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AUTHOR Burge, Elizabeth J.; And Others
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ABSTRACT

This paper presents a collection of experiences from the Canadian educational institutions that offer distance education. The first of four major sections defines the need for an alternative to traditional, classroom-based education, and describes the characteristics of distance education. The second section discusses the three institutions in Canada that are dedicated to providing distance education: Athabasca University in Alberta, the Open Learning Institute in British Columbia, and Tele-universite in Quebec. The third section focuses on the four provincial educational communications authorities in Canada and the educational programs they offer to their audiences: Radio Quebec, TVOntario, ACCESS Alberta (Alberta Educational Communications Corporation), and the Knowledge Network of the West. The fourth section looks at applications of various technologies in distance education: print, radio, audiocassettes, television, videotape, computers, videodisc, videotex/Telidon, teleconferencing, and satellites. A discussion of issues and problems that have arisen in connection with the application of information and communication technologies to distance education in Canada and a brief final statement on the current status of and opportunities offered by distance education conclude the report. (54 references) (DB)

TVOntario

Office of Development Research
Bureau de recherche pour le développement

NEW TECHNOLOGIES IN CANADIAN EDUCATION

PAPER 5

COMMUNICATIONS AND INFORMATION TECHNOLOGIES AND DISTANCE EDUCATION IN CANADA

By Elizabeth J. Burge
Joy Wilson
Audrey Mehler

Study Coordinator
Ignacy Waniewicz

August 1984

Papers in the Series

NEW TECHNOLOGIES IN CANADIAN EDUCATION

Paper 1	An overview of the educational system in Canada
Paper 2	Communications and information technologies in Canadian elementary and secondary schools
Paper 3	Communications and information technologies in community colleges in Canada
Paper 4	Communications and information technologies in Canadian universities
Paper 5	Communications and information technologies and distance education in Canada
Paper 6	Communications and information technologies and the education of Canada's native peoples
Paper 7	The provincial educational communications organizations in Canada
Paper 8	Educative activities of the Canadian Broadcasting Corporation and the National Film Board of Canada
Paper 9	Applications of new technologies in nonformal adult education in Canada: Two examples
Paper 10	Canadian cable television and education
Paper 11	Educational applications of videotex/Telidon in Canada
Paper 12	Educational applications of communications satellites in Canada
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Paper 14	Educational teleconferencing in Canada
Paper 15	Telehealth: Telecommunications technology in health care and health education in Canada
Paper 16	The high technology industry and education in Canada
Paper 17	New technologies in education in Canada: Issues and concerns

Copies of these papers can be purchased from TVOntario, Box 200, Station Q, Toronto, Ontario, Canada M4T 2T1.

FOREWORD

We dedicate this series to its designer and director, Ignacy Waniewicz. His death on February 21, 1984, has left us with a feeling of immeasurable loss.

With uncanny intelligence, instinct, and energy, Ignacy introduced the first educational television programs in his native Poland in 1957 and rose to the position of Director of Educational Broadcasting. During the mid-1960s, he served as a Paris-based program specialist in the educational use of radio and television, working for UNESCO in Chile, Cuba, Ivory Coast, Upper Volta, Mexico, Egypt, Nigeria, Senegal, Ghana, Great Britain, United States, Switzerland, and Israel. Ignacy shared the experience and insight he gained from this work by teaching and writing in Polish, German, Russian, Hebrew, Spanish, French, and English. His achievements are widely recognized in the broadcasting and academic communities on four continents.

As Director of the Office of Development Research at TVOntario, Ignacy explored his farsighted and consuming interests in adult education, media literacy, television as a primary tool for lifelong learning, and most recently, the educational uses of new technologies. His work did much to shape and guide TVOntario's progress over the last 15 years.

It is with love and respect that we dedicate this series to Ignacy Waniewicz. In its enormous scope, its thorough documentation, its emphasis on concrete results, and its concern with educational issues, this series reflects both Ignacy's vision and his intellectual legacy.

Donna Sharon
for the Office of Development Research

Preface to the Series

NEW TECHNOLOGIES IN CANADIAN EDUCATION

These papers in the series "New Technologies in Canadian Education" are the result of an international commitment. In June 1980, the Third Conference of Ministers of Education of Member States of the European Region of UNESCO adopted a recommendation requesting the member states to carry out joint comparative studies on well-defined problems of common interest in education. At a subsequent meeting of the European Region National Commissions for UNESCO, 14 subjects were agreed on for joint studies.

The theme "New Technologies in Education" was selected as study #11. The 17 countries participating in the study are Austria, Belgium, Denmark, Finland, France, Hungary, Italy, the Netherlands, Poland, Spain, Sweden, Ukrainian SSR, USSR, United Kingdom, as well as Canada, Israel, and the U.S.A. who are also members of the UNESCO European Region. At the first meeting of the national coordinators from these countries, held in October, 1982, at the University of South Carolina in Columbia, South Carolina, U.S.A., a plan was adopted for the study. In the first phase of this plan, the individual countries are to report on the ways in which the new technologies are being used in education. (A brief outline of the international design is available on request.)

The Canadian Commission for UNESCO was requested to coordinate, on an international level, the first year of the study. We are grateful to the Canadian Commission for selecting TVOntario, and the Office of Development Research (ODR) to be in charge of this task. The ODR was also asked to coordinate the Canadian contribution to the study, with financial support from the Department of the Secretary of State. We gratefully acknowledge their assistance.

In preparing the Canadian review of the use of technology in education, the ODR contacted a number of educators, academics, government officials, administrators in educational communications organizations, and others, across the country. It became apparent that there was a strong need for a well-documented account of the uses of both the "older" technologies (e.g., film, audio, television) and the newer technologies (e.g., computers, videodiscs, videotex) in the complex Canadian educational system.

Early in 1983, several types of research activities began simultaneously: designing instruments to gather information from each type of institution or interest group, identifying uses and users of each type of technology, and exploring the areas where Canada's distinctive features predispose toward technological developments. The 17 papers listed on the back of the title page emerged as a result.

Information for these papers was provided by hundreds of individuals expressing their own views or reporting on behalf of educational institutions and organizations, government departments, public and private corporations. We extend to them our sincere thanks.

I would like to acknowledge the contribution made by Thelma Rosen who assisted in the development of the inquiry instruments and played a major role in the gathering of this information. The task of supervising the final editing, production, and distribution of the papers was assigned to Donna Sharon. Her resourcefulness and persistence have contributed greatly to the completion of this series. Sharon Parker typed most of the papers from the initial drafts to their final versions. Her dedication made it possible to complete the study in such a relatively short period.

While the preparation of these papers has been supported by the Canadian Commission for UNESCO and the Department of the Secretary of State, the papers' contents do not necessarily reflect the official views of either party on issues related to technology in education.

Ignacy Waniewicz
Study Coordinator
Director
Office of Development Research
TVOntario

January 1984

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INTRODUCTION

The evolution of information and communications technologies has increased the potential for providing education to those who would otherwise not have access to educational resources. Distance education has been available in Canada for nearly a century, but only with the recent integration of technologies into education have the possibilities for learning at a distance become so comprehensive, credible, and popular.

The purpose of this paper is to present a collection of experiences from the educational institutions that offer distance education. By doing so, the paper will describe the role currently played by new communications and information technologies in the provision of distance education in Canada. The first section of this paper defines the need for an alternative to traditional, classroom-based education in Canada, and describes the general characteristics of distance education. The second section discusses the three educational institutions in Canada dedicated to providing distance education: Athabasca University in Alberta; the Open Learning Institute in British Columbia; and Télé-université in Quebec. The third section of the paper focuses on the four provincial educational communications authorities in Canada and the educational programs they offer to their audiences. The fourth section discusses applications of the various technologies (print, radio and audiocassettes, television and videotapes, microcomputers, videodisc, videotex, teleconferencing, and satellites) in distance education by educational institutions throughout Canada. This section is followed by a discussion of issues related to distance education concerning students, faculty, and institutions.

DEVELOPMENT OF DISTANCE EDUCATION IN CANADA

"Distance education is a land of contrasts."[1]

Under the Canadian constitution, education is a provincial responsibility. As a result, the development of distance education in Canada has not followed a centralized plan. Rather, it is based on responses to local or regional needs, which in turn reflect the diversity in terrain, economic wealth, and cultural and demographic make-up of the provinces.

The task of providing educational opportunities to their constituencies - often in remote, rural communities - is not a new one for the provincial ministries of education. Correspondence education (a forerunner of the distance education concept) began in Canada in 1889 with the establishment of a correspondence program at Queen's University in Ontario. In 1919, British Columbia's Department of Education saw correspondence education as "a method of overcoming the handicap of distance from schools, and a means of bringing about equalization of educational opportunity."[2] In later years, other provinces were to follow suit (Alberta in 1923, Saskatchewan in 1925, Manitoba in 1927). Today, the task of equalizing educational opportunities is far more complex than it was when correspondence programs offered the only alternative to traditional, classroom-based education.

The demand for adult education

The postwar baby boom in Canada and the recent decline in the birth rate are enlarging the proportion of adults in the population to the point where the demand for education may become stronger among adults than among young people. As Waniewicz has stated, "technological development and its impact on employment and careers, the rising educational level of the population, the changing role of women in society, leisure time and longevity, changing lifestyles, the rise of 'entitlements' among 'old' and 'new' minorities, all these create a need for delivering new educational opportunities."[3]

One aspect of these postwar changes has been the recognition that the learning process has become a lifelong pursuit for many people:

> "Starting from the observation that today the amount of knowledge acquired in school no longer stands up against the wear and tear of time and is therefore insufficient for a whole lifetime, it must be supplemented and brought up to date after reaching adulthood. Retraining and adult education in their various forms have become indispensable. School education must be supplemented by other possibilities and other forms of learning and training. But if all these different educational processes are to be as effective as possible, they must be co-ordinated and integrated in a single, comprehensive education system: lifelong education."[4]

The growth of distance education

The concept of distance education evolved in response to those adult learners for whom face-to-face, teacher-based learning is problematic. Reasons for this may include lack of time, irregular work hours, a too-distant campus, an inability to leave home for physical, personal or family reasons, dislike or fear of formal schedules or even the fear of academic failure in a public environment such as a classroom.

In designing a learning system for this type of individual, educators have, over time, produced a new sector of program delivery known as distance education. This term refers to learning systems that:

> "serve relatively dispersed student populations and involve a minimal reliance on face-to-face teaching. In so doing, they liberate the student from the constraints of space, time (and often age) associated with conventional provision permitting a degree of flexibility as to the regularity, timing and location of study activities [and the] opening of educational opportunity to new target populations.

"Concerning the learning materials and teaching methods which characterize the courses, the notable features are:

- a flexibility in the curriculum and content of the learning materials through, for example, modular structures

- the conscious and systematic design of learning materials for independent study incorporating, for example, self assessment devices and the provision of feedback from students to learning system staff and vice versa

- the planned use of a wide range of media...suited to the needs of the students."[5]

Since the early 1970s, distance education has been implemented at two structural levels. On one level, more and more universities and community colleges have investigated the potential of different technologies (broadcast and cable television, audio and videocassettes, audio- and video-teleconferencing, and computer networks) as viable mechanisms for developing distance education courses and have integrated distance courses into their broader academic structure. On another level, three relatively autonomous dedicated distance education institutions were created: Athabasca University in Alberta, the Open Learning Institute in British Columbia, and Télé-université in Quebec.

APPLICATIONS IN DEDICATED INSTITUTIONS

Athabasca University

Athabasca University was established in 1972 in Edmonton, Alberta, with a specific mandate to conduct a pilot project in university distance education. Athabasca gained self-governing status as a university in 1977, and since then has developed approximately 120 courses for three undergraduate degree programs. By the 1983/84 academic year, the University was handling 10,000 course registrations from over 6,500 students, and was expecting significant increases in future enrollments.

Athabasca uses primarily print materials in its courses, with support from audio- and videotapes and programs delivered via local cable television companies in all major centres of Alberta. AM/FM radio has been used for three French language courses, but programming schedules and the restricted size of the audience present problems in the use of radio. Group audio-teleconferencing is currently operating in 17 courses, and with the recent adoption of a plan to offer full degree programs in a number of rural centres, this figure should increase dramatically. Course delivery via teleconference is supplemented by sophisticated printed course packages which greatly enhance the learning experience. Athabasca's print materials are recognized for their carefully structured presentations and high standards of graphic design.

