EDUCATE – End-user Courses in Information Access through Communication Technology

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Abstract

This paper will describe the EDUCATE project for end-user training in information access. EDUCATE is a CEC Libraries Programme Project which involves six members: Limerick University, Ireland (co-ordinator) and the Ecole Nationale des Ponts et Chaussées, France, Chalmers University of Technology, Sweden, Imperial College and Plymouth University, United Kingdom and the University of Barcelona, Spain. The aim of the EDUCATE project is to produce a new type of model self-paced user education course in the selection and use of information tools. The courses will be distributed by means of the academic communication networks. EDUCATE courses will be produced within two subject areas: physics and electrical and electronic engineering. The EDUCATE project started in February 1994 and will run for a period of three years. The paper starts with an introduction describing the need for courses in Information Literacy. It continues with a discussion on course design and the use of networks for training purposes. The goals for the EDUCATE Project are given, together with a short description of the media under development.

I. Introduction

EDUCATE is a CEC Libraries Programme Project which involves six universities: Limerick University, Ireland, Chalmers University of Technology, Sweden, the Ecole Nationale des Ponts et Chaussées, France, Imperial College and Plymouth University, United Kingdom and the University of Barcelona, Spain. The aim of the EDUCATE project is to produce a new type of model self-paced user education course in the selection and use of information tools. The courses will be distributed by means of the academic communication networks. This paper will start by describing the need for courses in Information Literacy. It will continue with a description of the EDUCATE course design and the use of networks for training purposes. The goals for the EDUCATE courses will be given, together with a short description of the media under development.

II. The need for information

In the industrialised world of today, information plays a key role in the lives of scientists and engineers. Information is, for example, of vital importance in research and development work. Information is needed for practical work such as technical construction, manufacturing and in the marketing of products. Engineers and scientists also increasingly act as vectors in the transmission of relatively complex information between individuals or groups who either ask them to solve problems or tell them what is needed (society, industry, the general public, political authorities). This often involves the use of specialised systems for handling scientific, technical and economic information. There is an ever-growing volume of information in every sphere of individual, professional and social life. This has resulted in attempts to structure and organise information and in the production of tools such as databases and data banks to assist the search and retrieval process. The use of communication networks plays an important part in today's information handling.

II.A. Information in research and development

There are three important areas where information handling can play a decisive role in research and development:

- Creativity and new ideas when starting new projects
- The storage of existing knowledge and information
- Communication between research workers

Research workers strive to gain new *knowledge*. This knowledge can then be used for a number of purposes: to provide answers to fundamental questions, to solve problems or to be used as a base for interpretation. In order to gain knowledge one must acquire information. In order to acquire information one must know of, and be able to use, the *information sources*. The total mass of information is growing rapidly, thus making it more and more difficult to find exactly what one is looking for. Therefore, learning how to obtain and handle information efficiently is of great importance to today's students and research workers.

II.B. Information for engineers

Engineers have to use many types of information, both for design and development, in problem solving, and in the distribution and marketing of products and processes. Engineers need to manage the information systems which aid the decision-making process and enable appropriate answers to be found in relation to expressed needs.

Engineers can be visualised as steering a course in a sea of information; they transform this information and produce plans and projects which are the expression, in a given moment of time and in terms of practical information, of solutions geared to their clients' expectations.

Many leading companies have become aware of the importance of information handling techniques for strategic planning and in the development and design process. Successful use of information within the company involves the use of both *external* and *internal* information sources. These may be combined to form a *Business Intelligence System* for weighing future opportunities against the risks of taking a given action. Business Intelligence can be defined as the processed information which is of interest to the management in relation to the present and future environment in which the company is operating. This provides one example of the strategic management of information.

