made. Other projects undertake specifically European experiments based on collaborative work to develop methods, information and knowledge by teams from different countries. The point is to allow **cooperation** between the experts in the field, the public authorities, schools, companies and the universities with regard to theef learning-oriented technologies.

Exchanges between European universities, training centres and schools, carried out under Socrates through therasmus and Comenius actions has prompted the **networking** of universities and schools around themes of common interest. This cooperation has already produced a pooling of experience and teaching resources, a trend which should go from strength to strength with the use of ICT to facilitate the cooperation commenced with the Erasmus thematic networks. The networking of Comenius projects on identical themes should enhance the impact of the results of cooperation between schools.

The problem is how to **sustain and generalise** this experience. A special effort must be made to set up projects which take account of how they can be extended. All too often the additional funding which the extension of these experiments would need cannot be provided at the Community level, which can go no further than the pilot projects, and is very rarely forthcoming at the national and regional levels.

3.2.4.   *The need to define development models*

The development of educational multimedia applications of good quality cannot go ahead without the establishment of viable economic models. The current state of market development is not conducive to achieving this stage and public subsidies remain essential, particularly to play a catalyst role.

The launch of national plans in the Member States has **remedied a situation characterised by lack** of hardware and Internet connections. They have made it possible to start a phase to foster the use of ICT, but it is still difficult to clearly identify ongoing development strategies to encourage their increased use and widespread introduction, long-term funding guarantees, effective support for the creation of good quality contents and services, real consideration of the European dimension and a significant contribution by ICT to the development of education systems. **Strategic approaches** need to be defined which take account of different options for development models. These strategies must be part of a long-term approach and take due account of trends in education systems, of the European dimension, of the ongoing nature of human investment and the definition of working arrangements both in public service and in the context of partnerships with the traditional media industries and the ICT sector.

In addition to the European and national initiatives, the support of the local authorities for action started on the ground and a degree of autonomy in establishments are **very important factors** when it comes to the **adoption of**

innovation. The initiatives taken by the players on the ground to manage space and time differently, to develop original funding mechanisms and partnerships and to define projects associating technological options and teaching projects, all show the **considerable well-springs of motivation** which exists at local level. In each education establishment and each teacher training centre, defining, in conjunction with the local authorities, a **consistent and durable investment policy** based on a clear formulation of strategies for teaching and organisation and for developing skills, is a *sine qua non* which calls for new managerial practices.

Establishments need to be given more flexibility when it comes to incorporating and using ICT in a context of central guidelines defining a **coordinated and managed development** of education systems and of the role of pupils and teachers. The emphasis should be on pragmatic approaches to support and coordinate local initiatives, large-scale pilot experiments in conditions as close as possible to reality, backed up by thorough evaluation. Likewise, there is a need to pinpoint the biggest regional and national disparities and take the steps needed to promote gradual alignment on the best practices.

3.3. Developing teacher-oriented services

While it is generally agreed that the training of teachers has an essential role to play in creating a favourable environment, there is less agreement on exactly what types of training should be organised and how they should be delivered.

3.3.1. *Going beyond the purely technical aspect of training provided*

The training plans instigated at the start of the 1980s were by no means conclusive. More often than not, training went no further than foundation courses in informatics, where the emphasis was on knowing the essential functions of PCs and networks or on the technical characteristics of software designed for professional uses (word processing, spreadsheets, databases, etc.). This technical knowhow is not static and needs to be refreshed regularly. Once back inside their classrooms, most teachers make insufficient use of what they learned in training and there is little change in their teaching approach as a result. In this area, learning and doing are two activities so closely interlinked that expertise, as in the case of sport, is derived from practice and not the other way round, usually by immersion and imitation[24].

One observes that it is training in the tools that is predominant and that there is little investment in significant training, particularly innovative teaching practices. Yet investment in training cannot be fully justified without substantial motivation among the players and the existence of real development projects backed up by appropriate and sustained resources. It therefore appears important to develop two **additional training levels**. Firstly, the use of ICT must be put into perspective in

---

[24]   Observation and analysis of network uses. Ministry of Culture and Communication, France, February 1998.

relation to teaching practices. Secondly, the use of ICT must be set in context in relation subject areas and the promotion of a cross-curricular approach.

In the case of secondary school teachers, the choice of their vocation is often explained by their interest in a subject area. This partly explains their comparative lack of interest in training which lays emphasis on the tools rather than their subject area. But it also explains the interest shown by science teachers in software which enables them to go beyond the limitations of the traditional blackboard thanks to powerful simulation and display functions. This is where the question of content becomes acute as soon as training in the new tools is organised. As ICT permits a rethink of the traditional divides between subject areas, and as many innovative pilot projects straddle several subject areas or traditional areas, the question which must be asked before examining the relevance of any tool or method is **what knowledge, knowhow and skills have to be acquired** before it can be used.

3.3.2. More diversification in training processes

Given the problems encountered by traditional training, the current innovations place the emphasis on opening up training more. One observes the emergence of the concept of **training teachers 'throughout their careers'** linking initial and ongoing training, which may have many training actions and tools in common. Several of the approaches adopted strengthen the autonomy of teachers with regard to their continuing training. This has been tested successfully in the United Kingdom, where over one thousand teachers from nearly 600 schools have been issued with their own portable multimedia PCs allowing them to use the Internet at school and at home[25].

This has also led to more teamwork. Recognising the developments in progress, certain Member States have given priority to training modes based on **cooperation, initiative and creativity**. Study circles have also been set up in the Scandinavian countries, particularly Sweden, to help teachers define their needs and take responsibility for their own training. The links thus created during training are extended beyond it and continue once the teacher is back in class, making it possible to set up mutual assistance arrangements. In addition, the Internet allows bridges between what goes on at school and what goes on outside (museums, libraries, resource centres, etc.), and creates opportunities for documentation and information which are converted into self-training.

3.3.3. Structured exchange and support services

The wealth, quality and reliability of services will to a very large extent determine the attitude of the education community. If they are to integrate ICT in their teaching practices, teachers, trainers and managers need to have easy access to structured exchange and support services and to educational multimedia content

---

[25]   Source: NCET/BECTA.

both at school and at home. It is crucially important to develop services to **facilitate levels of interaction** via the Internet: exchange and dialogue, access and selection of educational multimedia content, on-line collaborative work on the preparation and handling of contents.

