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ABSTRACT

With its large territory, small diverse population, two official languages, and notable regional differences, Canada has always been quick to use new communications technologies as they appear, and has historically played a role in their development as well. In each of the 10 provinces and 2 territories, educational films and television programs are available for classroom use. Educational radio programs are provided both by broadcast and on audiocassettes. Students use computers in a variety of ways including programming, using software that teaches basic skills through computer-assisted instruction (CAI), word processing, and information access through databases. While each province makes decisions about new educational technologies according to regional needs and characteristics, the primary use of educational technology in the classroom is determined by the individual teacher. (12 sources) (DB)

TVOntario

Office of Development Research
Bureau de recherche pour le développement

NEW TECHNOLOGIES IN CANADIAN EDUCATION

PAPER 2

COMMUNICATIONS AND INFORMATION TECHNOLOGIES IN CANADIAN ELEMENTARY AND SECONDARY SCHOOLS

By Donna Sharon

Study Coordinator
Ignacy Waniewicz

January 1984

Papers in the Series

NEW TECHNOLOGIES IN CANADIAN EDUCATION

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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

Education in Canada is profoundly influenced by two of Canada's most distinctive features: its vast physical dimensions and its small, widely dispersed population, historically of French and English ancestry. Under the Constitution of 1982, and previously under the British North America Act of 1867, education in Canada is a provincial responsibility. Hence there are 10 provincial and two territorial educational systems across the country.

Although the provincial ministries or departments of education function autonomously, they do share several broad aims: to provide students with an opportunity to learn within the framework that best meets their aptitudes and interests; to prepare them for life in society; to promote social and cultural development and economic growth; and to encourage the advancement of knowledge. Paper 1 in this series describes how the provinces organize and administer their elementary and secondary school systems.

Canadians have always been encouraged by the large size of the country to develop and use new communications technologies. The first section of this paper looks at the development and use of radio, film, and television in elementary and secondary schools. The second section describes the introduction of microcomputers into the schools, and glances briefly at newer technologies now being studied for their educational applications.

FILM, TELEVISION, AND RADIO IN CANADIAN SCHOOLS

Over the past 30 years, educational films and television have become a familiar feature of elementary and secondary school instruction in Canada. Provincial departments and ministries of education have enabled and encouraged teachers to use films and television programs to stimulate student participation and exchange of ideas, to allow students to see situations outside their individual experiences; to present information and concepts; or to complement classroom teaching.

This section discusses the ways in which provincial governments promote the use of educational films and television, and describes the present inventory, sources, and distribution of programs. Brief mention is also made of the use of educational radio programs. Finally, the classroom use of film and television is considered.

Provincial policies and activities

Provincial governments have refrained from adopting explicit policies to guide teachers in the use of film and television in the classroom. Provinces view this as a professional matter to be determined by local educational authorities, school principals, and individual teachers. Nevertheless, all the provinces and territories have supported the use of film and television in a number of ways.

Purchases of equipment. During the 1960s and 1970s, several provinces subsidized the purchase of television equipment. Today, only British Columbia shares the cost of buying television sets and videotape players and recorders with individual school boards. In other provinces, school boards or administrative units are responsible for buying equipment out of their regular budgets. In the Yukon, equipment is purchased by the Department of Education for all schools in the territory.

Most provinces encourage the standardization of equipment, and provide technical and price information to purchasing agents in each school board. They often

recommend, but rarely dictate, what equipment is to be bought.

Teacher training. Training for teachers in the use of film and television is available to differing degrees in all provinces, although it seems to lag behind the proliferation of equipment. Both preservice training for student teachers and in-service training for practising teachers are offered.

- Preservice. During their preservice training, most teachers receive a minimal introduction to the use of audiovisual media, including filmstrips and other small-format materials as well as television and film. Usually a course on teaching methods includes a six- to ten-hour unit that describes equipment and considers how programs may be used.

A full course, usually optional, in the uses of audiovisual media in teaching is offered at some teachers' colleges and university faculties of education. These courses are chosen by only a small number of students. Until recently, the Faculty of Education of the University of Prince Edward Island required all students in the Bachelor of Education Program to take such a course, but it is now optional. In British Columbia, three universities offer these courses, and the University of Victoria has compulsory audiovisual courses for all graduating teachers.

- In-service. Practising teachers in most parts of the country are offered workshops that demonstrate or discuss beneficial ways of using television. These workshops are usually given at professional development meetings or conferences, and are conducted by personnel from the provincial department, ministry, or educational communications organizations (discussed later in this paper and described more fully in Paper 7), or by personnel from regional or local resource centres. In some provinces, there is a shortage of instructors for in-service workshops of this type. Workshops are being developed in Ontario and Alberta to train teachers to give workshops for other teachers as part of a strategy to increase the use of educational television.