Experimental applications of technologies at Athabasca centre on teleconferencing, Telidon system software, videodisc and computers. Between 1981 and 1983, page creation systems for Telidon were developed and experimentation carried out on the creation of text and graphics. Athabasca staff are assessing the feasibility of using Telidon for teleconferencing support and are developing the use of color, text fonts, and graphic devices for videotape production. While Athabasca recognizes a future for Telidon, it is also aware of the importance of the print package and the need for a cautious approach to future experiments.[6]

The use of microcomputers for course development and delivery is on the rise at Athabasca. A plan has recently been adopted to establish a network of microcomputers in about 30 locations in Alberta for use by students taking courses in administrative studies and computer science. It is expected that this network will soon be provided with the capacity for interactive computer-assisted instruction (CAI) in these areas as well as others.

Open Learning Institute

The Open Learning Institute (OLI) was founded in 1978 in Vancouver by the provincial government of British Columbia to "fill as many gaps as possible in the existing provincial system of post-secondary education,"[7] and to avoid "wasteful duplication of effort and resources through cooperation and collaboration."[8] OLI provides adult part-time undergraduate degree programs in arts and science and in administrative studies as well as programs in adult basic education, high school completion, and career, technical and vocational areas. In March 1984, OLI had 10,400 course enrollees and offered 100 degree-credit courses and 60 courses in the career-technical-vocational program. The undergraduate degree program allows students to transfer nearly all their credits from OLI to the three universities in British Columbia.

Print is a major medium of instruction, and the development of high quality, print-based materials such as course manuals has been a major goal of OLI. OLI prepares course packages containing textbooks, books of readings, novels, pamphlets, and audiotapes. In a few instances, television programs obtained by OLI for course use have been carried on the Knowledge Network. The Institute is just beginning to produce its own television material.

Tutors and advisors are available on toll-free telephone lines. Local advising centres have also been established in some parts of the province. The tutor provides students with subject matter guidance for each course, and the advisor assists them with course and program selection, financial aid matters, and monitors student progress. Students are assigned an advisor who remains with them as long as they are enrolled at OLI. OLI students enrolled in university courses have

mail and telephone access to library services at Simon Fraser University.

The Open Learning Institute is part of the International Universities Consortium with about 30 American universities, Athabasca University, and the British Open University. Through its membership in the Consortium, OLI has access to Open University courses as well as courses developed by the Consortium itself. In addition, OLI hopes to market its own courses to American universities through the Consortium; the Consortium has recently adopted an Athabasca course in microeconomics. Beginning in the Fall of 1984, OLI will offer courses developed by the British Open University. At present, OLI is working with the University of British Columbia to prepare a North American version of an Open University calculus course. Since early 1982, OLI researchers have been studying the effectiveness of audio, Telidon, teleconferencing, and videodisc applications.

Télé-université

Télé-université is a French-speaking distance education institution that is part of the Université du Québec. It was created in 1972 with a mandate to serve learners who are remote from a university service. Télé-université offers an alternative learning experience to its students, not only because it is a distance learning institution, but also by the nature of its curriculum. Télé-université offers a liberal arts program with a humanistic approach which allows the student to "internalize knowledge and to interact with his/her environment."[9]

Télé-université presently has an enrollment of 28,000 students in 60 different courses. It offers undergraduate credit courses that lead to a credit certificate (30 credits) and a bachelor's degree (90 credits). These credits are recognized by the other universities in Quebec as well as by a number of universities in other provinces.

The first program offered by Télé-université was in socio-cultural studies. Certificates are available from this program in Knowledge of Man and His Surroundings and in Knowledge of Man in Society. The other major programs offered by Télé-université are preparatory courses in science and technology, labor-management interaction in the public

and private sectors, and computer science. Télé-université also offers noncredit courses to large numbers of students and has been involved in community services, such as a successful campaign on the proper use of the French language, and an international symposium on drinking water.

Télé-université believes that educational media should improve and support the educational environment of the student, promote a dynamic, interactive learning situation, and be easily accessible and cost-efficient. Course delivery by Télé-université has relied on a multimedia mix to respond to different learning styles, but print has always been the primary technology. Seventy per cent of Télé-université learning material is print.

Audiocassettes are an important component of many Télé-université courses. They either carry the main educational content or offer supplementary material.

Video has been used at Télé-université mainly to supplement print. The educational content is distributed either by Radio-Québec, private cable companies, or by sending videotapes to learning centres. Since 1982, Télé-université has broadcast its video on the Canadian Satellite Communications Corporation's (CANCOM) satellite channel.

Telephone and teleconferencing are largely used as learner support tools. In many courses, the telephone is used to break isolation and often replaces face-to-face meetings. Students have access to the institution through toll-free telephone lines, and they may share questions, insights and learning experiences with their instructor and other students via teleconferencing.

Télé-université has used computer-assisted instruction (CAI) and computer-managed learning (CML) since 1974. A "télématique" network has been established that will enable information delivery and interaction with students using videotex and microcomputers.

For the past year, Télé-université, in conjunction with French, Swiss, and some Canadian universities, has been pursuing the possibility of combining microcomputers with interactive videodisc in the teaching of biotechnology.

While print is the primary medium for distance education at these and other educational institutions, audio and video materials are used to supplement many courses. Four provinces have established educational communications organizations that produce and/or distribute educational programming. These are Radio-Québec, TVOntario, ACCESS Alberta, and Knowledge Network of the West. Through a variety of facilities and services, these organizations support the delivery of distance education in their provinces.

PROVINCIAL EDUCATIONAL COMMUNICATIONS ORGANIZATIONS

Radio-Québec

Radio-Québec, created in 1968 in Montreal, is an educational television network with a mandate to promote access to education and cultural heritage for the citizens of Quebec, with special attention to the particular needs and concerns of each region of the province. Radio-Québec offers some academic programs, but its emphasis is on general cultural and educational offerings aimed at the largest possible audience.

For educational programs aimed at school audiences and continuing education programs for adults, Radio-Québec's role is essentially that of broadcaster rather than producer. Approximately 25 hours per week of Radio-Québec's television airtime is dedicated to broadcasting academic programs during school hours. These programs are produced by the provincial Ministry of Education and other agencies involved in the education of children.

Continuing education programs are shown from 1200 hours to 1800 hours on Sundays. Radio-Québec consults educational experts to decide which topics will be of interest to the target audiences. The subjects reflect the needs of a working population eager to update its professional skills. Radio-Québec oversees the production of these programs. Other continuing education programs broadcast by Radio-Québec are produced by Télé-université de l'Université du Québec.

The majority of Radio-Québec's television programs are in the category of general interest education. In this programming, the network assumes the more active role of producer. These informal educational programs are usually made with the help of communications specialists rather than professional educators. The creative use of leisure time, active participation in a constantly changing society, and the general enrichment of the viewers' lives are the main goals of this type of educational television. To make the programs as accessible as possible, Radio-Québec re-broadcasts the following afternoon the program of the previous evening, and uses scheduling strategies and

promotional techniques similar to those of commercial television.

Radio-Québec's broadcast network consists of 10 main transmitters and two re-broadcast transmitters. Recently, Radio-Québec signed an agreement with the Canadian Satellite Communications Corporation (CANCOM) to broadcast programs in northern Quebec via satellite.

TVOntario

TVOntario was established in Toronto in 1970. The main objectives of TVOntario are to utilize electronic and associated media to provide educational opportunities not otherwise available to all people in Ontario, and to cooperate with other organizations in attaining social and educational goals.[10] TVOntario's signal is transmitted by microwave and the Anik C3 satellite, and is re-transmitted to viewers by a comprehensive broadcast and cable network. The TVOntario network reaches 93 per cent of the population of Ontario. A Video Program Service (VIPS) makes TVOntario programs available on videotape for purchase and rental by nonprofit and educational institutions.

TVOntario broadcasts programming for in-school use during the day. Just before and after school hours, it broadcasts programming for children at home. Early evening programs are aimed at family viewing; science, public affairs, and arts programming later in the evening is directed at adults. Wednesday evening is devoted to adult part-time learning programs such as the TVOntario Academies, which provide structured educational content and offer print and other support materials and opportunities for student interaction.

TVOntario's weekend programming consists of children's programs, part-time learning programs and telecourses, many of which have been incorporated into university and college curricula. In the case of telecourses, TVOntario is responsible for the broadcast of the television programs, which are either produced by TVOntario or acquired from British, American, or other Canadian producers; the educational institution provides credit, administrative support, and feedback to the participant. Both credit and noncredit courses have been developed covering a wide range of subjects: for example, business management ("Understanding

Behavior in Organizations"), music ("All You Need Is Love"), economics ("The Age of Uncertainty"), and philosophy ("The Moral Question").

TVOntario's Sunday afternoon and evening broadcast schedule is devoted to French language programming for all ages. During the school year, one half-hour each weekday morning and afternoon is given to French language programming for use in French language and French immersion schools.

For in-school use, TVOntario develops television series accompanied by program guides, teachers' guides, student workbooks, resource books, or brochures produced to complement the programs. The programming may be produced by TVOntario or acquired from outside producers. Some programs are designed as core components of the Ontario school curriculum; others provide supplementary development of a subject.

TVOntario is also involved in projects concerned with the educational applications of computer-assisted instruction, computer-managed learning, and Telidon.

ACCESS Alberta

The Alberta Educational Communications Corporation (ACCESS) was formed as a crown corporation in Edmonton in 1973. ACCESS is composed of ACCESS Radio/CKUA, ACCESS Television, the Media Resource Centre, and the Instructional Technology Unit. ACCESS Radio/CKUA reaches approximately 90 per cent of the population of Alberta. The programming is produced by ACCESS (alone or in cooperation with another production facility) or acquired from other sources. ACCESS radio programs include five hours per week of daytime radio broadcasts relevant to school curricula in grades 1 to 12. The adult continuing education programming features 15½ hours weekly of evening and weekend programming designed for postsecondary students and general interest programs for adults. Athabasca University often utilizes ACCESS radio programs to supplement its French language and literature courses.

ACCESS has two production studios, one in Edmonton and one in Calgary, which together produce approximately 125 hours of programming yearly for preschoolers, elementary and

secondary school students, and adults. ACCESS also acquires 150 hours of programming yearly from various production facilities. ACCESS Television is carried on five private stations and five CBC stations in Alberta. In January 1985, ACCESS will begin transmitting over the Anik C3 satellite in order to reach those communities in Alberta which lack access to educational programming.

ACCESS' Media Resource Centre, located in Calgary, stores, duplicates, and distributes audio- and videotapes, multimedia kits, teachers' guides, and printed material to supplement ACCESS radio school broadcasts and ACCESS television programs. These are sent to elementary and secondary schools, Athabasca University, and other institutions.

The Instructional Technology Unit, responsible for educational computer materials and services, undertakes activities in computer literacy and awareness, software and courseware, and experimental projects. ACCESS also has six field service centres to provide information on ACCESS programs and materials and to assist in the implementation and evaluation of special projects.

Knowledge Network of the West

Knowledge Network of the West, British Columbia's educational communications authority, was established in 1980 in Vancouver to provide a satellite delivery network for programming produced or purchased by the province's educational institutions. The Knowledge Network delivers educational programming via the Anik C3 satellite to 85 per cent of the population of British Columbia, as well as parts of the Yukon. The distribution network includes community cable television, low power community re-broadcast transmitters, and direct broadcast earth receiving terminals. Approximately 100 hours per week of educational programming are currently provided to 160 communities.

Three types of programming are delivered via the network: telecourses, teleseries, and general interest programs. Telecourses are credit courses which include a package of printed resources and study materials combined with a television component. Students view the televised program and are able to ask questions and make comments by phoning the

instructor. Teleseries are series of noncredit television programs addressing particular topics or issues. They may include an interactive component.

All credit telecourses are presented in cooperation with an educational institution, which enrolls the students, collects the tuition, and grants the credit. Program development services in the form of staff training and technical assistance are made available to the cooperating institutions by Knowledge Network, but the cooperating institution retains full responsibility for developing and administering the course. In some areas, local learning centres have been established in cooperation with a university, community college, or local school district.