The development of such services could prove a **major element at stake** for education authorities inasmuch as it will influence the behaviour of millions of people. Accordingly, the development of educational multimedia services via the Internet and the support for the creation of contents should play essential structuring roles, allowing supply and demand to be better matched. This should be carried out under the auspices of the Ministries of Education or bodies of user groups in the area of education and training.

3.4.   Developing a global and consistent strategy

Costs which are solely additional will represent a difficult problem to solve if there is no overall coherent strategy over time entailing changes in the operational environment and approaches. As observed in other sectors of society, the nature of expenditure in ICT is both recurrent and increasing; it is fully justified by **innovation, improvement in quality, and by the transformation and effectiveness of processes**.

The time available is a major hurdle. The use of educational multimedia applications clashes with current activities and requires upstream **planning and preparation** on a big scale in order to maximise their effectiveness and their impact. On this front, the enthusiasm and the behaviour of the pioneers could well lead to some big errors of appreciation. Substantial adjustments will have to be proposed in order to mobilise a critical mass of teachers. Hence the importance of pilot experiments in contexts close to reality, and the provision of **comprehensive and adaptable good quality on-line services** incorporating training, maintenance and support to allow the processes of changing organisation, practice and behavioural patterns to be initiated and followed through.

Lastly, new skills are required, both at management level and in order to support teachers as they come to terms with the new tools: creation and management of multimedia contents, backup, assistance and maintenance services; legal and organisational skills. While the teacher is admittedly asked to acquire new skills, certain of these skills correspond to profiles of different posts and indeed to **new professions**. The notion of distributed and collective skills is expected to take on increasing importance.

4.   RECOMMENDATIONS FOR PRIORITY ACTIONS

In order **to understand better the changes** taking place and to **link better the different levels of management and intervention**, two series of recommendations should be introduced. Firstly, recommendations designed to make better use of what has been achieved to date and of a store of knowledge

which is constantly changing; secondly, a series of recommendations designed to better manage and promote innovation at all levels so that everyone can benefit. In conjunction with the Member States and on the basis of a broad consultation, a Community initiative should be launched in 2000 in order to implement these recommendations, achieve targets for the year 2004 and to promote the widespread introduction of innovation by drawing on all Community programmes and instruments concerned. These objectives will be consistent with the European employment strategy.

4.1. Making the best use of a store of knowledge which is constantly being updated

In order to capitalise on human investment at all levels, three types of horizontal actions should be launched: **continuous observation** of practices, uses and technologies; the pooling of conclusions and analyses by experts and by education system managers; and the definition of **prospective scenarios** to fuel discussion of the various potential options for management and **generalisation of innovations which are effective**, i.e. which has proved its merits in the field. This would make it possible to develop a system of management of the expertise acquired and still to be acquired with regard to interaction between uses and technologies.

4.1.1. Stimulating observation and comprehension of uses and of technologies

One first recommendation is to step up the work already started to better understand practices, based on observation arrangements at all levels. On the ground, it is important to better circumscribe the concept of good practice, the educational purposes of these practices, the teaching methods used, how effective they are, and the organisational conditions for promoting and implementing innovation in the Member States.

If this is to be achieved, it is vitally important for the Commission and the Member States to jointly examine the setting up of observation and analysis arrangements at European level and for them to have **reliable indicators** in order to monitor trends in the uses and the dissemination of ICT in education.

4.1.2. Building up a shared vision of the changes taking place

A second recommendation – based on these observations – is to get experts' groups, which should include users and their representatives, to work with those responsible for national and regional education and training policies, and for employment policies, and to get them to establish a **concerted vision** of changes and to identify priority areas for joint action. This presupposes regular consultation and structured exchanges on targeted areas of common interest.

Within this context, it would be necessary to reflect more deeply on **ways of learning and of organising learning**[26], for ICT will bring little added value if it is merely tacked on to traditional organisation and practices. There may also be a case for discussing specific issues such as the development of appropriate interfaces as part of setting up **"gateway" sites for educational multimedia** at European, national and regional levels. It is crucial for public authorities to contribute to the definition of **quality criteria** in a partnership with the designers and suppliers of applications and multimedia services. Otherwise, access to resources and the development of provision will be structured by *de facto* standards which will emerge and will put the industries' leading players in a dominant position.

4.1.3.   Developing prospective analyses

A third recommendation is to develop **prospective scenarios** on the basis of field observations and experts' analyses in order to provide those responsible and decision makers with pointers and regular information on the potential options available and to guide their strategic reflection. The point would be to anticipate on changes shaping up technologically and with regard to practice. The players in the field and within the key institutions (teacher training, centres dealing with matters concerning specific subject areas, inspection offices, etc.) could be involved in the development and discussion of these scenarios.

Links with **non-EU countries and international organisations** concerned need to be strengthened for these three levels of recommendation. Analyses should not be restricted to the situation of the EU but should also take account of the **prospects stemming from enlargement** and of approaches used outside the Union. The results obtained from work at these three levels should be broadly disseminated by the Commission to the publics concerned and should be published on the Internet.

4.2.   Managing and promoting innovation

To back up these first three levels of recommendations it is essential **to step up the drive in terms of research** and of social and technical experimentation in order to anticipate on likely changes on the area of organisation of education and training, and to **generalise the best practices**.

4.2.1.   Launching innovative experiences in key areas having a European dimension

The conclusions of the most advanced pilot experiments stress that technology prompts a rethink of the structure and contents of education and training

---

[26]   This includes learning methods, school rhythms, timetables, teaching methods, syllabus contents, relations between teachers and learners, the organisation of the establishments and classes, hierarchical relationships, evaluation of pupils and staff, their initial training and their continuing training, evaluation and recognition of skills, etc.

programmes, making it essential to launch experimentation in order to derive pointers on what the **school, university and training of tomorrow** should be, associating closely teachers, trainers, learners, parents and their representative organisations, industry and the social partners.

This recommendation accordingly seeks to develop innovative experiences which would feature futuristic hypotheses concerning school, the university and training and more effective ways of teaching and learning. In this context, **cross-disciplinary prospects** should be examined in greater depth, particularly when it comes to education in communication and the media, links between the sciences and the humanities, and modern language learning through intercultural education.

These experiments would provide an opportunity to strengthen the study and evaluation of conditions of use of ICT in a prospective light and to identify on the ground changes which might be possible. They could also take account of new organisation and management configurations in education and training establishments, **new formulas for participation and cooperation** by learners and teachers, and with existing or future partners in education and training.