II.C. The need for courses in Information Literacy

A particularly interesting study on the Scientific, Technical and Medical Information System (STM) in the United Kingdom has recently been carried out by the Royal Society, the British Library and the Association of Learned and Professional Society Publishers (ALPSP). [1] The individual scientist and engineer often has a need to obtain information rapidly and cheaply. What emerged very clearly from the Royal Society report was that a surprisingly large number of users of the STM system in the United Kingdom were unaware of many of the new tools and methods for information retrieval. It was found that users preferred the use of familiar and well-established information resources and that the newer technologies tended to be avoided. In principle, users were willing to explore the use of novel services, but, in practice, they continued to use the familiar material and methods. The Report made a number of recommendations, including:

R 1. ***Scientific researchers*** *should become more aware of the nature and problems of the STM system, and take greater responsibility for its health and effectiveness.*

R 2. *In view of the widespread ignorance of the availability of the new library research tools,* ***libraries in academic and research institutions*** *should routinely provide training for user and information providers in information access.*

A numbers of academic libraries have seen the need to provide this formal training. During the 1970s and 1980s, many academic libraries in the United Kingdom, the United States, Scandinavia and Australia started fairly ambitious programmes of user education, bibliographic instruction, or reader education. [2] Under the latter part of the 1980s there was a feeling that the use of expert systems and computer-based tools would reduce the need for this kind of education and training, but as has been pointed out by Fjällbrant (1990) [3], the increase in complexity of both media and methods has resulted in an even greater need to teach the users of scientific, technical and biomedical systems basic concepts about their information systems and to provide training in information skills. It is interesting to note that well-known universities such as Berkeley and Massachusetts Institute of Technology have recently started to emphasise the teaching role of the university library.

It is apparent, however, that many academic libraries have not been able to start the types of formal training suggested in the Royal Society Report. This is partly due to lack of economic resources and partly due to inertia or an inability to change direction and divert resources from one function to another. Within this context the **EDUCATE Project – End-user Courses in Information Access through Communication Technology** – has been planned as a means to provide a stimulus and help to libraries wanting to start courses on information literacy. A proposal was submitted to the CEC Libraries Programme (second call for proposals) in February 1993. This proposal was selected as one of 15 projects from the 97 applications, and work formally started on February 1st 1994. The project will run for a period of three years.

The aim of the EDUCATE project is to produce self-paced user education courses in the selection and use of information tools. These courses will be distributed by means of the academic communication networks. This will hopefully result in material which can be used by many libraries for the provision of courses in Information Literacy for users of information systems. EDUCATE courses will be initially produced within two subject areas: *physics* and *electrical and electronic engineering.* These subject areas have been selected in order to have one model course in science and another in technology.

III. What do we mean by Information Literacy?

The term Information Literacy is often used to denote the ability to make effective use of information systems – as expressed by the American Library Association:

To be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the information needed... Ultimately information literate people are those who have learned how to learn. They know how to learn because they know how knowledge is organized, how to find information, and how to use information in such a way that others can learn from them. They are people prepared for the lifelong learning because they can always find the information needed for any task or decision at hand.

ALA Presidential Committee on Information Literacy, 1989. [4]

Information literacy is based on the conceptual and behavioural strategies needed in order to make effective use of information systems. This can be regarded as a core competence which needs to be developed throughout life – from school through higher education and into the workplace and continuing education.

Today we are faced with an ever growing *quantity* of information – often referred to as the *information explosion*. Not only that, the information systems and the various handling tools available are increasing in *complexity* for example online and CD-ROM databases, online library catalogues and other information resources available via the academic networks. In addition, many new information resources are appearing on the research networks. This makes the students´ information tasks – searching, retrieval, evaluating, handling and organisation – complex. Within this context, the EDUCATE Project is aimed at helping students, research workers and practitioners in the development of information literacy.

Information Literacy is not an academic discipline in its own right, but rather a supra-disciplinary activity which can be integrated and/or related to other academic courses. It can be regarded as a variety of concepts and skills, which can be developed and used in connection with both academic studies and research, and in the continuing work of scientists and engineers. This would suggest that education in information handling should be closely integrated with the academic programmes, within the respective disciplines. The development of information literacy in the academic environment is ideally based on the close co-operation between academic and library staff. It is very important that the courses should be designed to meet **the real information needs of the users** and made available at a time when there are specific information requirements, as in projects and problem-based learning. The advantage of network-based instruction is that this can be used to provide a tool for both formal courses and for individual repetition at a time of need.