During 1982-83, over 8,000 students were enrolled in courses offered through the Knowledge Network in cooperation with the postsecondary sector of British Columbia, which includes three universities (two located in Vancouver and one in Victoria), 15 colleges, and four technical institutes.

APPLICATIONS BY TECHNOLOGY

The implementation of information and communications technologies in education has been characterized by an integrated, multimedia approach whereby different technologies are combined to facilitate the various aspects of the teaching/learning process. For example, a course based primarily on print material may be supplemented by additional material on audiocassette or videotape and by telephone tutorials; or a seminar course taught via teleconferencing may be supported by print material. This integration is necessary because educators involved in distance education realize that particular technologies serve particular needs: no one technology is the key to effective teaching and learning.

The focus of the information presented in each subsection of this chapter is on the applications of particular technologies in Canadian educational institutions. Reference will also be made to the use of combinations of technologies. Many institutions use technologies in similar ways; to avoid repetition, each occurrence of these applications will not be described. Instead, some institutions will be highlighted because of their significance as pioneers in developing certain types of applications, or because of their long-term application of certain technologies.

Print

Owing to its use in distance education for over 150 years and its high standards of design and production, print is a core technology in many distance education programs. For students, printed material offers the advantage of being a familiar, convenient, private, and portable medium for the acquisition of information.

Print is used as either the primary medium, supported by telephone tutorials, or as supplementary material to courses taught primarily with audio-based or video-based technologies. For example, approximately 80 per cent of the 55 courses in the Guided Independent Study program at the University of British Columbia (UBC) use print materials only, with tutorial support via telephone access and through

graded assignments. The Audiovisual Services Department at UBC initially used the Knowledge Network to deliver televised classroom lectures; it has now joined forces with the print-based Guided Independent Study program to develop a distance education model using print as the primary component with supplementary television programs broadcast on the Knowledge Network. More than half the students record the broadcasts so that they can view them at their own convenience.

Of the distance education courses at the British Columbia Institute of Technology (BCIT), 97 per cent are based on print materials: only a few use audiocassettes. Distance students at BCIT have to work on campus if they wish to supplement their courses with the use of audio- or videocassette players or microcomputers. The University of Victoria uses print for delivering 35 per cent of the information in its courses (as compared to the use of television for 60 per cent and the use of other technologies, such as teleconferencing for five per cent).

The Direct Independent Study Courses program at Simon Fraser University in British Columbia offers courses equivalent to those given on-campus in areas such as science and history to off-campus students throughout Canada. Eighty per cent of the courses use print as the primary medium, with audiocassettes and television broadcasts over the Knowledge Network as supplementary material. However, students are not required to view the television broadcasts in order to complete the courses.

Queen's University in Ontario has run correspondence courses using print materials since 1889; it now uses audiocassettes as optional supplements. This same use of print with occasional audiocassette support is true of many Ontario universities, including Guelph, Laurentian, and the University of Western Ontario.

Memorial University of Newfoundland offers 45 degree-credit and 10 certificate print-only correspondence courses. Course manuals, workbooks, worksheets, figures, lists, bibliographies, and assignment descriptions are important supplements to other distance courses taught mainly by videotape and teleconference. Although advanced preparation of these materials requires considerably more time than conventional in-classroom courses, students feel that manuals

structured to fit each taped lecture are essential to their understanding of course material.[11]

Memorial University Extension Service publishes a bi-monthly magazine called Decks Awash, a 64-page magazine focusing on issues such as health care, agriculture, and fishing legislation. With a paid subscription base of 5,000, Decks Awash is one of the Extension Service's most popular distance education offerings.

Owing to its flexibility as a teaching tool, its relative cost-effectiveness as a technology for production and distribution, and its familiarity as a socially-entrenched and accepted form of communication, print is an established technology for distance education in Canada and will no doubt remain so in the future. While new technologies are likely to change dramatically the nature of distance education, they are unlikely, in the foreseeable future, to replace the printed course package as the major vehicle of instruction.

Radio and audiocassettes

Conventional radio broadcasting has long been used in formal distance education programs in Canada as an economical way of transmitting information to large numbers of students. The low cost of radios and their popularity and availability to the general population make radio broadcasting an established and practical form of communication.

The Open College/Ryerson in Toronto has been offering university-level credit and noncredit courses on radio CJRT-FM since 1971. The courses are credited and sponsored by Ryerson Polytechnical Institute and Atkinson College of York University. Each one-hour program is broadcast three times weekly for the convenience of students with irregular work hours. In addition to the radio broadcasts, which reach students within a 160-kilometre radius of Toronto, Open College offers students across Canada a variety of courses on audiocassette. Students are also supplied with the basic textbooks for the course, a workbook and study guide to the programs, and access to a telephone tutor, teleconference calls, or an occasional discussion group.

Radio is used as a course component in Alberta, where ACCESS Radio/CKUA (heard throughout the province) provides

programs for adult continuing education. Many of these educational programs could be described as nonformal, although some are connected with credit programs offered by educational institutions. The Alberta Correspondence School has used ACCESS radio programs to supplement high school English and social studies courses. The Faculty of Extension of the University of Alberta, in cooperation with Alberta Agriculture, offers a series of agricultural home study programs each year. The instructional design and production of radio and television programs is carried out by Alberta Agriculture; the Faculty of Extension's agricultural division administers registrations and provides audiovisual hardware and assistance for local seminars.[12]

Broadcast radio does have one major limitation - learners cannot control the time at which a course is broadcast; they must adjust their study time to accommodate an externally imposed schedule. Unless the student records the radio program on a home tape recorder or is provided with an audiocassette of the program by the institution, radio is a "once-only" technology: the student cannot play it back to review the material.

Athabasca University has noted the problems associated with delivering course material when an institution does not have its own radio station or network: "air-time is limited and the programs have to be of some interest to the general listener as well as the student. Furthermore, even friendly radio stations don't like repeating the same educational material more than two or three times, and A.U. courses need a shelf life of at least five years to be cost-effective. There is little chance of giving dozens of traditional lecture courses on the regular AM/FM airwaves!"[13]

The development of side-band radio may offer an alternative mode of broadcasting radio programming in the future. Sub-Carrier Multiplex Operation (SCMO), or side-band radio, is a narrow-casting private service to a limited audience. The service offers closed-circuit radio reception using a decoding device. At present, its role is only experimental. Athabasca University is investigating the use of SCMO, and the University of Alberta is using it on a trial basis. The Faculties of Arts, Education and Extension at the University of Alberta sponsored a continuing English program to provide courses for teachers of language arts and English. A three-part series on stories for children was presented in

the Grande Prairie-Peace River area, using SCMO receivers supplied by ACCESS Alberta. Approximately 32 teachers in various locations participated. Their responses to the programs could be telephoned in during the airing of the series.

A major problem with SCMO is that it is fairly expensive to transmit over long distances. "It [SCMO] will be viable for Athabasca University only when a province-wide network exists and hence ACCESS must be the University's fairy godmother. When the satellite network is established, the University will be able to off-load its present CKUA offerings and provide SCMO lecture courses over the air."[14]

The use of audio technology for distance education is more likely to be implemented through the use of audiocassette rather than through broadcast or SCMO delivery. Audiocassettes and their player-recorders are relatively inexpensive, easy to operate, durable, and portable. Content on cassette can be integrated into a course design because an instructor can have direct control over what is spoken into the cassette recorder. For example, in describing how audiocassettes (used in conjunction with print support materials) are prepared at the University of Waterloo in Ontario, one professor wrote: "The actual way that professors prepare one of our taped correspondence courses is that they sit down at a desk with a tape recorder, the formal visual material and a pad of paper. The professor talks into the tape recorder, and can refer the student to various aspects of the formal visual material. The professors can do examples or present written notes, using the pad of paper just as they would use a blackboard in a classroom."[15]

In fact, audiocassettes are used by educators in a variety of ways: for backing up or commenting on other media, as resource material providing unique experiences for analysis (recordings of real-life situations, conversations, interviews), or for exploring the wider significance of the course subject through taped lectures by specialist lecturers. The ability to control the content of the audiocassette is a feature that allows educators to use examples relevant to the region or group being served. Furthermore, the audiocassette allows learners to receive individual comments and permits a degree of privacy and confidentiality that is not possible on public radio broadcasts.[16] Other advantages to the student include the

ability to control the time and place for working with the technology as well as the pace of learning by stopping and replaying the cassette as many times as needed.

As mentioned earlier in this paper, a number of institutions use audiocassettes as supplementary course material: for example, the British Columbia Institute of Technology; Queen's University; the University of Guelph; Laurentian University; and the University of Western Ontario. The University of British Columbia uses audiocassettes to complement a few of its print-based Guided Independent Study Programs, including several degree-credit courses and a noncredit learning skills program. The Alberta Correspondence School has used audiocassettes to advantage in many introductory courses, such as typewriting, shorthand, music, and modern language courses. The School considers the use of audiocassettes to be beneficial and intends to expand their use in the future.

The University of Waterloo has used audiocassettes as the primary technology in its distance education courses for the last 15 years. Nearly 300 courses using an audiocassette correspondence approach were offered in 1983-84, representing more than 20 departments in six faculties. Students may choose to enroll in one of several undergraduate degree programs or to take courses without any degree expectations. The courses are composed of 40-minute lectures recorded on audiocassettes and supplemented by notes, textbook, and resource kits. Students carry out assignments and communicate with their tutors by mail and occasionally by telephone. Recently, audio-teleconferencing tutorials have been introduced in some courses, and planning is in progress for computer conferencing. As a measure of the credibility of these courses, most universities across Canada accept the University of Waterloo's correspondence courses for credit.

Audiocassettes appear to be a cost-effective technology for learning at a distance. Yet, like other technologies, their effectiveness is related to the quality of their content and to the learning style of the individual student. Audio is less effective for those who require a great deal of visual stimuli in learning. In contrast to the success of the University of Waterloo's experience with this technology, it has been reported that audiocassettes at Athabasca University "used to be a strong component in their system but they didn't provide as much as they should have, so are used

less now...they are good for language teaching, but for other courses, the base is print and students still request transcripts: audiocassettes are useful for a change of pace but not for information."[17]

It appears that audiocassettes, like many other technologies, are useful for some but not all courses and styles of learning. Nevertheless, audiocassettes will continue to be a component in distance education applications.

Television and videotape

Television has been used to varying degrees as an instructional or educational tool in distance education throughout the country. At some institutions (Wilfrid Laurier University and Carleton University in Ontario), television has been the primary mode of delivery for distance education courses. In other institutions, it is used as one of several components in a course, or is used to deliver only certain types of courses.

Telecourses are generally characterized by the primary use of television programs supplemented with printed materials (student guides, textbooks) and the presence of some mechanism for student/instructor or student/tutor interaction (such as telephone tutoring, written correspondence, or teleconferencing). The video portion of a telecourse might be produced by using a camera in the classroom to record a series of lectures for broadcast, or it may be acquired from a producer such as the British Broadcasting Corporation, TVOntario, or, quite often, one of several American producers of educational material. Telecourses may be broadcast or distributed by cable, usually in cooperation with one of the provincial educational communications authorities.

Mount Saint Vincent University's Distance University Education via Television (DUET) program uses a studio-equipped classroom to transmit live, interactive credit and noncredit courses to distance learners throughout the four Atlantic Provinces (Nova Scotia, New Brunswick, Prince Edward Island, and Newfoundland). Regular classroom lectures are delivered live on weekdays via microwave to the local cable company in Halifax/Dartmouth, and on the Atlantic Satellite

Network channel of the Anik C3 satellite to cable distributors in the other Maritime Provinces. Return telephone links have been provided by means of either dedicated telephone lines, collect call lines, or an audio-teleconferencing bridge which allows up to 10 callers to participate in the classroom experience at one time. Taped reruns of the programs are shown on Saturdays.

Business courses in accounting, word processing, public relations, marketing, and business adminstration are offered to such institutions as the Nova Scotia Power Corporation, Maritime Telephone and Telegraph, and Maritime Life Assurance. DUET coordinators have encouraged businesses to set up receiving centres in which their employees can take courses together or with other members of the community. By doing so, they hope to foster a community development concept of education that will promote dialogue among participants at each centre.[18]

The University of New Brunswick (UNB) has offered telecourses since 1981 via cable television. UNB uses prepared telecourse materials from a variety of production sources for both degree-credit and non-degree course offerings. Programming from the Maine (USA) Public Broadcasting System is received in those parts of the province which are wired for cable. There is general access throughout the Atlantic region to the Atlantic Television (ATV) channel, a commercial service which provides a designated portion of its airtime for educational use as a condition of its broadcast license. UNB collaborates with other Atlantic Canada universities in the negotiation of viewing times with ATV.