4.2.2. *Fostering the development of quality on the supply side*

This recommendation aims to stimulate the market and particularly to strengthen the European dimension of the contents and services accessible via the Internet while respecting cultural and linguistic diversity. This would entail stimulating the development of on-line services particularly by associating and **extending initiatives by the Member States**. This presupposes in particular better understanding of demand – e.g., with regard to courses having an international dimension, virtual mobility and the continuing training of teachers.

Public investment should be increased in order to give access to fast networks in all learning contexts, and in order to develop contents and provide education and training multimedia services available over the Internet. An infrastructure of fast networks linking education establishments, research institutes, businesses and public forums such as libraries and museums is essential in allowing universal access to education, training and culture. With regard to contents, priority could be given at European level to language skills and intercultural comprehension, skills in the teaching-related use of ICT, European cooperation between establishments and between peer groups, and to the interconnection of different networks and educational multimedia sites developed in the Member States on the Internet in order to promote a **virtual European education area**.

4.2.3. *Strengthening social cohesion*

What this recommendation seeks to achieve is for the widespread introduction of the use of ICT in education to take full account at all levels of the needs of those who are most disadvantaged through economic, social, geographical or other circumstances.

With regard to the equipment and infrastructures, the point is above all to **guarantee more equitable access** through appropriate measures and funding arrangements, and to promote the development of alternative forums and ways to raise awareness, and to provide training and access to ICT as close as possible to the target populations. On the services side, there should be more systematic **consideration of specific requirements**. There is also a need to increase intercultural comprehension, self-esteem and self-confidence in the learning process, particularly in conjunction with the work of organisations involved in specialised education and the fight against exclusion.

ANNEX 1

AN OVERVIEW OF INITIATIVES IN THE MEMBER STATES OF THE EUROPEAN UNION AND AT THE COMMUNITY LEVEL

PROMOTION OF A LONG-TERM VISION

There has been a proliferation of national, regional and local initiatives since the mid-1990s. Compared with previous actions, the trend is mostly for them to go beyond the experimental framework and to fit into a **long-term vision**. A broad-based consensus around a long-term vision including a policy of regular investment in ICT in the interests of innovation is needed in order to cater for the expectations of the players concerned and to secure their lasting support. This is an area to which the Scandinavian countries gave the utmost attention from the early 1990s. Most European countries gradually followed suit, particularly from 1997 on.

The Superhighway Initiative[27] in the **United Kingdom**, for instance, launched in 1995, involved 25 projects and 1 000 schools. The results made it possible to define and launch in 1998 the *National Grid for Learning*[28] which sets ambitious targets for the year 2002 with regard to connection, training of teachers, skills and use of ICT for educational purposes in all subject areas and in administration.

PRIORITY FOR EQUIPMENT AND INFRASTRUCTURE

The national plans deal to varying extents with hardware, the training of teachers (an area which receives increased focus), stimulation for the development of contents, and – something new – widespread connection to the Internet, the creation of national and regional educational multimedia sites and the creation of partnerships with the industry, the latter contributing hardware, technical backup and financial support through sponsorship and even on-line publicity[29]. **Top priority, however, was given to equipment and infrastructure** in order to improve the availability of multimedia platforms in establishments. This focus was echoed by the local authorities.

In **Italy**[30]**,** for instance, a four-year programme was launched in April 1997 to allow 15 000 schools, from nursery to secondary level, to purchase telematics multimedia equipment for teachers and learners. In **Portugal**[31], each secondary school was equipped with a multimedia computer and an Internet connection, and this issue will be extended to primary schools under

---

[27]   Out of 25 projects, 12 projects attained all their objectives, six projects attained some of their objectives, and five none. Source: "Preparing for the information age: Synoptic report of the Education Department's Superhighway Initiative (1997)".

[28]   Comprising a mosaic of networks and interconnected educational services using the Internet, and supplying a medium for teaching, learning and administration for education establishments, museums, libraries, businesses and households. It provides a way of finding and using on-line educational multimedia resources and is backed by a budget of € 148 million. 500 000 teachers are expected to have received training by 2002. (http://www.ngfl.gov.uk/).

[29]   This is particularly the case of the Berlin Land. Source: EENet.

[30]   (http://www.istruzione.it/).

[31]   (http://www.uarte.mct.pt/) and (http://www.dapp.min-edu.pt/nonio/nonio.htm).

the *Nonio Seculo XXI* programme designed to promote and accelerate the use of ICT in teaching.

INTERNET-RELATED SERVICES AND ELECTRONIC MAIL

Policies to promote specific hardware platforms got nowhere in the 1980s and priority was switched to services, teacher training, exchanges and the testing of innovative teaching practices. Provided it is accessible, **electronic mail** is the most popular application with pupils and teachers alike. Most plans seek to give each teacher and each pupil an individual electronic address at secondary level in the near future.

France, for instance, in November 1997 launched a plan with the aim of providing each teacher, each student and each class with an e-mail address in the year 2000. The number of establishments having an Internet connection in 1998 doubled in six months and over 80% of higher secondary schools had a connection by the end of June 1998. The creation of the *Educnet* and *Educasource* on the Internet[32] helps all the players involved in the education system to find interesting material and to dialogue with one another.

ESTABLISHMENT OF PARTNERSHIPS WITH INDUSTRY

A number of ambitious initiatives on the **networking of schools** are linked to partnerships with hardware suppliers or telecommunications operators.

In **Germany**, for instance, the Federal initiative *Schulen ans Netz*[33] developed in cooperation with Deutsche Telekom has made it possible to equip and connect over 8 000 schools to the Internet, with 5 000 more to come subject to the assembly of local and regional funding. The EUR 50 million contribution by the **Irish** government to the *Schools IT 2000* initiative[34] designed to speed up the incorporation of ICT in schools has been topped up by EUR 12 million by contributions from partners such as Telecom Eireann. It is often at local and regional levels that partnerships of this type are the most striking. Nevertheless, certain achievements focusing on very specific technical solutions may ultimately prove inappropriate.

CONTINUATION OF EFFORTS AND LONG TERM CONSISTENCY

By assembling resources over a limited period national action plans tend to succeed one another regularly and to establish **increasingly ambitious objectives**. This is partly a reflection of the relative uncertainty over the guarantee of sustained public funding and over the continuity and following up of policies in this area.