IV. Course design

Education can be regarded as a process which changes the learners – a process "in which someone has to decide what changes are possible and desirable. Every student-teacher interaction is based on some implicit conviction on the part of both teacher and student about the possibility and desirability of certain changes" (Bloom et al). [5] The goals – both explicit and implicit – of the students and the teachers are not, however, necessarily identical or even similar. In designing courses it is necessary to try to provide situations which facilitate the learning process, taking into account that students (and teachers) are individuals with different starting points and requirements. In recent years, technological development within computing and communication has provided the potential to improve learning and teaching efficiency. In the EDUCATE Project we aim to use and integrate methods based on the use of modern information technology, distributed by means of the academic networks, in order to provide courses on information handling suitable for a variety of teaching/learning situations. A most important factor is to produce courses related to the needs of individual students.

The design for the EDUCATE courses aims to facilitate the learning of fundamental concepts about information retrieval and handling and to provide practical experience at a point related to student needs. In terms of libraries and information resources, the basic concepts of information literacy are based on the underlying ideas of the logic of scholarly communication. These will be experienced in qualitatively different ways by different people. An understanding of these concepts facilitates a qualitatively deeper type of learning. What do we mean by surface and deep learning? In 1979, Säljö carried out a study, based on interviews, which led to the description of five conceptions of understanding of learning: [6]

1. Learning as a quantitative increase in knowledge. Learning is acquiring information or "knowing a lot."
2. Learning as memorising. Learning is storing information that can be reproduced.
3. Learning as acquiring facts, skills, and methods that can be retained and used as necessary.

4. Learning as making sense or abstracting meaning. Learning involves relating parts of the subject matter to each other and to the real world.
5. Learning as interpreting and understanding reality in a different way. Learning involves comprehending the world by interpreting knowledge

The conceptions in the latter two categories are qualitatively different from the first three, in that they are more complex and are connected with meaning and understanding. They emphasise the personal aspect of learning in which learning is something that you do in order to be able to understand and relate to the real world. The concepts in the first three statements have been described as related to *surface learning* as opposed to those in the last two statements which have been linked to *deep learning*. The latter implies understanding and facilitates retention, whereas matter that is acquired by surface learning is soon forgotten. The student's conception of learning is of considerable importance, as has been pointed out by Laurillard, because this is the way that they believe that they can come to know (or learn). It is important for teachers to know as much as possible about the views of their students in this respect (Laurillard, 1993). [7] Ideally the learning process should take the form of an **interactive dialogue** between teacher and student, where both are in agreement on the learning goals for the topic.

In planning the use of the EDUCATE courses, it is desirable to try to provide situations which will encourage deep learning rather than surface learning. The possibilities for this will vary in different institutions and teaching situations. The *timing* of instruction in information literacy and its linkage to other parts of the student's course of work is extremely important. This ensures that the student is highly motivated. When designing courses in Information Literacy to provide participants with *concepts* and *tools* which will be useful, not only in connection with their immediate studies, but also throughout their working lives, it is vital that the students experience the relevance of the course. Instruction in information retrieval is likely to be successful if provided at a point when students are working on a project which requires them to acquire information.

The design of the EDUCATE courses started with the definition of the main **goals** and **objectives**, the **course contents,** and the **teaching methods** and **media** to be used. The result of this planning will then be tested in practical situations and **evaluation** will be carried out in order to assess the effectiveness of the programme. The evaluation will be of two types – *formative evaluation* during course development, and *summative evaluation* directed towards the educational products.

V. Goals for the EDUCATE courses

The goals for the EDUCATE project have been based partly on the reflective experience of teachers and library practitioners, partly as the result of negotiation with students. These are expressed in terms of student learning, as follows:

The *Aims* of the EDUCATE courses are that after the course you should have:

* the ability to apply the principles of scientific communication to problems of information handling;
* the ability to locate, select and use appropriate information retrieval tools in order to obtain useful information in connection with studies or work, as and when required;
* confidence in using, and satisfaction in carrying out, information searching.