In Ontario and Nova Scotia, universities offer evening and summer courses that may lead to a teaching certificate as

a media specialist. In Ontario, a three-part "Specialist in Media" program is offered at several universities on a rotating basis.

Most teachers receive, as part of their preservice training, a few hours of instruction in the operation and use of audiovisual media, but only those with a special interest enroll in a full course or seek extensive training. Some educators express concern that teachers are inadequately prepared to take full advantage of television and film as teaching aids.

The provision of films, television, and radio programs. In each province, films and television programs are available for classroom use. There are school television broadcasts in most parts of the country and in most regions programs are available on videotape. In the smaller provinces, films and videotapes are purchased and distributed to all schools by the department or ministry of education. In larger provinces, school boards or regional centres purchase and distribute programs independently.

The Canadian Broadcasting Corporation (CBC) broadcasts national and regional educational programs, and the Provinces of Ontario and Alberta have created educational communications organizations, known as TVOntario and ACCESS Alberta, respectively. As part of their educational functions (described in Paper 7), these organizations produce television programs and accompanying print materials for schools. The Provincial Educational Media Centre in British Columbia also produces film and television programs which have broadcast on British Columbia's Knowledge Network of the West. In each producing province, programs are broadcast and are made available to schools on videotape. Programs are also sold for broadcast and for use by schools in other provinces and countries. Both the production and distribution of film and television are discussed further in the following pages.

The broadcasting authorities also publish film catalogues, broadcast schedules and, in some cases, teachers' guides and student workbooks to accompany television programs.

Educational radio programs and audiocassettes are produced for school use in Newfoundland, Nova Scotia, and Alberta. In Newfoundland, the Department of Education produces radio programs and audiocassettes which, in recent years, have been closely related to the curriculum. Alberta provides school broadcasts on CKUA, a provincial radio network, and makes audiocassettes of the programs available to schools. Some resource centres in other provinces maintain a supply of audiotapes from a variety of sources.

Films, television, and radio programs

As background to a discussion on the use of film and television in the classroom, this section describes the sources of film and television productions, the amount of material available, and the systems for distributing programs to teachers.

Sources of educational films. The largest single Canadian producer of films used in schools is the National Film Board (NFB) of Canada, which produces roughly 25 per cent of films purchased by schools. The CBC, from its collection of broadcast materials, makes a number of films available to schools. The main suppliers of educational films, however, are the commercial educational film companies in the United States. Canadian commercial producers supply only a small proportion of school films (probably less than 10 per cent). British and other foreign producers also provide some educational films for Canadian schools.

Sources of television programs. TVOntario and ACCESS Alberta produce educational television programs for their schools and buy additional programs, primarily from the United States, Britain, and other European countries. There have also been co-productions with the NFB and the Agency for Instructional Television in the United States.

Radio-Québec, a provincial television network, produces television programs for schools when requested by the provincial ministry of education. British Columbia's Provincial Educational Media Centre (PEMC) produces television programming as well.

In the other provinces, there is much less production of educational television. But while the quantity is smaller, regional and provincial productions should not be overlooked. Nova Scotia, for example, focusses on "productions which reflect the people and the environment of our region." Their productions include series on the Micmacs, early inhabitants of Nova Scotia, and on the Acadians, French settlers in the eighteenth century who remained in the Maritime provinces after the British conquest.

In Manitoba, the Department of Educations Media Productions Section produces some educational television programs. In Saskatchewan, Saskmedia has recently ceased production. New Brunswick has so far undertaken a minimum of production, but recent improvements in its production facilities are expected to result in more programs. The Northwest Territories is also planning a small production facility for the future.

Through the facilities of the Canadian Broadcasting Corporation, the Council of Ministers of Education has provided two half-hours a week of school television programs in English and one in French. The Council is also encouraging co-productions and co-acquisitions of programs among provinces as a cost-saving measure. The first co-production of this kind is now being prepared; its subject will be Canadian literature.

Film and television inventories. Inventory figures for all provinces except Quebec are shown in the table below. In most of these provinces, inventory figures do not include additional programs in regional, school board, or school libraries.

Film collections are much larger than videotape inventories. However, in Ontario, Manitoba, Alberta and British Columbia, videotape collections are substantial, at or approaching 4,000 programs. In proportion to their smaller numbers of students, Nova Scotia, with almost 2,000 videotapes, and Prince Edward Island (P.E.I.) with 1,000, seem to have a sizeable inventory. Newfoundland, New Brunswick and Saskatchewan have acquired comparatively few videotapes.