In **Denmark**, for instance, the introduction since 1994 of *Sektor Net*[35] for the whole of the education system is based on over EUR 67 million of public funding up to the year 2000. After an evaluation by international experts, an action plan (1998-2003) was launched in order to speed up the implementation of the objectives set in 1997, and of reforms affecting institutional matters, programmes and teaching methods. The investment should gradually be

---

[32] The Ministry labels products and services of teaching interest and updates an information database. (http://www.educnet.education.fr/ and http://www.educasource.education.fr/).

[33] (http://www.san-ev.de/).

[34] (http://www.scoilnet.ie/).

[35] *Sektor Net* links over 1 000 schools, 10 000 teachers and 100 000 pupils. Each school has open access to the education network and a restricted access for administrative purposes and to Internet. Utilisation costs for the first two years are covered by subsidies, but not the connection charges. (http://www.sektornet.dk/).

transferred from network setup and back-up activities to the development and support of added-value services.

STEPPING UP TRAINING ON A MORE WIDESPREAD BASIS

The training of teachers has now become a major concern reflecting the account taken of the essential role of teachers in the process of incorporating ICT and teaching innovation.

Accordingly a two-year emergency programme was launched in **France** in 1998 in order to train future teachers in the use of ICT in their teaching. However, as the vast majority of teachers are in service and likely to remain so for the next 20 years, the main challenge is to equip and provide this population with training and back-up. **Spain**[36] introduced a plan in order to provide 40 000 teachers with an Internet connection, and **Sweden**[37] in June 1998 launched the *Tools for Learning* initiative (1999-2001) in order to speed up the widespread introduction of ICT use and provide training in small groups and on tangible projects for over 40% of teachers in service, in close conjunction with their pupils, the administrative staff, librarians and local authorities.

MANY CHALLENGES STILL TO BE MET

In many respects **Finland** is a genuine **information society laboratory** in Europe and has the most Internet sites[38] per 1 000 inhabitants, just behind the USA and ahead of other Scandinavian countries. In the year 2000, there should be one PC for every eight or so pupils at primary level and one for every six secondary pupils, and the rates of Internet connection should be close to 100%. However, an evaluation conducted at the end of 1998 at the instigation of the Finnish Parliament, made the **criticism** that:

– there was not always sufficient availability of hardware;

– there was a continuing shortage of good quality educational multimedia content;

– teaching and technical back-up services remained inadequate;

– the training of teachers needed to be stepped up and better targeted;

– **there was a need to continue research efforts, to increase dissemination of the most promising practices and to take due account of the vital problem of equal access**.

These are the challenges which Finland is proposing to take up as part of a national strategy on education, training and research for the information society over for the period 2000-2004[39].

---

[36]   (http://www.pntic.mec.es/indice.html).

[37]   Sweden is one of the most advanced countries. At the end of 1997, the number of pupils per PC was 13 at primary level and six at secondary level. 20% of pupils used the computer daily at school and 50% weekly. 56% of primary schools and 91% of secondary schools were connected to the *Skoldatanätet*. (http://www.skolverket.se/skolnet/english/index.html).

[38]   106 Internet sites per 1 000 inhabitants. Source: Network Wizards.

[39]   (http://www.minedu.fi/julkaisut/information/englishU/welcome.html).

These are also the challenges facing all Member States to varying extents. Their scale will require significant and sustained effort. Their complexity should increasingly justify the use of **greater cooperation at the European level** in order *inter alia* to promote a concerted vision, to exchange information, experience and best practice in a structured and effective way, and to pool developments in terms of resources and services of common interest.

THE EDUCATIONAL SOFTWARE AND MULTIMEDIA TASK FORCE (1995-1998)

A "educational and multimedia software task force" was set up in March 1995 in order to allow **six European programmes[40] to pool their efforts** to speed up the development of technology for education and training and their implementation in the European Union.

The Task Force in July 1996 published an analysis[41] of the educational multimedia situation in Europe, thus making a major contribution to discussions prior to the adoption of the Council Resolution on educational multimedia software. A **common plan of work** was drawn up to cover the areas listed in the Council Resolution, along with the Community action plan "Learning in the information society".

This cooperation led to the organisation of a joint call for proposals in December 1996 backed by a Community contribution of EUR 49 million. Over 800 proposals were sent in by over 4 000 European organisations. These figures reflect the level of interest raised and the players' need to get access to joint public funding in order to foster the creation of a provision whose cost-effectiveness is still somewhat uncertain. Over 425 companies and institutions took part in the 46 educational multimedia projects selected. Half of the participants were universities and schools, and the development of technology was thus enhanced by demonstrations in real circumstances, research on teaching methods and practices, and the dissemination of best practice.

The experience showed the advantage of cooperation between different programmes in order to **contribute to the implementation of policies** drafted at the European level in the areas of education and training.

THE ACTION PLAN "LEARNING IN THE INFORMATION SOCIETY" (1996-1998)

The action plan "Learning in the information society" was launched on 2 October 1996 to back up and supplement national initiatives and other Community actions. **Four lines of action** were pursued: encouraging the introduction of electronic networks between schools throughout Europe; stimulating the development of educational multimedia resources; promoting the training of teachers in the use of ICT and providing information on the potential of audiovisual and multimedia education tools.

---

[40]   Socrates, Leonardo da Vinci, TSER, Esprit, Telematics Applications and TEN-Telecom.
[41]   July 1996 – SEC(96) 1426 (http://www2.echo.lu/emtf/en/report796-toc.html).

The development of the European multimedia network of schools EUN[42], co-financed by the "Educational multimedia software" task force, extending and associating at the European level the national and regional multimedia educational networks, made a major contribution to the implementation of the first line of action. This initiative was launched in Brussels on 17 December 1996 by the Swedish Minister, Mrs Ylva Johansson, at the conference "Towards a European electronic schools network". She received the support of the Ministers of Education at an informal meeting of the Council in Amsterdam on 3 March 1997, then during the presentation of a progress report on 26 June 1997 in Luxembourg. **EUN could play a significant role** in allowing the exchange of innovative teaching practices between European classes and their environment: libraries, multi-media libraries, museums, etc. It could also contribute to strengthening the European dimension in education, particularly in subject areas such as languages, sciences, history or art, and should be associated with the new Socrates programme. The first experiences show the teaching advantages that can be expected. These include a more outward-looking attitude to the rest of the world, greater ability to seek and exchange good quality information, a sense of team work around themes of common interest, and familiarisation with cultural and linguistic differences. **Nineteen countries have so far joined their efforts to organise this network in cooperation with the Commission**.