A UNB faculty member is appointed to serve as academic resource person for each degree-credit telecourse. This person is responsible for developing and distributing additional readings, assignments, tests, and examinations. On-campus tutorials, teleconferences, and decentralized lab sessions are also used, depending on the requirements of a particular course. In addition, the course resource person stipulates the office hours during which he or she is accessible to students wishing to telephone or visit. Instructors who reside in communities throughout the province have been recruited, and they are able to work at the local level with telecourse registrants.

In Quebec, Télévision Educative du Québec (TVEQ), a consortium of 13 educational institutions, has been formed to provide interactive television programming to their communities. These institutions are Université de Montréal, Université Laval, Université de Sherbrooke, CÉGEP Montmorency, Ecole Nationale d'Administration, Ecole des Hautes Etudes Commerciales, Université du Québec à Chicoutimi, Université du Québec à Rimouski, Université du Québec à Hull, Université du Québec à Trois Rivières, Université du Québec à Montréal, and Université du Québec-Siège Social. Each community has been allotted time on a specialized educational cable channel. In Montreal and Quebec, educational programming is available on this channel 24 hours a day. In the other communities, the channel is dedicated to the regional member of the consortium for four to five hours per day.

Research and experimentation for the network began more than three years ago to provide a means of sharing the activities of each campus with the students and residents of other communities. Each campus produces its own programming at its on-campus television studio and then mails the videotape to the network's head office at Télé-université. There, two liaison officers package the material received from all branches and send it to cable distributors in each region. Radio-Québec carries the programming on Sunday afternoons.

The programming consists of both credit courses and general interest programs. The credit courses include such topics as astronomy, adult education, biology, and history of the Holy Scriptures. These courses are accompanied by print materials and exams are given in each community at the end of the course. Once or twice during the season, these courses are delivered live directly from the campus involved and students are given the opportunity to speak with the professor by telephone. The noncredit programs include professional development courses, such as continuing medical education, as well as programs that may be of general interest to the community. For example, the Université du Québec à Montréal has produced live programs geared toward interactive community education on peace and disarmament, writing and reading literature, and altered states of consciousness. Viewers are able to participate in the program by telephone. The coordinators of the project hope to implement a teleconferencing system for the 1984-85 school

year to allow several audience members to interact simultaneously with guests in the studio.[19]

Video is considered to be like any other audiovisual resource available to the branches of the Université du Québec. A professor may request videotapes and a television monitor to illustrate course material rather than use a slide or film projector. The coordinators of the educational cable network emphasize that the operation of the network requires no additional financial outlay beyond the established resources available at each campus.[20]

A number of universities and community colleges in Ontario use telecourses for continuing or distance education. Laurentian University in Sudbury serves the northeastern part of Ontario, and has offered telecourses for distance education since 1972. The telecourses are developed by faculty within the Continuing Education Centre or are acquired from other sources (Athabasca University, North Island College, the University of Ottawa, Wilfrid Laurier University, and TVOntario). Laurentian University also has three federated religious colleges which offer video and correspondence courses. Although their operations are independent, except for publicity and registration, there is increasing cooperation among the three colleges.

In eastern Ontario, the University of Ottawa and Carleton University offer telecourses for distance education. The University of Ottawa uses television, print supplemented by audiocassettes, and teleconferencing. The courses are developed by regular faculty members, usually in addition to their normal teaching responsibilities. Current plans for expansion of courses by the University do not place a high priority on either the print or video modes of delivery. Expansion is forecast, however, for the teleconferencing mode.[21]

Carleton University has been involved with distance education since 1978, using camera in the classroom techniques. Distance students may reach the instructor by telephone during the lecture and during designated office hours. In 1981-82, 10 courses were offered (eight produced by faculty and two co-produced with TVOntario). The telecourses are delivered via cable, on the TVOntario broadcast network, or videotapes of the class are sent out to the students. All courses carry credit toward a Bachelor of

Arts degree. The School of Continuing Education is responsible for the organization and coordination of distance education (providing registration and other administrative services), and the academic departments are responsible for the preparation of supporting materials and for provision of instructors and tutorial resources.

The University has expressed a cautious approach to expansion of the distance education program and has no plans to offer a full degree program by video. It does not foresee enrollments in upper level courses of sufficient numbers to justify the cost of offering those courses by television. The University also feels that the seminar mode of most upper level courses is difficult to convey over television.[22]

Wilfrid Laurier University (WLU) in Waterloo, Ontario offers telecourses as its primary mode of delivery in distance education. In 1981-82, there were 14 such courses offered with credit toward a Bachelor of Arts degree. Each course is developed as a joint effort on the part of a faculty member, the Office of Part-Time Studies, and Audiovisual Services. The video components of WLU courses are either produced internally or acquired from TVOntario. The courses are distributed on the educational channel of local cable companies or on the TVOntario broadcast network. Aside from offering tutorial support to students via telephone, WLU holds tutorial sessions at least once a term in the cities of Waterloo, Brampton, Oshawa, and Barrie, depending on the number of local registrants. While attendance is not mandatory, the student response is very good.

Wilfrid Laurier University foresees significant expansion to the existing Bachelor of Arts distance education program, with development plans calling for 20 more courses by 1985-86, including some business administration courses. From an enrollment in 1981-82 of 300, the University expects registrations to reach 1,000 by the 1985-86 period.

The Ontario universities that use TVOntario telecourses each contribute to the production and development costs of the courses, and in return are granted regional rights to conduct the telecourse. For example, the Universities of Windsor, Waterloo, Wilfrid Laurier, Laurentian, and Carleton each contributed funds to the development of a new

telecourse, entitled "Introduction to Sociology," which will be aired in January 1985.

Assiniboine Community College in Brandon, Manitoba offers a credit course in business management over cable television. The course is a 26-part series of half-hour videotaped programs produced by the Coastline Consortium in California. Wrap-around segments, in which the course instructor introduces and concludes each program, are produced in Assiniboine's on-campus television studio. Each segment is shown over community cable access channels in 17 towns in Manitoba and repeated three times weekly. Printed support materials are used, and the instructor is available for telephone tutorials.

The University of Regina Extension will be broadcasting live, on-campus classes to four remote classrooms in Swift Current, Moose Jaw, Melville, and Yorkton, beginning in September 1984. Classes in personnel administration, industrial relations, business information systems, and the art of motion pictures will be sent via Saskatchewan Telephone's fibre optic network and distributed by community cable networks to designated sites equipped with decoders. Distance students will be able to participate in the classroom interaction via audio-teleconference.

The province of Alberta has a relatively long history in the use of educational television (ETV). ETV experiments began in 1958, and Canada's first ETV broadcast station was established in Calgary in 1968. The use of television for distance education in Alberta is not widespread, however. Currently the provincial educational communications authority, ACCESS Alberta, distributes television programming through the use of private or Canadian Broadcasting Corporation-owned television stations and cable companies. Little prime time scheduling is allotted to ACCESS Alberta programming - a deterrent to distance education on a province-wide basis. This situation will change with ACCESS' use of the Anik C satellite. However, some telecourses are available from the University of Calgary and from Athabasca University in regions where distribution arrangements have been made with the local cable companies.

The University of Calgary offers three credit telecourses and more than a dozen noncredit telecourses for distance education students in the Calgary area. Athabasca University

has also used television sparingly as a technology for distance education. For example, in 1980-81 only six courses had video programs as a component. The University has had difficulty in distributing telecourses across the province. It has used four general distribution systems at various times: ACCESS Alberta; the Spokane Public Broadcasting System (in the USA) which is carried in Alberta on cable television; community cable channels in various regions; and the Educational Cable Consortia, which comprises cable companies in Edmonton, Calgary, and Grande Prairie.

Videotape. The development of videotape technology has created an alternative to broadcast television programming for those regions not well served by broadcast or cable networks. In Newfoundland, for example, Memorial University distributed courses on videotape to local community centres for nearly a decade in the 1970s before use of local cable channels was made available.

In 1961, Memorial University began using broadcast television for noncredit courses. In 1969, the University offered off-campus credit courses by distributing videotapes to "borrowed" classrooms in schools or community centres. The University subsequently built a collection of videotapes from a base of fewer than 100 titles to over 1,000 titles by 1981. Memorial produces videotapes that reflect local or regional interests as well as programs on topics which reflect the academic expertise available at the University. Other tapes are acquired from outside agencies.

In 1974, the Extension Service of Memorial University equipped 25 rural communities with videotape equipment as part of their Community Learning Centre project. Using video cameras and lights, the residents of the communities were able to document local situations and problems to reinforce their requests for government funding for wharves, improved roads, schools, or services. They also used video to communicate with other centres. This use of videotape originated with the Fogo Island Process of Communication developed in the mid-1960s in conjunction with the National Film Board's Challenge for Change program. The process had originally used film; however videotape provides a more immediate product, is cheaper to use, and hence, makes the process more accessible. The Fogo Island Process has been used in many other areas of the world including India,

Australia, the United States (particularly in the Alaskan and Appalachian regions), Alberta, and the eastern Arctic region of Canada.

In 1978, the Media Unit of Memorial University's Extension Service, in cooperation with the National Film Board, spent three months in Scotland and Norway examining the effects of oil and gas development on rural communities. More than 30 hours of interviews were filmed with teachers, social workers, police, fishermen, business people, and retired citizens. These interviews were transferred from film to videotape and edited into 26 modules on various subjects related to economic, social, cultural, and environmental impact. The tapes were then shown at 240 community meetings, seminars, and conferences over the next three years to inform Newfoundlanders about the possible impacts of offshore oil and gas development and to initiate discussion about the best approach to take in preparing for its eventual arrival.

Eight field workers from Memorial's Extension Department continue to use video to bring information to adults in outlying regions, 40 per cent of whom have less than a grade-eight education and thus find it difficult to understand printed information.[23]

The Social Assistance Administrators program at Saint Francis Xavier University in Nova Scotia is a non-degree program produced by the University for the Department of Indian and Northern Affairs. The program consists of a set of nine one-hour videotaped presentations accompanied by a 400-page workbook. It is entirely self-contained in the sense that learner-teacher interaction is limited to contact for evaluation purposes. The University of Saskatchewan has used this program for its professional development program.

The diversity in television and videotape content and delivery modes has enabled many institutions across Canada to take advantage of this technology, and it is now an accepted and successful medium for distance education. In addition to being a one-way channel for the delivery of audiovisual information to students, television is emerging as an interactive medium for learning. Television's applicability to distance education programs is currently under review by academic institutions across the country.

The major problems with the use of television and videotapes and their delivery technologies (such as cable and satellites) are the cost and access to production and distribution resources. And, as with other technologies, there is a recognition that television and videotapes are suitable only for some types of teaching and learning styles.

Computers

Mainframe, mini- and microcomputers are used in distance education for computer-assisted instruction (CAI), computer-managed learning (CML), computer literacy courses, and computer conferencing, as well as for administrative support and research.

Computer-assisted instruction has been defined as a "teaching process directly involving the computer in the presentation of instructional materials in an interactive mode to provide and control the individualized learning environment for each student. These interactive modes are usually subdivided into drill-and-practice, tutorial, simulation, gaming, and problem solving."[24] Computer-assisted instruction allows for a high level of student interaction and potential for self-paced learning.

The capacities of computer-managed learning include organizing curricula and student records, monitoring student progress, diagnosing instructional needs, prescribing instructional materials, scoring tests, evaluating learning outcomes, and providing planning information for educators.

The term computer literacy is used to indicate awareness of computers and appreciation of their power and limitations. Computer literacy may denote skills like keyboard familiarity, screen reading, and information retrieval.[25]

Computer conferencing is the exchange of information by computer, between two or more users. This can entail message storage and retrieval, report writing, editing, and cross-referencing. Messages can be sent and received at times convenient to the user, and the "dialogue" may continue over long periods of time. Electronic mail is the simplest form of computer conferencing, whereby messages may be entered, stored, and delivered from one individual or department to another.

Computer-assisted instruction. In some cases, microcomputer courseware is part of the support material offered to students for at-home use, or for use on microcomputers in the regional or local community centre or campus to which distance education students may have access.