Size of Inventory*

Province	Films	Video-Tapes	Audio-Cassettes	No. of Students
Newfoundland	3,500	200	3,500	135,000
Nova Scotia	2,800	1,960	610	180,000
New Brunswick	4,000	600	--	147,000
P.E.I.	3,000	1,000	--	25,000
Ontario	**	3,800	--	2,000,000
Manitoba	**	4,200	740	200,000
Saskatchewan	2,600	680	340	200,000
Alberta	**	3,500	2,500	440,000
British Columbia	7,000	4,000	1,000	450,000

*Central inventory only, not including holdings in regional or school board centres.

**Film collections are held in local school boards or regional centres.

Inventories of both film and television cover most subjects and grade levels. Although the total numbers of programs seem large, the programs available in a particular subject or topic may be small. For example, TVOntario offers schools 1,485 hours of TV programs, including 255 series with a total of 3,800 programs. The number of television series available for each subject and grade level is given in the following table.

TVOntario Series by Grade Level

Subject	Primary	Junior	Inter.*	Senior*
Art	2	2	--	6
Business	--	--	--	3
Canadian studies	--	--	13	9
English	14	11	15	11
French	--	1	2	1
Geography	--	--	17	6
Health**	3	4	13	20
History	--	--	8	15
Math	3	3	4	2
Music	2	1	1	4
Science	3	3	16	13
Social science	1	4	7	8
Total	28	29	96	98
Series designed mainly for schools	28	29	47	21

*Each series is counted in the lowest grade at which it can be used.

**Health includes several related areas, such as family studies, physical education and guidance.

A general look at the availability of film and television in Canada shows that sizable inventories of films are provided for teachers across the country; they originate mainly from producers in the United States and from the National Film Board of Canada. A substantial inventory of videotapes is available in most provinces as well, produced primarily in Canada by educational communications authorities and by provincial ministries or departments. A substantial inventory of both provincially produced television programs and purchased programs is available in Nova Scotia, Ontario, Manitoba, Alberta, and British Columbia. P.E.I. has purchased many programs, mainly from Alberta and Ontario. The remaining provinces have only small inventories of television programs.

Distribution of film and television. Films are purchased and distributed to teachers by individual school boards or regional centres in Quebec, Ontario, Alberta, the Yukon, and the Northwest Territories. The remaining seven provinces each has a provincial resource centre that distributes films to teachers in small communities, while larger communities maintain their own distribution centres. In Nova Scotia, New Brunswick and Manitoba, a computerized cataloguing and booking system, called Medianet, is used to facilitate the distribution of films and television. In some areas, schools borrow films directly from the local National Film Board library.

Television programs are available to teachers at the scheduled broadcast times or on videotape at times selected by the individual teacher. In most parts of the country, the Canadian Broadcasting Corporation broadcasts two half-hours of school television each week in English and one half-hour in French.

Provincial broadcasting is available as well. TVOntario offers 25 hours of school broadcasts each week, and ACCESS Alberta purchases 10 hours of broadcast time each week from commercial stations. PEMC in British Columbia provides an additional three half-hours weekly on CBC and 10 half-hours on KNOW, the provincial educational broadcaster, using direct broadcast satellites. Experiments using direct broadcast satellites are now underway in Alberta. In Quebec, Radio-Québec, the Canadian Broadcasting Corporation, and its French language service, Radio-Canada, together provide 15 hours of

school television each week. In the four Atlantic provinces, the Atlantic Satellite Network provides four hours per day of transmission time for educational use.

Commercial cable television systems are required by federal law to include provincial educational channels in their basic service, thereby extending off-air distributic of school television. In some regions, educational authorities arrange for educational broadcasts on the local cable channel (see Paper 10).

Broadcasts of secondary school programs are used primarily for off-air taping by technicians in school board resource centres or by teachers in schools. Broadcasts of elementary level programs are used both for immediate classroom instruction and for off-air taping.

Videotapes can be purchased from the television-producing organization as well as taped off-air. Videotapes of many National Film Board films are also available. In Quebec, videotapes (and other audiovisual materials produced by the Direction générale des moyens d'enseignement of the Ministère de l'Éducation) are sold to schools by a private company, Secas Adimec. Purchasing rather than taping off-air is preferred where the reception is poor or where the resource centre staff is small; it is essential in provinces without broadcasting networks.

In Ontario, two school boards distribute television programs by a 2,500-megahertz IFTS system. This closed-circuit system links each school television receiver to a central transmission source. Programs are transmitted to classrooms from the centre on request, thereby eliminating the need to circulate videotapes or to have videotape replay equipment in each school.

Since videotapes are easily duplicated, many schools maintain collections of the videotapes they use most often. Some departments in secondary schools have small resource centres as well.