The second line of action has been implemented through creating awareness and interest among European players in the audiovisual and publishing sectors. A first database[43] on publishers and European educational multimedia products was developed in 1997. The conference "Learning differently", organised on 26 September 1997 in Cannes with the participation of the main players in the audiovisual sector highlighted five avenues for cooperation: improvement of market transparency; focus on contents ensuring continuity with regard to what is done at school; cooperation in building up "programme and documentary product modules"; the promotion of compatible digital platforms; security and limiting network access and utilisation costs. A **European Education Partnership**[44] was set up in September 1997 bringing together a large group of players from the ICT, audiovisual and publishing sectors, along with representatives of the education community.

The training of teachers was a priority set by the Dutch Presidency. The exchanges carried out on this theme at an informal meeting of the Council in Amsterdam on 3 March 1997 led to the adoption of conclusions by the Council[45] *inter alia* calling upon the Member States to **add a European dimension to the strategies they were preparing**. An average budget of around EUR 4 million is earmarked yearly by the Community programmes for this theme, and the Commission encourages the networking of teacher training institutes, on the basis of the outcomes of work carried out under education and research programmes. EUN also seeks to develop a virtual forum for the training of teachers and the exchange of best practice.

In implementing the fourth line of action, the Commission has every year since 1997 organised, in conjunction with the Member States and private sponsors, a wide range of activities to raise awareness and promote the use of Internet during the **Netd@ys** week[46]. The focus was initially on schools, but has since 1998 targeted an increasingly wider public.

---

[42] EUN: The European Schoolnet, grouping the 15 Member States of the European Union, plus Norway, Iceland, Switzerland and Slovenia. (http://www.eun.org).

[43] BASE project financed by the Socrates programme's ODL action.

[44] EEP: European Education Partnership. (http://www.eep-edu.org/).

[45] OJ C 303 of 4.10.1997 pp. 5-7.

[46] In 1998, 108 Commission-funded projects, including 73 under the Socrates programme, 31 under the Leonardo da Vinci programme and 4 by ISPO. (http://www.netdays99.org).

COMMUNITY PROGRAMMES IN THE AREA OF RESEARCH, EDUCATION AND TRAINING (1995-1999)

The launch of 1996 as the **European Year of Lifelong Learning** with a budget of EUR 8.4 million raised awareness in the Member States on the central themes linked to developments in education and training in Europe, and on what ICT could contribute in this context.

166 projects involving over 1 000 organisations were funded during the period 1995-99 under the **action[47] to promote open and distance learning under the Socrates programme**. The priority was focused on understanding and developing the processes involved, the creation on a collaborative basis of resources and networks, and information services specific to the areas of application of ODL and educational multimedia.

Since 1997, a dozen or so pilot projects[48] for **second chance schools** have been launched in the Member States, in partnership with the public authorities concerned, associations and social services, as well as the private sector, targeting young people living a situation of social exclusion. Their purpose is to bring these young people back into society by offering them suitable training with a view to their entering the employment market. The emphasis is on the acquisition of skills in the area of ICT.

Over 700 organisations took part in the 86 projects funded by the **Telematics Applications programme** in the area of education and training during the period 1994-98[49]. The European Commission contributed over EUR 100 million to the projects. The **Esprit programme** in 1998 launched around ten projects for creating multimedia school environments, backed by funding of EUR 13 million. The aim is to try out on a European scale the tools, interfaces and methods which might provide the new learning environment for young children.

Thanks to all these projects, it has been possible to build up in Europe a wealth of experience and know-how. Be that as it may, the needs and expectations of teachers and learners at school, university and in informal contexts, continue to represent major challenges.

As from the year 2000, the new **Minerva** action under the Socrates II programme and the fifth Community R&D framework programme will make it possible to speed up the development and experimentation of innovative teaching methods, the availability of multimedia educational applications using wide band telecommunications infrastructures, and tools whereby Internet's huge resources can be used for learning purposes.

The aim will be to **support lifelong learning**, to encourage creativity, to promote linguistic and cultural diversity and to improve the functions of future information products and services. Thanks to these, the study, design, experimentation and validation of methods, systems and innovative services targeting the widest possible range of learners and trainers, in close **conjunction with the education policies** of the Member States and those devised jointly at the European level, can be pursued in a way which is consistent with the European employment strategy.

---

[47]   Source: "Open and distance learning in action: current actions and reflections in the field". (http://europa.eu.int/en/comm/dg22/socrates/odl/ind1a.html).

[48]   (http://europa.eu.int/en/comm/dg22/2chance/home.html).

[49]   Source: "Review of research and development in technologies for education and training: 1994-1998". (http://www2.echo.lu/telematics/education/en/news/intermediate_report.html).

ANNEX 2
STATISTICS

1.   GENERAL INFORMATION

1999: **195 million** Internet users throughout the world, including approximately **46 million in Europe** and **107 million in North America** (Source: NUA)
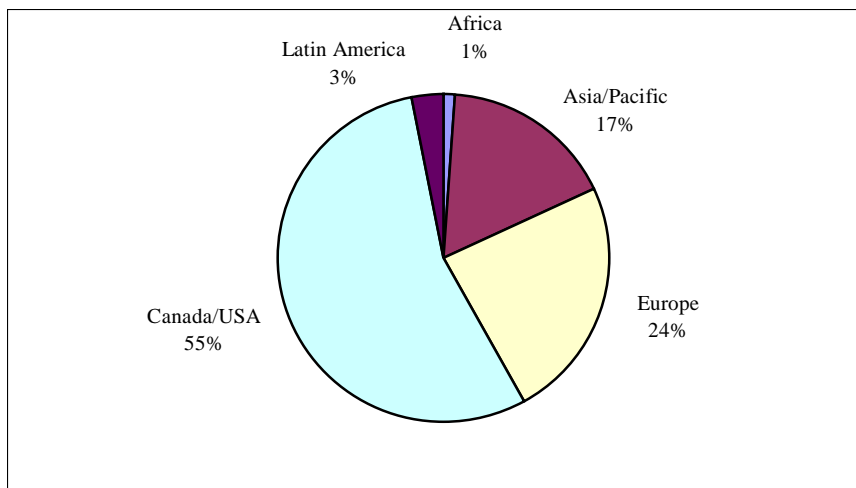
Distribution of Internet users (Source: NUA. 1999)

➢   The number of Internet sites rose by **118%** between 1997 and 1999.