The British Columbia Institute for Technology has plans to offer diskettes for use on Apple microcomputers. The diskettes will contain exercises in subjects such as accounting and economics. The University of Victoria is also planning to use diskettes in a course on the fundamentals of computer-assisted learning for teachers. The Faculty of Extension at the University of Alberta maintains a Programmed Logic for Automated Teaching Operations (PLATO) Learning Centre which delivers a variety of courses to adults in the community. The University of Calgary's computer system is linked to the University of Alberta's PLATO system so PLATO software can be used for CAI at both institutions. The University of Calgary's Faculty of Education also provides remote learners with computer terminals to access the University's computer, where course materials are stored.

An obstacle to the effective use of microcomputers for CAI is the lack of good educational software. As in any emerging technology that makes a profound difference in the way in which people interact and learn, it takes time for experience in software development to be acquired and for a set of guidelines or principles of instructional design to appear. At present there is a problem in achieving quality software applications.

Microcomputer software is likely to be a rapid growth area in the coming years. The development of good-quality software requires new conceptual and technical skills, and the educational system will have to support the skills retraining or upgrading of its educators and students if the academic community is to benefit from computer technology. To a certain degree this retraining is already underway; classes in software design for computers, including microcomputors, are available at a number of universities (for example, the Laboratory for Telematics at the University of Montreal, Concordia University in Montreal, and the Ontario Institute for Studies in Education) and community colleges (for example, the training program in CAI development and production at Sheridan College in Ontario).

Computer-managed learning. One of the largest distance education applications was developed by TVOntario as a multimedia learning opportunity called the Academy on Computers. The Academy, which ran for 13 weeks beginning in February 1983, attracted over 10,000 registrants.[26] Repeats of the Academy have attracted several thousand more. The French language version, prepared in cooperation with the Direction générale des moyens d'enseignement du Ministère de l'Education du Québec (the Correspondence and Communications branch of the Quebec Ministry of Education), attracted large enrollments in Quebec. The Academy combined the use of a television series with print support materials and an opportunity to enroll in a computer-managed exercise/evaluation process whereby students answered questions on the program theme, mailed the questionnaire to TVOntario, and received a personalized computer-generated response. Introductory computer software was also available to demonstrate the capacities of microcomputers.

Distance education institutions such as the Open Learning Institute have developed highly sophisticated student record systems for use by internal staff as well as tutors and advisers. Online computer terminals in the regional centres make information available to all sites so that students may be served more effectively and quickly.[27] At the OLI, computer-managed learning provides diagnostic feedback, remedial help, and revision aids.

Computer literacy. Students at OLI may enroll in an introductory course on computer literacy intended to aid them in understanding the fundamentals of computer operations and applications. The students are loaned a Radio Shack TRS-80C microcomputer. At the end of the course the student can either return the microcomputer to OLI or arrange to buy it.

In September 1984, the North Peace Educational Consortia began sponsoring CompuVan, a travelling van containing 12 IBM personal computers to teach computer literacy to residents in northwestern Alberta.

Beginning in the Fall of 1984, the University of Regina Extension will offer a two-semester computer programming course to students in the Saskatchewan communities of La Ronge, Prince Albert, and Indian Head. The University's mainframe computer will be connected to Saskatchewan

Telephone's database system, and students will be able to access the mainframe from microcomputers set up at remote learning centres. Course material, assignments, and communication between student and instructor will be transmitted by computer.

In Manitoba, a new project sponsored by the federal government's Skills Growth Fund allowed the purchase of two mobile computer trailers, each equipped with 10 IBM personal computers. The trailers will operate out of Assiniboine College in Brandon, and Keewatin Community College in The Pas, to provide a variety of credit and noncredit computer training. The trailers will remain in each community for three to four months at a time.

The Edmundston Campus of New Brunswick Community College supports a microcomputer training centre for all community residents. Residents are able to book one hour of hands-on training free of charge to engage in self-instruction. Although no formal classes are offered, the centre is supervised by an instructor from the College.

Memorial University of Newfoundland's Extension Service has an extensive program in computer education. In 1983, 128 microcomputers were purchased for use in introductory computer courses, workshops, and camps. Many of the micros were distributed to field offices, where local instructors were recruited to teach the classes. A van travelled to rural communities to provide two- to three-day workshops to people who had no other access to information on computer literacy. Nearly 2,000 people throughout the province used these services in 1983. Eight manuals were developed to supplement the hands-on instruction. Plans are now underway for Memorial to offer computer-assisted instruction in a number of subject areas and to establish a network for computer conferencing and electronic mail.

Computer conferencing. Recent innovations in the area of computerized conferencing and electronic mail permit communication between and among computers. Some universities have established on-campus and inter-campus computer networks which are used to exchange information and data.

The University of Lethbridge and the University of Calgary in Alberta are currently working on a pilot project

to test the feasibility of inter-institutional online communications between the two university libraries. The objectives of the project are to enable the University of Lethbridge Library to access the University of Calgary Library's catalogue and government documents collection, and to enable the University of Lethbridge to create a machine-readable government documents catalogue using the University of Calgary's NOMADS software. The development of this system would represent a prototype for other universities that are members of the Alberta Library Network Assembly.

In April 1984, the University of Guelph established Northnet, a computer network linking 11 universities in Ontario and Quebec. Leased telephone lines connect the mainframes at each university. The network is used to exchange data and information concerning university administration, joint faculty publications, and system maintenance. In September 1984, Northnet will be linked to Bitnet, a similar network in the United States comprising 60 colleges and universities and over 160 computers. Bitnet has plans to add European sites to its network in the near future.

Dalhousie University Law School is currently using data conferencing among lawyers in the Atlantic Provinces, networking through the mainframe computer at Wayne State University in Michigan. The Atlantic Provinces Association of Continuing University Education intends to initiate a data conferencing project as soon as the University of New Brunswick mainframe is upgraded to accommodate such a facility. The Association will use the technique to support distance audio and video education activities already in place.

Videodisc

Laser videodiscs provide extremely high-density, multimedia storage which can include printed text, photographs, motion, animation, and audio. The videodisc players can be linked to microcomputers to allow students greater freedom in deciding the order, speed, and level in which they study a subject. The videodisc's instant random access capabilities allow the student to access an individual frame at any point on the disc.

Due to its capacity to simulate reality and to allow students to work independently and at their own pace, a major use of interactive videodisc is in industrial training. A single videodisc side can equal dozens of training manuals or slide/tape programs and can provide many hours of instruction. Schools might use videodisc simulators for lab experiments and as sophisticated "electronic tutors," whereby carefully programmed feedback guides students through lessons.[28]

Currently, videodiscs are not used in distance education applications in Canada. Rather, it is the intensive study of videodisc's potential as a learning tool that is currently occupying the attention of many Canadian educators. Among the institutions that have been involved in videodisc experimentations are Télé-université in Quebec, the Ontario Institute for Studies in Education, and Sheridan College in Ontario, the Banff Centre for Continuing Education, the University of Alberta, and Alberta Vocational Institute, in Alberta, and Simon Fraser University in British Columbia.

The videodisc could be an extremely useful medium for distance education. However, the development costs are high and the technology does not permit users to record or erase the discs. A significant penetration of laser videodisc players in the home market or in local learning centres is a prerequisite to the use of videodiscs in distance education.

Videotex/Telidon

Videotex is a two-way interactive service that connects a central computer to a television screen by any telecommunications link (standard telephone lines, cable television, satellite). Videotex provides a means for creating, displaying, exchanging, and storing text and high-quality color graphics in a computer database. This information may be retrieved at the user's command and displayed on a television screen or monitor. Teletext is similar to videotex, except that it is a one-way transfer of information via a television broadcast signal. With teletext, a stream of pages is broadcast continuously; and the user, by pressing the appropriate keys on a keypad, can choose a particular page to be displayed on the screen. For example, the Grassroots Telidon network originates from

Winnipeg, Manitoba, and provides service to farming communities in Ontario, Manitoba, Saskatchewan, and Alberta. Users are able to select information from a menu listed on their television screens. They choose a page from a menu by punching a number on their keypad. The selected page is then displayed on the television screen and may contain textual and graphic information pertaining to topics such as weather conditions, market prices, and planting schedules.

In North America, the videotex format has been standardized with the adaptation of the North American Presentation Level Protocol Syntax (NAPLPS) for language capability across different media and manufacturers. A version of this standard has also been adopted by broadcasters for teletext. The videotex and teletext standards allow a broad exchange of information among television sets and computers in North America.

Videotex graphics are often used to illustrate concepts in teaching. The system has also proved to be an effective means for creating and distributing print and graphic course support material.

Experimentation with the educational use of videotex in Canada has been in progress since 1979, using the Canadian version known as Telidon (see Paper 11 for an in-depth review of the use of Telidon in Canadian education). The development of Telidon is usually thought of in terms of its role as a videotex information system. However, Telidon is also a graphics medium that can be used with other types of communications systems, such as teleconferencing, or as part of a computer programming language for computer-assisted instruction.

The University of Calgary's Faculty of Continuing Education ran a project in 1982 in which Telidon graphics were successfully incorporated as the visual component of an audio-teleconferencing course. This use of Telidon was explored to see if it would solve the problem of showing students charts, diagrams, and other visual aids in color to enrich the audio presentation of a course on the teaching of grammar. Through a switching system, participants viewed the graphics on a modified television set and then engaged in a teleconference discussion using the same telephone line used for the delivery of the graphic images. Although some technical difficulties had to be overcome in developing the

switching system to allow the graphics and voice elements of the interchange to share the same telephone line, the combination of graphics and audio-teleconferencing was considered to be a useful approach to the delivery of a distance education course.[29]

Brandon University in Manitoba is negotiating with the provincial government for funding to develop software designed for community college training programs in the techniques of creating Telidon pages. Another plan is to provide course descriptions and registration information on the existing Grassroots network. The Continuing Education Department at Brandon hopes eventually to make Bachelor of Arts programs available to rural residents via Telidon and teleconference. Lakeland College, on the border of Saskatchewan and Alberta, offers farmers in both provinces four courses in the utilization of the Grassroots network, and the University of Guelph in Ontario uses Telidon for agricultural extension and veterinary continuing education.

The use of videotex for distance education, however, is still at a nascent stage of implementation. At the moment, only a few applications of videotex systems are being developed specifically for distance, and these generally represent services for continuing professional development. For example, the AGORA project underway at the Université du Québec à Montréal is an electronic journal addressed to the needs of audiences such as information specialists and the disabled. In Montreal, two medical training and continuing education projects are underway. One is sponsored by the Clinical Research Institute of Montreal in cooperation with two hospitals; the other is sponsored by the Université de Montréal in cooperation with its 14 affiliated hospitals. In Ottawa, the Canadian Hospital Association is setting up a national videotex service to serve its members' continuing educational needs.

The Inter-Provincial Association for Telematics and Telidon (IPATT) is establishing a cooperative network of universities (Télé-université, Athabasca, the University of Victoria, the University of Waterloo, Carleton University, and the University of Saskatchewan) to produce and exchange courseware.

Two trends in the use of Telidon and videotex are emerging: the use of Telidon graphics as visual support for

other telecommunications media (such as teleconferencing) and the use of videotex systems for information retrieval and continuing education for professionals. The future use of videotex in distance education will depend to a large degree on the results of current projects, most of which are sponsored by the Canadian Department of Communications and industry. These experiments will form a basis for evaluation of the cost-effectiveness and the educational-effectiveness of the technology.

Teleconferencing.

A teleconference can be defined as a conference between three or more people in two or more separate locations using telephone technology, either alone or in conjunction with other media. A point-to-point teleconference is between two locations; multipoint teleconferences involve three or more locations. Audio-teleconferencing is the basic form of teleconferencing, using speakerphones or telephones connected to a loud speaker and push-to-talk microphones to conduct the conference. A teleconference bridge is necessary to join three or more telephone lines. A bridge can be purchased or rented from the telephone company, and located either at a central telephone company office or on the user's premises. Audio-plus teleconferencing involves the addition of audiographic supplements such as electronic blackboard, slow-scan video and videotex (these technologies are described elsewhere in this paper). Video-teleconferencing uses full-motion video (moving pictures with synchronous sound) to supplement the audio-teleconference.