The *Objectives* of the EDUCATE course in Information Literacy are that you should:

* be able to develop a ***systematic method*** of searching for information in connection with your studies – project work, writing a literature survey, etc.
* be aware of the wide range of ***sources available*** for finding information and select the sources which will best meet your needs
* be aware of appropriate ***indexing*** and ***abstracting services*** and ***databases*** and understand the principles of their use
* develop your ***database searching techniques*** for accessing both online and CD-ROM databases
* be able to use ***current awareness methods*** to keep up to date with the published literature after your initial search
* be able to use ***citation indexes*** to find information
* be able to use the ***international academic networks*** for getting information
* be able to **compare and evaluate** information obtained from various sources
* be able to ***cite bibliographic references*** in your project reports or theses
* be able to construct a ***personal bibliographic system***

VI. Using the networks for communication

Now we have the exciting possibility of communication within a global research community based on the use of the data communication networks – the **Internet.** The roots of the Internet go back to the ARPAnet – Advanced Research

Project Agency network – developed by the U.S. Department of Defense to support military research in 1969. The ARPAnet used a fairly simple set of rules – a protocol – the Internet Protocol (IP) for sending messages. This IP technology was subsequently made use of in the National Science Foundation´s (NSF) **NSFNET** which connected the five US supercomputer centres in the late 1980s. These five very expensive supercomputer centres had to be connected in order to share resources amongst the academic community. This opened up the networks for academic use, and the **Internet** was born as a net of networks linking different kinds of computers. [8] Other networks using the Internet Protocol TCP/IP could be easily linked in. One example is **NORDUnet,** a consortium formed by the national networks for research and education in the five Nordic countries – Denmark, Finland, Iceland, Norway and Sweden. Another example is **AARnet** – the Australian Academic Network.

There are, however, many computer networks that do not make use of IP protocols. The majority of the European national networks have been developed from X.25 networks. The computer networking infrastructure in Europe for academic and research networks is still dominated by the *National networks* and their corresponding networking organisations. With all these various networks and protocols, there is an obvious need for co-operation and integration. In September 1991 a decision was taken by the large TCP/IP users to establish a European Backbone Network with the name **EBONE.** An important issue for the future development of European research networks is that of funding. The CEC has supported many development projects, but cannot, within the limits of its authority, provide all the support necessary for operational services. There are, in addition many European countries which are not part of the European Community. During the last few years there have been radical changes in central and eastern Europe. One result of this has been a greatly increased demand from the academic communities for network services. The CEC has taken the initiative to provide 64kbps links to some of the central European countries.

The academic networks provide an excellent medium for communication and the distribution of teaching material. They can be used for transmitting textual material, for connection to databases and online library catalogues (OPACs) throughout the world, and for the provision of source material in the form of electronic pre-prints, and electronic journals and newsletters and electronic texts, as well as for connection to discussion groups and Bulletin Board Systems. The type and variety of information resources available on the Internet is expanding at a phenomenal rate. Indeed one of the problems is finding out what is available and how to obtain it. A useful recent guide is *On Internet 94* which provides information about electronic journals and newsletters, discussion lists and special interest mailing lists, electronic texts, text archives and Internet resources guides, as well as commercial services available on the Internet, USENET Newsgroups and other mailing lists, freenets and other community-based information services, etc. [9]

VII. Recent developments of digital networks

The academic and research networks have a characteristic pattern of increasing use, so considerable effort is now being put into increasing the capacity of these networks, in order to cope with the increased traffic. We started with Kilobit networks, moved to Megabit networks and are now approaching Gigabit networks. As demand grows, the capacity of the networks increases – the highway gets bigger! The present speed of the main backbone is now 45Mbps. The Joint Academic Network – JANET – was established in 1983 to link all United Kingdom universities and institutes funded by the Research Councils. JANET will eventually be superseded by SuperJANET based on the use of optical fibre technology which will initially provide 34Mps interconnections at each site (Breaks, 1993). [10] This will be increased eventually to 140 Mbps and later 600Mbps. SUNET – the Swedish university network has recently been upgraded and has a backbone of 34Mbps lines interconnected by Cisco routers. It is interesting to note that one of the earliest academic networks in Europe to offer 34Mbps was the Norwegian UNINETT which made use of surplus capacity available on the Norwegian PTT lines.