➢   The average risk capital invested in the creation of an Internet-linked company was around **$ 10 million** in the first quarter of 1999, compared with $ 7.8 million in 1998. (Source: Harper's Index)

➢   **Finland** has the highest number of sites per 1 000 inhabitants in the world (Source NUA).
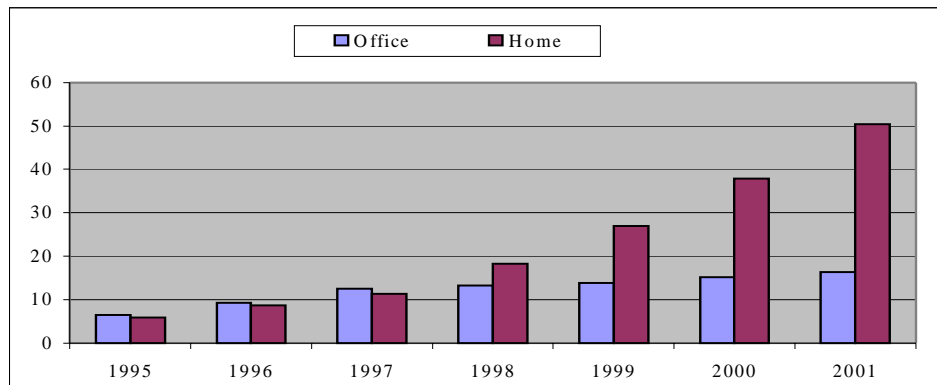
Distribution of Internet users in Europe (Source: EITO. 1998)

2003: **47 million household in Europe** should have an Internet access at home (Source: NUA).

2005: Non-American users should reach **700 million** within a total community of over **1 billion**. (Source: NUA).

1.1 NUMBER OF INTERNET USERS IN EUROPE

	1995	1996	1997	1998	1999	2000	2001
Office	6.466	9.266	12.530	13.247	13.904	15.161	16.279
Home	5.860	8.663	11.398	18.231	27.007	37.820	50.394
Total	12.326	17.889	23.928	31.478	40.911	52.981	66.673

Source: EITO 98
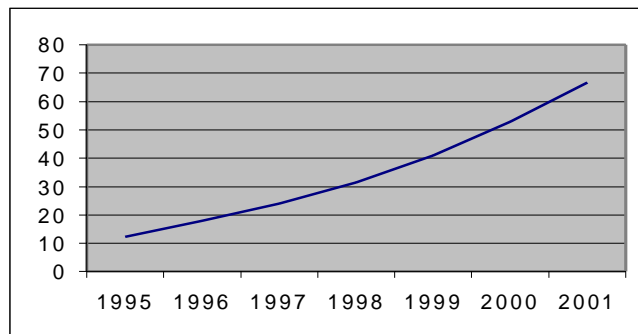
Growth in the number of users in Europe. Source: EITO.1998

1.2 TYPOLOGY AND FREQUENCY OF USE OF THE COMPUTER AT HOME

| MAIN USER OF THE COMPUTER						
	France	Germany	Italy	UK	USA	Japan
Child under 6	0	0	1	1	1	2
Child between 6 and 12	4	4	5	6	5	2
Adolescent aged 13-18	14	9	15	11	8	3
Child over the age of 19 not in education	6	6	18	3	4	4
Child over the age of 19 in education	14	6	12	10	4	8
Male head of household	42	57	39	47	42	63
Female head of household	18	16	8	19	34	5
Other adult	2	2	2	3	2	13
FREQUENCY OF USE						
At least once daily	44	50	53	46	65	54
2 to 3 times weekly	34	38	27	36	26	23
Once weekly	11	7	10	8	5	14
Once or twice monthly	5	2	5	4	3	5
Less than once monthly	5	2	3	4	n.a.	3
USE OF A MODEM TO COMMUNICATE						
At least once daily	16	19	34	32	n.a.	21
2 to 3 times weekly	31	31	17	44	n.a.	18
Once weekly	6	29	12	15	n.a.	20
Once or twice monthly	11	8	14	1	n.a.	11
Less than once monthly	13	10	0	8	n.a.	16

Source: EITO. 1998
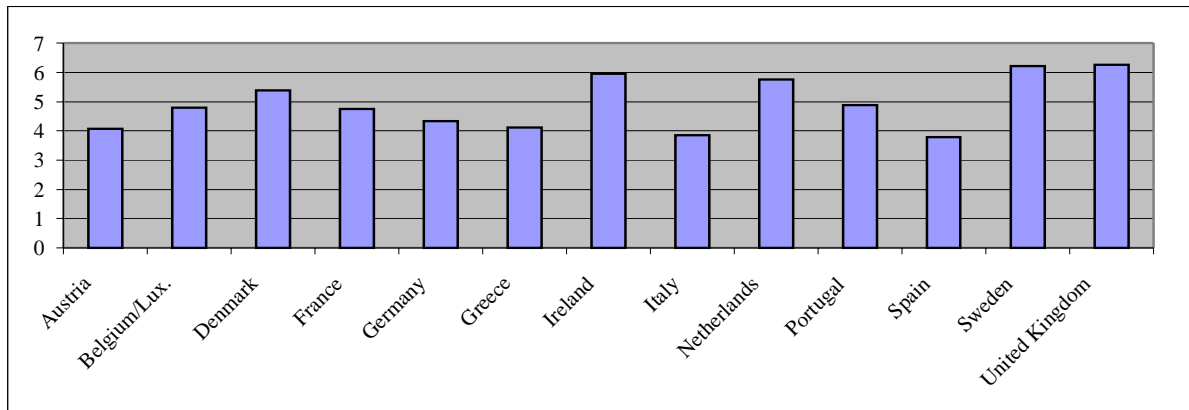
2. PENETRATION OF NEW TECHNOLOGIES IN EUROPE