More and more institutions are using teleconferencing to facilitate interactive, group-based learning as well as to supplement print-based distance courses with telephone tutorials. Approximately 20 of the 71 universities and about 30 of the 196 community colleges in Canada are using or planning to use teleconferencing in distance education courses. Almost all of these institutions use audio-teleconferencing as a component in courses that are based primarily on other media such as print, audiocassettes, and videocassettes. Also, some experimentation with one-way video, two-way audio-teleconferencing has been undertaken. (An in-depth discussion of educational teleconferencing in Canada can be found in Paper 14 of this series.)

Memorial University of Newfoundland offers a variety of courses by teleconference through its Division of Part-Time Credit Studies. All regular term teleconference courses at Memorial run for 13 weeks and are based on 30 teleconference hours each term. Print materials such as a course manual and readings supplement the teleconference sessions. Audiotapes and videotapes are also used, but to a lesser degree. A course offered in the Winter, 1984 term on Shakespearean tragedy included six plays on videotape for 18 hours of viewing, 13 lectures on audiotape, and one-and-one-half hours per week of teleconferencing.

Centres participating in Memorial's teleconference courses include Bell Island, St. Anthony, Goose Bay, Labrador, and Labrador City (which is Memorial's most distant teleconferencing site, 2,400 kilometres north of the Univeristy). Each centre is equipped with a convener (a control box which connects to a standard telephone) and five or six press-to-talk microphones. Memorial recently received grants for a pilot project to extend its teleconference system into 18 communities in Labrador. This new division in the Memorial system will be used for medical and educational purposes and will also provide the Labrador region with a means for community interaction.

The Extension Department of Saint Francis Xavier University in Nova Scotia conducted a project to determine the modifications required to convert two traditional classroom courses into an appropriate format for off-campus presentation using teleconferencing as the primary medium for student-teacher interaction. Entitled Design of Distance Education Curriculum, the project was intended for professors of English literature and political science. The project resulted in two new plans for instruction and some documentation of the process of adapting curricula to the requirements of distance education media.[30]

Mount Saint Vincent University's Distance University Education via Television (DUET), mentioned earlier, uses one-way video with telephone call-back to transmit live classroom lectures to homes and learning centres thoughout the Maritime Provinces. Toll-free telephone lines are made available to distance students, who are encouraged to phone the classroom and converse with the instructor and the other students. A program resembling DUET is offered by the University of Victoria in British Columbia. Twenty educational centres in

British Columbia have been chosen to receive televised transmission of a nursing course originating in a classroom at the University of Victoria. Students can either watch the course in groups at the centres (which are equipped for teleconferencing), or at home where they can telephone collect to reach the classroom.

In September 1981, the University of Ottawa initiated teleconference teaching in order to reduce the travelling expenses and lost time of students and professors; to bring university level courses to persons unable to attend on-campus classes; to fulfill the mandate of the University by bringing special education and professional development courses in French to isolated Francophone communities in Ontario; and to establish a flexible, cost-effective system for delivering credit and professional development courses to the workplace. Point-to-point courses in history, psychology and communications are offered via telephone lines connecting two locations. Multipoint courses, offered to three or more off-campus centres simultaneously, include English, history, philosophy and nursing.

An electronic blackboard is used to supplement some courses taught by audio-teleconferencing at the University of Ottawa. The electronic blackboard resembles a normal chalkboard, but it has a pressure-sensitive surface that converts the chalk strokes into digital data that are transmitted over telephone lines. At the receiving points, data are converted back into handwriting which appears on a television monitor. Each receiving site can also be equipped with an electronic board for return transmissions. An audio recording of the digital data can store the visual images produced by the electronic blackboard.

Beginning in September 1984, a trial program funded by the Secretary of State will enable the University of Ottawa, the Faculté Saint-Jean in Alberta, L'Institut Pédagogique du Collège Saint Boniface in Manitoba, Université de Moncton in New Brunswick, and Université Sainte-Anne in Nova Scotia to exchange credit courses in French via audio-teleconferencing, electronic blackboard, and computer networking. All courses will be extended-classroom versions of on-campus Faculty of Education courses, taught by regular faculty members who will visit each centre at least once a semester. The courses can be taught from any centre, and each university is responsible for granting course credit to its own students.

Other future projects at the University of Ottawa include a Faculty of Science postgraduate-level course sent live from the classroom via teleconference to employees at several electronic firms in the Ottawa region; and lunch-hour teleconferences that will enable companies to consult with a specialist by long distance.

The University of Western Ontario offers degree-credit courses via point-to-point and multipoint teleconferencing. The University recently acquired its own teleconferencing equipment, which will enable it to expand its teleconferencing services to the area of professional development.

In the Winter of 1983, Assiniboine Community College in Brandon, Manitoba, offered two courses via audio-teleconferencing to farmers in nine rural Manitoba communities. Each community has a learning centre where students gather to participate in the teleconferencing session. The Manitoba Telephone System loaned the College teleconferencing equipment to allow up to 10 centres to participate and to permit transmission of Telidon graphics for the duration of the courses.

One of the courses, Advanced Grain Marketing, was offered as a two-day seminar linking 17 experts across the country to 64 farmers in the nine communities. The farmers were able to ask questions and receive up-to-the-minute information on the status of grain markets. Farm Accounting, a 10-week evening course that enrolled 68 students, used printed materials to support the audio-teleconferencing sessions. Both of these courses will be repeated in the Fall of 1984.

Brandon University currently operates distance courses at 10 remote learning centres in northern Manitoba. Until recently, instructors from Brandon University would fly in to these centres and spend six to 10 weeks teaching on-site. Now, evening courses are held three times a week by teleconference from the University campus, and are followed by 90 minutes of telephone tutorials.

In 1978, the University of Regina in Saskatchewan was asked to develop and implement a program of university degree-credit courses in administration for the Arctic Co-operatives Limited (ACL). The ACL is a parent organization representing 37 cooperatives located across 3.36 million

square kilometres of the Canadian North. The remote locations of these cooperatives, made a centralized classroom approach to employee training unfeasible, and a distance education approach was implemented. The courses developed by the University reflect a truly multimedia approach; they include print, audiocassettes, videocassettes, and teleconferencing components.

In order to provide more interaction for the students and teacher than was available through audio-teleconferencing, the University developed its own microcomputer-based electronic blackboard system. The system used ordinary telephone lines for transmission of information. (It is interesting to note that the University designed its electronic blackboard system using a standard microcomputer that can also be used by each cooperative for small business applications, such as accounting. In this way, the system can be put to more than one use.) According to a specialist in educational technology from the University of Regina: "Extending teleconferencing coupled with the graphic support of a blackboard will allow for a much broader reach in the rural areas...As with most postsecondary institutions, the University of Regina is faced with the financial constraints of the 1980s. In order to serve the needs of an ever-widening constituency of interests, we require a multimedia delivery system which can allow a limited teaching staff to serve a larger number of student groups - the electronic blackboard can assist in this endeavor."[31]

The electronic blackboard is still an emerging, or experimental, possibility for distance education in Canada. The University of Ottawa and the University of Regina have taken initial steps toward the development and implementation of this technology in some of their distance education programs, but its future expansion in distance education remains open to conjecture.

Pioneering work in the field of teleconferencing has led to the development of over 100 teleconference sites across the Province of Alberta, involving almost every college, university, and educational consortium. The Faculty of Continuing Education at the University of Calgary has established a teleconference network based at the Teleconference Centre on the University of Calgary campus. The network comprises 20 rural education centres, 33

hospitals, and many other facilities to provide education and professional development in many disciplines. Each centre consists of a convener, a loud speaker, push-to-talk microphones, and a standard Alberta Government Telephone for dialing into the control centre. Many of the centres also have videocassette recorders, overhead projectors, slide projectors, and small audiocassette recorders attached to the conveners to record the lesson for those who missed the session. Local Program Administrators (LPAs) hand out materials, collect fees for courses or books, operate equipment and proctor exams on behalf of instructors. The teleconference system carries five types of events: noncredit courses, undergraduate credit courses, graduate credit courses, and one-time seminars and meetings. The events may vary in length from one, day-long program in the case of seminars, to two, three-hour weekly sessions, in the case of a 13-week course.

The Southern Alberta Institute of Technology, which has a longstanding tradition of working with the rural communities in the province, has created four teleconference courses for use with the University of Calgary teleconferencing centres. The Universities of Alberta and Calgary have collaborated on an experimental project using video-teleconferencing as the primary medium for graduate-level nursing seminars.

As is true of other technologies, the use of teleconferencing by educational institutions is based on a number of factors: the priorities of the institutions and their resource capabilities, and the needs and characteristics of their learning market. The current interest and experimentation in teleconferencing makes it likely that the technology will become an established and integrated component of more and more courses.

Satellites

The advent of communications satellites has expanded the geographic reach of broadcast distribution and has increased the potential for access to distance education. In 1977, Memorial University in Newfoundland participated in a telemedicine project using the Hermes satellite. The University's television centre in St. John's transmitted video and audio signals to hospitals in four locations in the province. Interaction with St. John's was provided through a

return audio signal for teleconferencing. The experiment made available continuing medical education, nursing education, community health education, and consulting services to the different locations. The continuing medical education program offered approximately 10 hours of broadcasting in such subject areas as anaesthesia, therapeutics, and communications/development disorders in children. Memorial's School of Nursing developed 10 hours of broadcast material for the nursing education program.

The satellite experiment at Memorial also involved the use of slow-scan, or freeze frame, television for the transmission of medical data such as electrocardiographs and electroencephalographs. In slow-scan television, a video image is packaged in such a way that it can be transmitted as a still picture over regular telephone lines. The television signal is converted into audio tones which can be sent down a conventional telephone line as a low band signal. A memory unit at the reception site reconstructs the signal into a visual image. It is important to note that slow-scan and voice transmission cannot occur at the same time. Unless two separate telephone lines are used, the voice link must be interrupted while visual data are being transmitted.

The Université du Québec also has experimented with satellite communications using the Hermes satellite. From October 1976 to March 1977, the Université conducted Réseau Omnibus, a series of 12 different educational experiments among its various campuses. For example, students in Hull participated in a graduate seminar in public administration delivered from the Quebec City campus; and in a tele-documentation demonstration, students at the Rimouski campus consulted librarians at Trois Rivières and students in the Gaspé Peninsula consulted librarians located in Rimouski via a one-way video, two-way audio satellite link. The transmission of pertinent documents was carried out later over telephone lines by facsimile. A professional development course was delivered from Trois Rivières to teachers on the Ile d'Orléans; microscopic images were transmitted from the Armand Frappier Institute in Laval to science students in Rimouski, Trois Rivières and Quebec; and in a community exchange program, citizens from Saint-Raymond-de-Portneuf and Buckingham exchanged pictures of their communities, recipes, and stories via satellite. The evaluators of the Quebec experiment found that the satellite makes possible cost-effective communications over very long

distances as well as communication with locations that lack terrestrial telecommunications facilities.[32]

Project Outreach was a satellite experiment conducted from January to June 1982 by ACCESS Alberta in cooperation with various educational and governmental agencies and the Educational Cable Consortia. Sixteen televised series for adults were transmitted to Anik B from ACCESS facilities in Edmonton and then broadcast from the satellite to seven locations throughout the province. A total of six hours of programs were broadcast on Monday and Wednesday evenings. During the broadcasts, viewers were encouraged to use a toll-free telephone number to comment or ask questions about on the programs they were watching.

This capacity for on-air communication between members of the home audience and the educators in the Edmonton studio proved to be successful. Over the duration of Project Outreach, a significant average of one call every 1.4 minutes was received during the periods when audience/presenter interaction was possible via telephone.[33] It was estimated from surveys that Project Outreach captured about 40 per cent of the audience aged 18 and over that typically watch educational television.[34]

Eight of the 16 series were of general interest, and three were certificate program courses from Grant MacEwan Community College, the Southern Alberta Institute of Technology, and the Extension Division of the University of Alberta. Another two series were telecourses carrying credit from Athabasca University and Grant MacEwan Community College. There was also a print-supported course in high school trigonometry from the Alberta Correspondence School; a noncredit course in stress management from Athabasca University, and a telecourse on energy-efficient housing from the Northern Alberta Institute of Technology.