Another important development is the creation of gateways that allow the connections between networks that do not have the TCP/IP protocols to the Internet. (for example the European X.25 networks, Bitnet and DECnets). These connections called *Gateways* were first used only for the transfer of electronic mail between the networks. Many have, however, been to developed to provide full service compatibility.

A number of global network tools have been developed over the last two years. Many are distributed information systems based on a client-server architecture. The server is used for the administration of the data whereas the client machines access the servers across the Internet and act as a presentation to the user, who is thereby spared having to know about a lot of networking details. Most of the programmes are free – a real bonus for the hard up scholar or librarian! These tools include the **Gopher** which makes use of a simple protocol using networked hierarchical directories. It is possible to access files, directories, servers (including Archie and WAIS servers), USENET-NEWS servers, and Telnet to other computers all round the world, by entering simple commands or pointing to menus. It is fast, easy to use and easy to install, so it has spread very rapidly amongst Internet users. It is possible to keep a track of particularly useful communications by setting Bookmarks, for future use. A very useful accessory tool for searching in Gopherspace is **Veronica** (Very Easy Rodent-Oriented Net-wide Index to Computerized Archives) which was created at the University of Nevada. Veronica maintains an index of titles of Gopher items and provides the facilities to carry out simple keyword searches of those titles. Another network tool is **WAIS** – the Wide Area Information Systems. WAIS is a tool for full-text information retrieval over wide area networks (WANs) The World Wide Web (WWW or W3) is a hypertext based system for finding and accessing Internet resources. WWW was first developed at CERN, and is gaining in popularity, particularly when used with the MOSAIC interface. Information about network tools is provided, and currently updated, by the Networked Information Retrieval Working Group, a co-operative effort between the Internet Engineering Task Force (IETF), Réseaux Associés pour la Recherche Européenne (RARE) – the European Association of research networking organisations and their users – and the Coalition for Networked Information (CNI). The current information can be obtained from the UK Mailbase server. [11] Other sources of information on networking tools are given in the reference list. [12],[13]

VIII. EDUCATE progress so far

In any project with a number of participants from different countries, it is essential to build up good methods for communication as soon as possible. These are partly achieved by formal meetings of the EDUCATE Steering Committee and meetings between the various work groups. Communication between these various actors has been greatly helped by establishing closed discussion and mailing lists, based on a server at Chalmers University. Good network communication is invaluable in international projects. At a later stage an EDUCATE electronic newsletter will be produced.

The course design for the EDUCATE programme has been agreed upon (see above) and a start has been made in producing the teaching material. The text *Communication in Science and Technology – an Introduction* has been written and work has begun on the next two teaching packages –*Information Sources in Physics* and *Information Sources in Electronics and Electrical Engineering.* In parallel, work has started on the design of demonstrations and exercises in information retrieval from both databases and library online catalogues – OPACs. The first versions of the teaching material will be produced in English. This will be followed by adaptations in French and Spanish. A particularly important issue is the choice of suitable hardware and software for network applications. In this instance it is deemed necessary to use software that can be applied over many hardware platforms PCs – Macintosh and IBM-compatible, UNIX workstations, and terminals type VT100. The MOSAIC interface appears to offer an attractive possibility here. Within the consortium, experiments are being carried out on the use of World Wide Web, Wide Area Information Systems (WAIS) and Gopher clients and servers.

IX. How the EDUCATE packages can be used

The EDUCATE material can potentially be used in a number of ways:

* by librarians for designing courses in Information Literacy;
* by academic teachers for designing courses in information literacy;
* by both these groups acting together;
* by individual students – in distance learning situations;
* by scientists and engineers for continuing education.

Within the EDUCATE project, there will be a special programme for "Training the Trainers" – that is – training librarians, who are used to organising and evaluating information sources, how to teach users of these sources. We feel that it is very important for the user to be aware of and learn to use *appropriate resources* and to critically evaluate the information sources and tools that are available. Time will show if we manage to achieve this aim.

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