Per capita spending on ICT. (Source MESO. 1998)
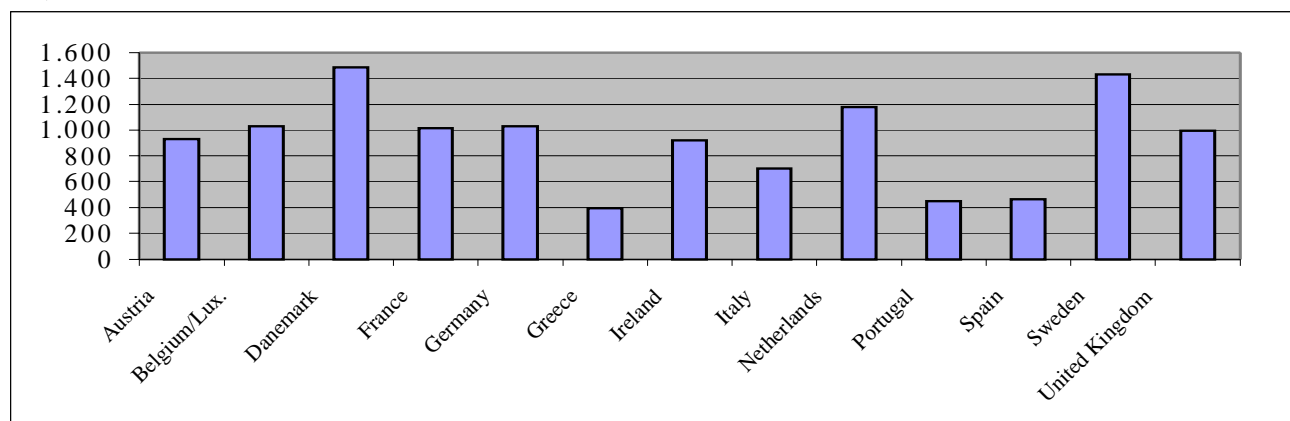
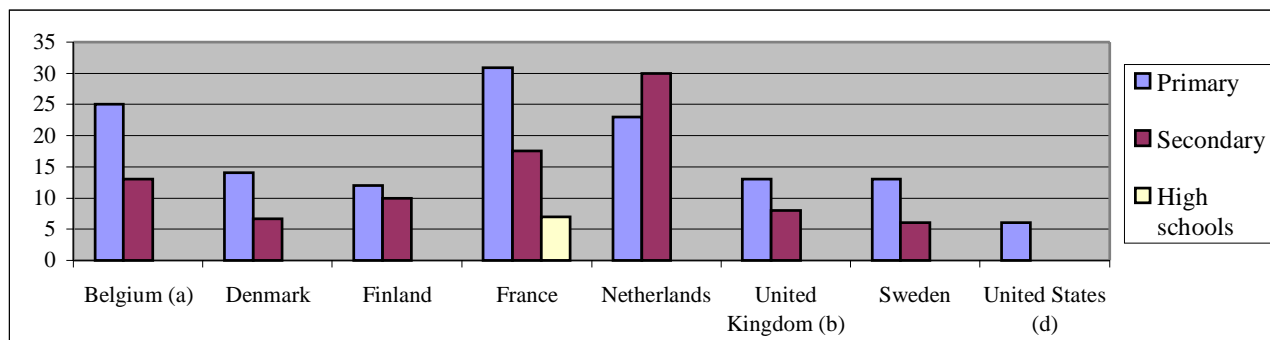Percentage spending on ICT in relation to GDP. (Source MESO. 1998).
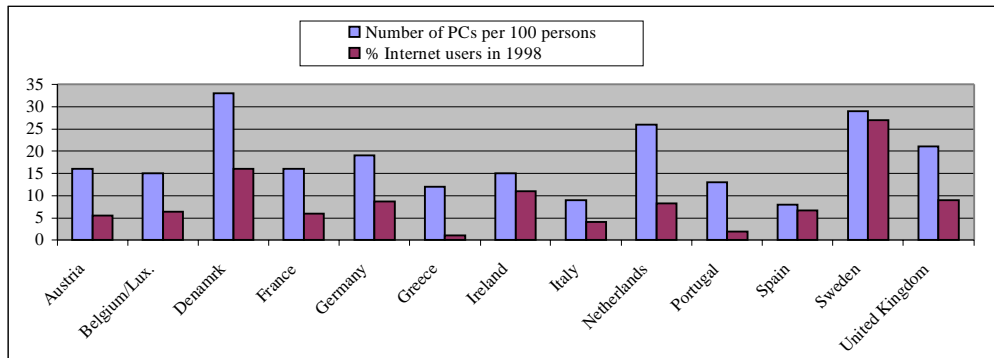
Number of PCs per 100 inhabitants and percentage of Internet user. (Source MESO. 1998)
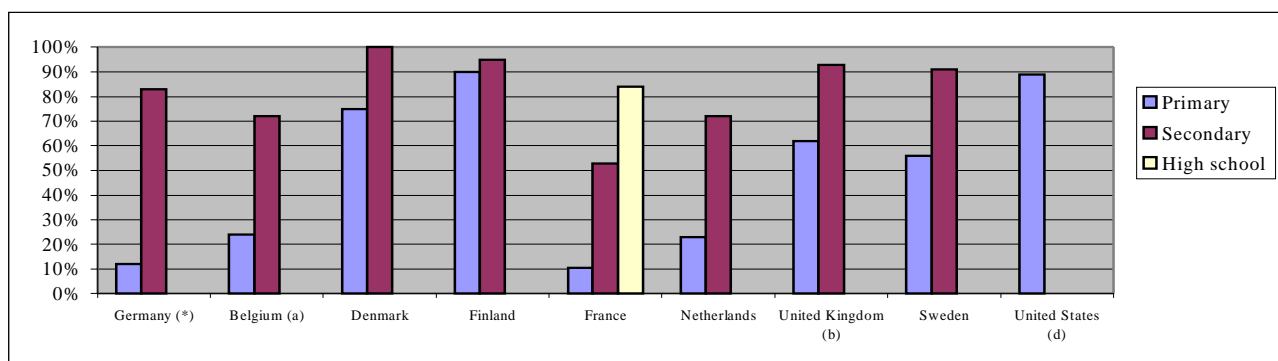
4. INDICATORS IN EDUCATION

Number of pupils per computer . (Source: EUN and U.S Department of Education. 1999)

Percentage of schools connected to the Internet. (Source: EUN and U.S Department of Education. 1999).

	Number of pupils per computer		% schools connected to the Internet	
	Primary	Secondary	Primary	Secondary
Germany	n.a.	n.a.	Between 12.38% and 82.94% (*)	
Belgium (a)	25	13	24 %	72 %
Denmark	14	6.6	75 %	100 %
Finland	12	10	90 %	95 %
France	30.9	17.5 - 7 (**)	10.5 %	52.9 % - 84 % (**)
Netherlands	23	30	23 %	72 %
United Kingdom (b)	13	8	62 %	93 %
Sweden (c)	13	6	56 %	91 %
United States (d)	6	n.a.	89%	n.a.