ACCESS Alberta is in the process of designing a satellite-delivered television schedule which should begin in early 1985. ACCESS multi-educational services transmitted via the Anik C3 satellite will be available on educational cable channels in urban areas and via Direct Broadcast Satellite (DBS) receiving systems to Albertans who reside in the remote or underserved areas of the province. The implementation of a permanent satellite distribution

mechanism for educational programming will bring increased educational benefits to Albertans.

Distance education via satellite has had an extensive history in the province of British Columbia. In 1977, the British Columbia Ministry of Education's Distance Education Planning Group was formed to determine the feasibility of interactive television. The British Columbia Institute of Technology (BCIT), four regional colleges, and three public universities were invited to form a consortium for the production and delivery of courses for the duration of the Hermes satellite experiment in the province. The Hermes experiments were followed by programs transmitted by the Anik B satellite launched in 1978.

By September 1979, several educational institutions in British Columbia began offering undergraduate credit courses via satellite. BCIT offered a number of televised credit courses in cooperation with the College of New Caledonia, Northwest College, Northern Lights College, East Kootenay College, and North Island College. The courses ranged from careers in hospitality and tourism to contruction administration, forest utilization, and mining.

Telecourses from the University of Victoria have also been made available. The University has developed two four-part telecourses in public affairs (with print support) and one course in public administration (supported with print material and face-to-face contact).

The University of Victoria is also involved with a number of interactive, satellite-based courses in public administration, educational administration, and, in conjunction with the University of British Columbia, professional development for registered nurses. These courses involve two-way audio and one-way video seminars, print support materials and supplementary videotapes, and feature group discussions at different field centres throughout the province. For example, a fourth year credit course in educational administration attracted 48 students at nine centres throughout British Columbia; the nursing course, designed to enable registered nurses to qualify for a baccalaureate degree in nursing, attracted 160 students at 21 centres in British Columbia and four centres in neighboring Alberta. The University of British Columbia has also developed two distance courses in special education for

practicing teachers, which were broadcast on the Knowledge Network several times betwen 1981 and 1984. The establishment of the Knowledge Network in 1980, a result of the success of the Hermes and Anik B trials, has facilitated the on-going cocperation and coordination of many educational institutions involved in educational broadcasting. (For further discussion of the use of satellites in education, see Paper 12 in this series.)

As can be seen from the preceding discussion, the use of technologies by educational institutions in Canada is widespread and varied. Technologies serve different purposes in different contexts, and may be used in various combinations to meet the particular requirements of students and subject matter. Print remains the basic form for distance learning material, and is commonly augmented by audiocassettes, television, and teleconferencing. As CAI and videotex courseware are developed and refined, educators will continue to experiment with them as tools for teaching and learning at a distance. New communications and information techologies allow people to communicate in new ways at both the individual and institutional levels, and provide additional learning resources to those who are geographically remote from educational institutions.

ISSUES

Many issues and problems have arisen in connection with the application of information and communications technologies to distance education in Canada.

The first issue concerns two different approaches to the application of new technologies. One may be called a process approach, the other a product approach. A process approach stresses a careful, planned, and systematic use of existing theory and practice in order to design learning activities appropriate to learner characteristics and needs. A product approach is characterized by its preoccupation with the use of the technical equipment rather than with its impact on learners. The two perspectives can be distinguished on the basis of how "user friendly" or effective the resulting educational materials are. The two approaches can be integrated only when educators plan learning strategies appropriate to the learner and at the same time assess how the technology will enhance effective learning. Inappropriate uses of technology can result when educational designers are more interested in using a new technology than in improving actual learning processes. In addition, the excitement of working with the newer technologies may overshadow the known advantages of print, video, audio and the traditional links between them. To avoid creating inappropriate products, designers need to adopt a learner-centred view and to ask to what extent the technology is likely to support learning rather than dominate it. The use of technology should add flexibility for the learner - an alternative, more effective, more personally appropriate way of learning. In urging educators to clarify their view of technology and not to succumb to the "answer in search of a question" syndrome, Crawford argues for learner-centred uses of the new technologies: "In the implementation of these technologies, I hope that we might be able to avoid some of the pitfalls that have characterized the implementation of some of the older technologies. To illustrate: radio, TV, slide-tape, and other audiovisual media have been used primarily to solve classroom problems, that is, as aids to the teacher. I would like to see an alternative strategy in the implementation of the newer communications technologies. I would like to see them used to solve learning problems, that is, as aids to the learner."[35]

If technology is to be used effectively, a conceptual framework is needed. Such a framework can offer theoretical guidance in the design and use of different media so that learners can use a fully integrated set of learning materials appropriate to their learning styles and interests. A related issue is that of matching types of technology, both hardware and software, to types of learners. Adult educators have to respond to a wide variety of cognitive and learning styles within a student group, and they also must deal with the use of different learning styles by an individual in different projects. In a classroom situation, this response function can be carried out continuously because the teacher has direct evidence of learner differences. In distance education, however, course designers and tutors have to use other methods for gathering data on learner behavior and differences. Those data can then be used to match technologies and teaching to learning styles. It is worth noting that in 1984, the first workshop of the newly formed Canadian Association for Distance Education held via audio-teleconferencing, focussed on instructional design and included a discussion of principles and guidelines for the design of learning activities and materials.

Another issue is that of changes in the roles and activities of instructors. The anticipated availability of large databases, local and regional learning resources, and high-quality multimedia course materials makes it unnecessary for faculty to be omniscient. Distance learners equipped with portable, reliable hardwar and comprehensive learning materials could exercise significant control and self-direction over how and what they learn. The ability to interact quickly and vigorously with instructors and peers, using various technologies, would help learners improve their learning skills. The faculty would have more of a facilitative role in helping learners to develop self-responsibility for learning, to specify their own learning objectives, and to identify effective learning resources and strategies. In adapting to this style, instructors who relied on prescriptive and highly directive approaches to the learner would have a difficult transition to make.

Resistance to the use of new technologies for distance education is common among educators who are unfamiliar with technological applications. There is a tendency toward institutional inertia when faculty fear changes in their responsibilities and in the structure of educational

programs. Unwillingness on the part of faculty members to research possibilities for integrating new technologies into their curricula can hinder the institutional adoption of the technology.

Until recently, the design and development of distance education courses often have been viewed as part of an instructor's "additional" teaching workload, not as a research endeavor equivalent in prestige to the traditional research and publication efforts expected as part of a professor's contribution to academic life. As a result, incentives for faculty to research new technology applications have not always been provided by the academic institutions in the country. This viewpoint was commented on by one educator with regard to research into satellite applications: "Time-consuming and pioneering though it may be, the design, development and delivery of satellite-based courses is still perceived by many institutions as 'teaching.' Where publications and research rate high, it rates comparatively low. This prevents some academics from getting involved and thus slows development."[36]

In some universities, distance education is not accepted as being equivalent to on-campus education. It is seen as less creditable, as peripheral to the central mission of the university - teaching (in the traditional sense) and research. The use of some of the same technologies for both on-campus and off-campus course delivery may help to raise the creditability of distance education. In fact, more faculty members may take advantage of the opportunity that technology provides to teach off-campus.

Training for faculty is important, since the nature of distance-based interaction differs from that of classroom-based instruction. The straight transfer of teaching and tutoring styles from classroom to distance contexts can lead to inappropriate teacher behavior in the new context. In situations where a team model of course development is used, informal and often subtle training is carried out by the instructional designer or educational technologist whose job, in part, is to act as an agent provocateur. It is fair to say that the responsibility for an informed application of the new technologies to Canadian distance education rests heavily on instructional designers. If the special characteristics of the new technologies are to be used efficiently and effectively, then faculty will need help in

developing an accurate awareness of their predominant classroom styles and successful distance styles so that adjustments can be made. Criteria for effective and sensitive interaction of faculty with students are needed.

For many classroom-based faculty, some changes in attitude toward distance education are necessary. These changes can be facilitated either by instructional designers or by faculty already skilled in and enthusiastic about distance education strategies. Many course writers and tutors new to distance education need to be reassured that their role is not diminished in a distance context and that developing their distance education skills will often give them new ideas applicable to all their teaching, both distance and classroom-based.

If the possibilities for distance education delivery are to be realized, new attitudes, new repertoires of skills in visualizing thought, and new arrangements between learner and instructor must be sought and attained.[37]

The enhancement of learner support services is a key issue in the application of new technologies. To what extent can the technologies facilitate the speed and frequency of communication among learners and between a learner and a tutor? How can the use of the new technologies encourage reflective learning and personal assessments of the affective as well as the cognitive learning process? To what degree can students at a distance be afforded the same types of opportunities for counselling that their on-campus counterparts receive? Learners need to feel that any form of technology is user friendly and even transparent, in that it does not inhibit learning. At a more practical level, the technology must also be reliable and easily accessible. Designers and administrators are already dealing with organizational problems of accessibility to Telidon terminals, microcomputers, and group audio-teleconference equipment, but more work is needed on their learner support functions.

There is a further aspect of the learner-support issue that demands increasing attention - that of learner adaptation to the use of new technologies. "Few adults are familiar or comfortable with computers, television, audiotapes or teleconferencing as instructional media... A training or familiarization period may be required to enable

adults to adapt to new learning tools and environments, and the effects of such programs on learner persistence and success in technological instructional environments should be examined carefully."[38]

Learners may view the use of technology as an invasion of their privacy. For example, computer-managed learning systems allow tutors and administrators to gather and manipulate large amounts of data and to intervene in and monitor the learner's progress through a course. Another example is the audiotape recording of conversations between student and tutor, a process that may inhibit spontaneous and effective participation.

The economic realities that face educational institutions in Canada have not only encouraged the development of distance education as a means of broadening an institution's learner base for funding, but have also been compounded by the use of cost-intensive information and communications technologies.

Among the strategies being developed are cooperative initiatives among institutions with regard to resource sharing; a "softening" of many institutions with regard to jurisdictional mandates, such as regional boundaries for learner markets; granting of equivalency credits among institutions using shared resources; and stronger awareness of the role that shared research and evaluation can play in improving both the educational value and cost-effectiveness of course planning and production. The degree to which institutions can supplant a competitive ethos with a collaborative one will determine the future effectiveness of distance education.

To what extent are institutions willing and able to exchange courses and adapt others to avoid costly duplication of effort? The Atlantic Provinces Association for Continuing University Education (APACUE) is an organization made up of the 19 universities in the Atlantic region. The Association's mandate is to facilitate both the sharing of information and the coordination of the efforts and initiatives of its member institutions. APACUE places a high priority on issues relating to distance education, and several significant cooperative ventures have sprung from this involvement. Specifically, APACUE has sponsored a group teleconferencing pilot project (with the technology being

used by the group to transact much of its business and to gain practical experience in teleconferencing techniques and logistics); it has carried out a professional development session via teleconference for interested faculty members of nine universities; it has developed a cooperative funding proposal for a regional electronic communications network and a regional information base on the subject of technological change and its social and personal impact; and it has held a regional conference on the subject of educational television and its potential for the use by Atlantic Provinces.

APACUE is a forum for information sharing with respect to distance education course development, support services, and policy issues. The Association has attempted to put the idea of interuniversity cooperation and collaboration into practice. The joint efforts of the 19 universities in the Atlantic region have resulted in a greater awareness of educational technology and fuller understanding of its implications.[39] The speed with which new technologies in education are being developed has meant that many activities, such as the sharing of resources, take place without the guidance of established policy for inter-institutional cooperation. APACUE's progress is a hopeful sign of a trend toward collective management in communications technologies for Canadian education.

The Association of Atlantic Universities in Halifax, Nova Scotia, recently established an Office of Educational Communications. The working mandate of the Office is to facilitate the multi-disciplinary use and understanding of modern communications technologies in Atlantic universities, with emphasis on cooperation and collaboration. It is hoped that the Office will become the major focus for negotiation with producers and distributors of distance education materials, hardware and software developers and vendors, and telecommunications utilities; identification of funding sources; and initiation of dialogue concerning transfer of credit among Atlantic universities. The executive director of the Office will work with APACUE to coordinate the sharing of resources and the collective exploration of new technologies.

The Western Canadian Council on University Distance Education (WCCUDE), composed of representatives from Manitoba, Saskatchewan, Alberta, and British Columbia, was established in 1982 to provide a forum for sharing problems

and discussing issues pertaining tc distance education. In the Fall of 1983, the WCCUDE began to build a databank of the distance education courses offered by all 13 of its member institutions. Each entry lists the name and level of the course, the number of credits, and the different components offered. Still in its trial stages, the databank will eventually be openly available to the public, so that individuals and institutions acrose the country will have access to its listings.

Another approach to sharing resources and information is evident in the establishment of a Committee on Distance Education by the Council of Ontario Universities. The universities represented on the Committee want, among other things, to reduce the operating costs of their distance programs by sharing resources and avoiding redundancy. To dc this, the Committee has outlined the following objectives: to facilitate the exchange of information about institutional activities in distance education; to coordinate program planning; to initiate inter-institutional credit transfer policies; and to develop mechanisms for cooperation among universities and between universities and other organizations in the development of course materials and delivery services.[40]

The Committee recently adopted a proposal to establish 110 resource centres at public libraries across Ontario. Each centre would have at least one microcomputer, a videocassette recorder, and audio-teleconferencing equipment. Part-time students and distance education students from any Ontario university will be able to use the equipment at these centres in connection with their courses. If it is approved by the Secretary of State, the network will make it possible to offer courses entirely by computer. Purchase of equipment and operating expenses for the first three years is expected to cost about $2.4 million.[41]

A broader level of collaboration is exemplified by the 1983 formation of the Canadian Association for Distance Education. Consisting of representatives from postsecondary education, government agencies, and producers and distributors of hardware and software, the group uses audio-teleconferencing to share information and to plan various activities. The purpose of CADE is to foster excellence in the provision of distance education in Canada. Activities

include professional development, information exchange, the promotion of research, and discussion of policy issues.

Another institutional issue concerns networking and the documentation of distance education activity in Canada, especially as it relates to inventories of course offerings and reports of technological developments. The Western Provinces Education Agreement, signed on 7 March 1984 by the Ministers of Education in British Columbia, the Yukon, Alberta, the Northwest Territories, Saskatchewan, and Manitoba, outlines areas of collaboration at the ministerial level on policies pertaining to distance education. In the hope that the united efforts of these parties will result in improved access to distance education, the agreement specifically calls for coordination and cooperation among provinces in the development and delivery of distance education course material, combining resources toward the purchase of necessary hardware and software, and establishing a committee of representatives from each province to facilitate coordination and determine areas in need of attention.[42]

Plans are underway in British Columbia to establish the Open University Consortium, a cooperative board comprised of two representatives from each of the three universities - University of British Columbia, University of Victoria, and Simon Fraser University - the Open Learning Institute and the Knowledge Network. The purpose of the Consortium will be to coordinate distance education programs, particularly a Bachelor of Arts external degree program. An academic council will be formed to assess credit transfers, so that anyone may obtain a university education without physically attending university.[43]

Several task groups of the Council of Ministers of Education, Canada have, since 1981, been examining ways of improving interprovincial cooperation in the development of educational media as well as cooperation between various production agencies. Such cooperation overcomes many of the traditional jurisdictional and geographic boundaries that have existed among different levels of the educational community, between public and private educational agencies, and between institutionally based education and human resource developers in business, industry, labor, and government. There is cause for optimism here; distance

education technology encourages the formation of new links among these various agencies and individuals.[44]

CONCLUSION

There exists a need for committed activity and innovative leadership in the development of coordinated distance education administrative policies and programs. While there is still much to be learned, significant development in the field has already taken place. The successful application of technology to distance education requires an understanding that there is no single ideal educational technology, and that designers must provide learners with options and integrated, appropriate media.

It is safe to predict that sensitive and efficient applications of new and old technologies will constitute a revolution in the nature and scope of adult education in Canada. Distance education strategies will help both on- and off-campus learning activity. Administrators have a right to expect that materials flexible enough for classroom use and distance use will be produced and that faculty will play a supportive and facilitative role. In terms of target markets, the future applications of new technologies ought to be able to extend access to education to members of paid-education-leave programs, credit-free learners, patrons of art galleries, museums, and libraries, workers, those on unemployment benefits, and trade union members, to name just a few adult groups. Elementary and secondary school students of all ages could also benefit from the potential.

In terms of the educator's response, distance education based on the new technologies is an unprecedented opportunity for modelling effective tutoring strategies for adult learners. Contemporary humanistic adult learning principles stress the adult's need for autonomy - for self responsibility and direction, supported by appropriate guidance. The ability of distance educators to supply services and equipment to enhance that autonomy and maintain close contact with the learner is steadily increasing. If they can literally and metaphorically meet the learners on their own ground and, through collaboration and guidance, develop learning skills and choices in learning, then distance education will have taken an incremental step in its development.

NOTES

1. "The Contribution of Media and Technology to Learning at a Distance." In J. Daniel; M. Stroud; and J. Thompson, eds., Learning at a Distance: A World Perspective. Edmonton: Athabasca University/International Council for Correspondence Education, 1982, p. 263.

2. Ruggles, R.; Anderson, J.; Blackmore, D.; Lafleur, C.; Rothe, J.; and Taerum, T. Learning at a Distance and the New Technology. Vancouver: Educational Research Institute of British Columbia, 1982, p. 16.

3. Waniewicz, Ignacy. "The Adult Learners: Who Are They, Why and Where Do They Learn?" In Ruggles, et al. Learning at a Distance, 1982, p. 87.

4. Hummel, Charles. Education Today for the World of Tomorrow. Paris: UNESCO Press, 1977, p. 35.

5. Kaye, A. and Rumble, G., eds. Distance Teaching for Higher and Adult Education. London: The Open University, 1981, p. 1.

6. Cowper, D. "The Application of Telidon." Bandwidth. Vol. 2, No. 3, February, 1983, p. 64.

7. Mugridge, I. "The Establishment of a New Distance Education Institution: The Open Learning Institute of British Columbia." Distance Education. Vol. 2, No. 1, March, 1981, p. 98.

8. Ellis, J. and Mugridge, I. "The Open Learning Institute of British Columbia: A Case Study." Distance Education Research Group Paper No. 8. Milton Keynes, U.K.: The Open University, August 1983, p. 11.

9. Lamy, T. and Henri, F. "Télé-université: Ten Years of Distance Education in Quebec." Programmed Learning and Educational Technology. Vol. 20, No. 3, August, 1983, p. 198.

10. TVOntario. Strategic Plan 1984-1988. Unpublished document, p. 2.

11. Mandville, M.L. A Man's Reach Should Exceed His Grasp. Distance Education and Teleconferencing at Memorial University. St. John's: Memorial University of Newfoundland, 1982, p. 115.

12. Carefoot, J. The Birth of a Western Canadian Committee on University Distance Education, April 1981-June 1982: Proceedings of Meetings. Regina: University of Regina, 1982, p. 42.

13. Gregory, D. "Simple Thoughts on Super Toys: Why Athabasca University Needs Educational Technology." Bandwith. Vol. 2, No. 3, February, 1983, p. 55.

14. Ibid.

15. Leslie, J. "The University of Waterloo Model for Distance Education." Canadian Journal of University Continuing Education, 1979, p. 36.

16. Ruggles, et al. Learning at a Distance, 1982, p. 9.

17. Carefoot, J. The Birth of a Western Canadian Committee on University Distance Education, April 1981-June 1982, pp. 13-14.

18. Carl, Diana. Coordinator, DUET, Mount Saint Vincent University, Halifax, Nova Scotia. Personal communication, 13 July 1984.

19. Pichette, Michel. Service à la Collectivité, Université du Québec à Montréal. Personal communication, 25 May 1984.

20. La France, Andre. Coordinator, Télévision Educative du Québec. Personal communication, 4 June 1984.

21. Smith, W.A.S. and Snowden, B.L. A Review of Distance Education in Ontario Universities. Toronto: Council of Ontario Universities, April, 1983, p. 16.

22. Ibid., p. 11.

23. Balsom, Donald. Memorial University of Newfoundland. Personal communication, 9 June 1984.

24. Splittgerber, F. "Computer-based Instruction: A Revolution in the Making?" Educational Technology. January, 1979, p. 69.

25. Megarry, J.; Walker, D.; Nisbet, S.; and Hoyle, E. (eds.). World Yearbook of Education 1982/83, Computers and Education. London: Kogan Page Ltd., 1983, p. 267.

26. TVOntario. Annual Report, 1982-83, p. 7.

27. Kaufman, David. A Computer-based Instructional System for Distance Education. Richmond, B.C.: Open Learning Institute, 1984, p. 3.

28. Currier, Richard L. "Interactive Videodisc Learning Systems." High Technology. November, 1983, p. 52.

29. Ellis, B.G. and Winn, W. "Educational Teleconferencing and Telidon." Bandwidth. Vol. 2, No. 2, September, 1982, p. 31.

30. MacNeil, Teresa. Director, Extension Department, Saint Francis Xavier University. Personal communication, 17 July 1984.

31. Thomas D. "Distance Education in the Canadian Arctic: Developing an Alternative Delivery System." In L. Parker, ed., Teleconferencing and Interactive Media. Madison: University of Wisconsin, Extension Center for Interactive Programs, May 1980, p. 153.

32. Dumas, P.; Duprey, R.; Bertrand, G.; and Lortie, R. "Le Réseau Omnibus de l'Université du Québec." In I. Paghis (ed.), Hermes, the Communications Technology Satellite: Its Performance and Applications, Vol. 3. Ottawa: The Royal Society of Canada, 1977, p. 112.

33. Plumb, M. "Project Outreach: Initial Results of Alberta's First Interactive T.V. Distance Education Experiment." Bandwidth, Vol. 2, No. 2, September, 1982, p. 29.

34. Ibid.

35. Crawford, G. "An Instructional Developer Looks at Educational Technology." Bandwidth. Vol. 2, No. 3, February, 1983, p. 57.

36. Potter, G. "Redefining Education: Canadian Satellite-based Distance Education - Projects and Experiments." In C. Crump and K. Livingston, eds., ASPESA Forum '81 Papers. Fiji: University of the South Pacific/ASPESA, 1981, p. 69.

37. Bedecki, B. "The Possibilities for Videodiscs in Distance Education Delivery." Bandwidth. Vol. 2, No. 3, February, 1983, p. 65.

38. Shobe, C. "Research Needs in Educational Technology for Distance Education." Bandwidth. Vol. 2, No. 3, February, 1983, p. 73.

39. Noble, Marilyn. Program Coordinator for Distance Education, University of New Brunswick. Personal communication, 27 June 1984.

40. Council of Ontario Universities. Briefing Notes. No. 10, June 1984.

41. Gray, Jack. News-Memo. International Council for Distance Education. University of Waterloo, Ontario, May, 1984, p. 3.

42. McFarland, Bruce. Director, Continuing Education, Brandon University. Personal communication, 25 July 1984.

43. Landsburg, June. Knowledge Network Coordinator, Department of Continuing Education, Simon Fraser University. Personal communication, 10 August 1984.

44. Nobel, Marilyn. Personal communication, 27 June 1984.

OTHER SOURCES

Bains, G.S., ed. Proceedings of the Conference on Remote Learning: Its Scope and Attendant Problems. Winnipeg: Continuing Education Division, University of Manitoba, 1977.

Betay, E.D. "Sixty Years of Distance Education in Alberta." Bulletin of the International Council for Distance Education. No. 4, 1984, pp. 8-12.

College Canada. January/February, 1983.

Council of Ministers of Education, Canada. Report of the Post-Secondary Task Force of the Coordinating Committee for Media. June, 1983.

Ellis, G.B. "Applications of Advanced Technology in Educational Programming at the University of Calgary." Unpublished paper. Calgary: Faculty of Continuing Education, University of Calgary, 1983.

Frewin, C.C. Outreach Project. Thunder Bay: Confederation College of Applied Arts and Technology, 1982.

Haughey, M. "Distance Education at the University of Victoria: The First Five Years, 1978-1983." Unpublished paper, 1983.

Holmberg, B. Distance Education: A Survey and Bibliography. London: Kogan Page, 1977.

Shore, V. "Distance Education Schools Join International Consortium." University Affairs/Affaires Universitaires, Vol. 25, No. 1, January, 1984, p. 5.

Snowden, D. A Direction for Atlantic Universities in Relation to New Communications, Information and Instructional Technologies in Education. A report for the Association of Atlantic Universities. Unpublished, December, 1982.

MAP OF CANADA, with names and locations of institutions which provide adult distance education.

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