(a) Flanders only. (b) England only. (c) 1997 figures. (d) Source US department of Education. 1999
(*) According to the different Länder (primary schools and secondary schools together). (**) The first figure corresponds to lower secondary schools the second to higher secondary schools.

The **number of teachers per computer** is not known, except in the case of Denmark (1.3 at secondary level) and in Sweden (6 at primary level and 2 at secondary level). The percentage of computers installed in schools with **basic multimedia functions** is not known. In Denmark, however, 47% of computers in secondary schools have a CD-ROM and 73% a sound card. In Finland, 30% of the computers installed have basic multimedia functions. In Sweden, two out of three primary schools, and the majority of secondary schools, have CD-ROM.

Targets:

Germany	To connect all schools to the Internet in 2001
Denmark	Between 5 and 10 pupils per computer installed within the past 5 years in 2002-2003 at primary level.
Belgium	15 pupils per computer in 2000 then 10 pupils per computer in 2002 at primary and secondary level.
Finland	10 pupils per computer at primary level and 7 per computer at secondary in 2000.
Sweden	To train and equip 60 000 teachers between now and 2001.

The percentage of schools with **fast connections** is now known. However, in Belgium the programme commenced in Flanders gives only 64 Kbits/second. In Denmark all connections are fixed and have a speed of 64 Kbits/second or more. In Sweden, 14% of primary schools have a fixed connection (6% ISDN) compared with 65% of secondary schools (5% ISDN). The percentage of schools connected having a **local network** is not known. All schools in Denmark have a local network. In the Netherlands, only 7% of primary schools and 88% of secondary schools do. These percentages stand at 37 and 80% respectively for Sweden.
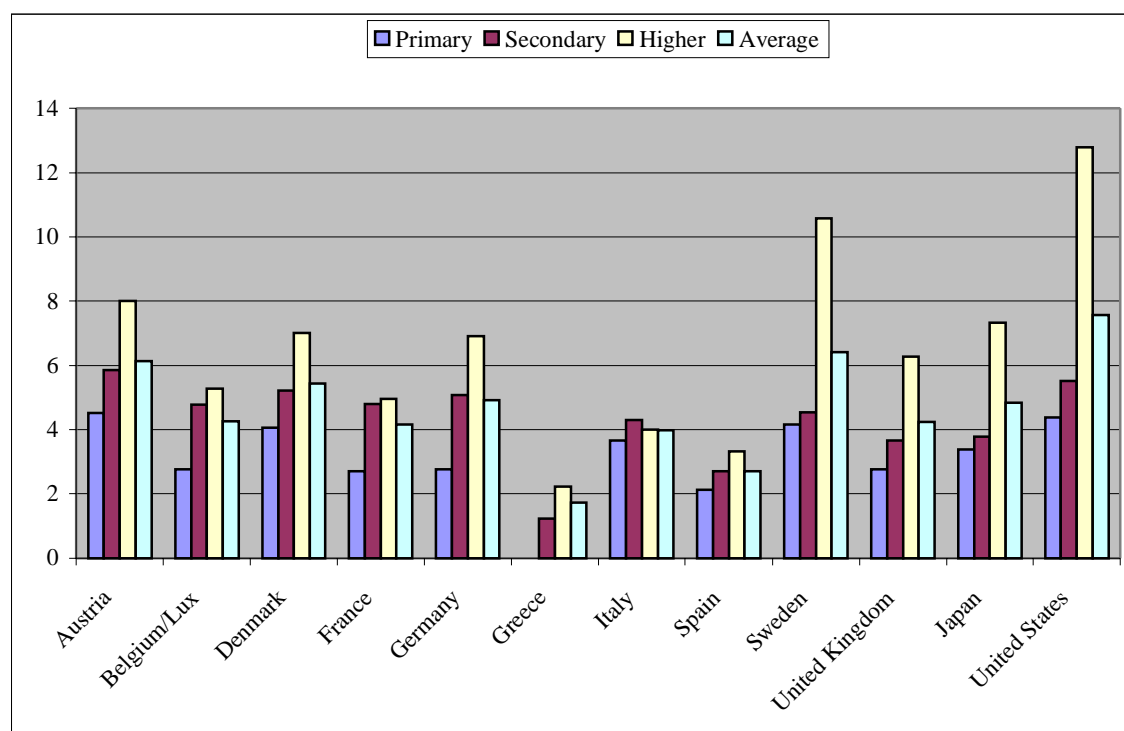
Average public spending on ICT per teacher and per pupil is not known, but in England the average expenditure is GBP 5 700 per school and GBP 27 per pupil at primary level and GBP 38 200 per school and GBP 45 at secondary level.

The **percentage of teachers having basic skills** in ICT is not known. However, in Sweden, 8 out of 10 teachers in 1997 stated they were not conversant enough with ICT. 20% of teachers in Finland have basic skills and in England 68% of primary school teachers and 66% of secondary school teachers were confident about their capabilities. **No information is to hand concerning the percentage of students using ICT daily and monthly**, but in Sweden, 20% of pupils use it daily and 50% monthly.

5.   OVERALL EXPENDITURE IN EDUCATION

	Capital expenditure as a % of GDP 1997	Annual expenditure for a pupil (€) at primary level 1997	Annual expenditure per pupil (€) at secondary level 1997	Annual expenditure per student (€) 1997	Average expenditure per capita (€) 1997
Austria	5.6	4.521	5.857	8.010	6.129
Belgium/Lux	n.a.	2.763 (B)	4.768(B)	5.271(B)	4.267
Denmark	7.0	4.067	5.205	7.012	5.428
France	6.2	2.706	4.793	4.958	4.152
Germany	5.8	2.764	5.082	6.913	4.920
Greece	2.4		1.229	2.211	1.720
Italy	4.7	3.655	4.306	4.001	3.987
Spain	5.6	2.128	2.698	3.324	2.717
Sweden	6.7	4.150	4.537	10.576	6.421
United Kingdom	n.a.	2.772	3.655	6.270	4.232
Japan	4.9	3.390	3.778	7.326	4.831
United States	6.6	4.372	5.511	12.796	7.560

Source. MESO based on data from different sources (MESO Report, Education at a Glance – OECD Indicators 1997, OECD, Paris, 1997)

Source: MESO. 1998