Radio programs. From 1957 until June, 1983, school radio broadcasts were carried over the Canadian Broadcasting Corporation network. During the past 20 years, school programs were aired from 1400 hours to 1430 hours each school

day. Educators worked with broadcasters at the national, regional, and provincial levels to determine what kind of programs were needed and to produce programs. National programs originating with the Council of Ministers of Education were broadcast one day a week; regional programs were broadcast a second day; and provincial programs filled the remaining three half-hours each week.

In Ontario and some other parts of the country, as film and television became more generally available, the demand for radio programs waned. Since the termination of the national service, school radio programs are broadcast only in Alberta, on the ACCESS Alberta network CKUA. Every day two hours of educational programs, produced for the most part by ACCESS Alberta, are broadcast on this network.

Provincial inventory figures given above show that Newfoundland produces more hours of school radio programs than the other provinces. Despite the end of school radio broadcasts, Newfoundland will continue to produce and distribute programs on audiocassettes. In recent years, approximately 300 audiocassettes have been produced annually and over 12,000 copies are distributed annually.

Quebec, British Columbia, and Nova Scotia also distribute a sizable number of audiocassettes. The British Columbia educational media centre fills requests for over 10,000 copies each year. Many of those programs were produced in British Columbia, although some were acquired from ACCESS Alberta or commercial producers. (Audiocassettes for teaching foreign languages, for example, were bought from private producers.) Nova Scotia filled over 2,700 requests for copies of 610 audio programs. Saskatchewan distributes a smaller collection of audiocassettes, as do many regional or school board resource centres in Ontario and other provinces.

Classroom use of films, television, and radio

Proportion of teachers using film, television, and radio.

Statistics on the proportion of teachers who use film, television, and radio are available for Quebec, Ontario, and Alberta. Each of these large provinces reports a different pattern of media use, partly because the different kinds of programs are not all equally available in every province.

In Quebec, audiotapes are used by a substantial proportion of teachers, and videotapes are used by few teachers, especially in the elementary schools. The difference is probably a result of the shortage of French-language film and television programs for elementary schools. The Quebec Ministry of Education prefers to produce audiocassettes with accompanying slides and filmstrips rather than videotapes for elementary students. This is due to the cost of the equipment needed to supply a large number of small elementary schools and the greater cost of production. (Overhead transparencies, filmstrips, and 35mm slides, often with accompanying audiocassettes, are commonly used across the country, especially in elementary schools.)

Quebec - Percentage of Teachers Using Media, 1982

	Films	TV Off-Air	Video-tapes	Radio	Audio-tapes
Elementary	23	21	5	3	52
Secondary	58	15	21	3	46

According to the Alberta figures shown below, films are used by a majority of teachers, videotapes by roughly a third of teachers, and off-air television, radio, and audiocassettes by fewer than one in five. It would appear that the availability of large numbers of films and videotapes has attracted sizable proportions of teachers, and that the use of radio and audiocassettes has declined. Although Alberta has the only provincial radio network and a large collection of audiotapes, the latter are used by only a small proportion of teachers.

Alberta - Percentage of Teachers
Using Audiovisual Media, 1981

	Films	TV Off-Air	Video-tapes	Cable Off-Air	Radio	Audio-tapes
Elementary	64.5	17.4	33.3	6.9	3.4	11.2
Secondary	51.7	7.5	32.0	2.5	2.4	14.8
Average no. of times used/month	3.4	3.4	3.4	3.1	2.6	3.1

In the Ontario figures shown below, films are used by a majority of teachers, and a substantial minority use television at least once during a school term. Figures for the use of audiocassettes were not available. The pattern of use is quite similar to that found in Alberta, although, in Ontario, films are used somewhat more and television slightly less often.

Ontario - Percentage of Teachers Using Audiovisual Media

	Film	TV Off-Air	Video-tapes	Radio
Elementary	80	22	31	6
Secondary	59	1	25	7

A recent TVOntario study shows that films and television are used more in elementary schools than in secondary schools. Elementary teachers use television most often in language arts, mathematics, and health. In secondary schools, a majority of geography and history teachers use television. As might be expected, a greater proportion of teachers use television in subjects where more programs are available. The following table lists several secondary subject areas and the proportion of Ontario teachers who use television in each.

Proportion of Teachers in Each Subject Who Use Television

Geography	55%
History	50%
English	42%
Family studies	38%
Science	35%
Music	18%
Art	18%
Mathematics	14%
Technical subjects	12%

In the same study, regular (i.e., weekly) use of television was reported by 26 per cent of elementary teachers and 11 per cent of secondary teachers. There are no comparable figures available for the use of films.

Among Ontario teachers who use television, approximately 45 per cent of elementary teachers and 88 per cent of secondary teachers use videotape replay exclusively; 27 per cent of elementary teachers and two per cent of secondary teachers use off-air broadcasts exclusively; and the remainder use both.

The other provinces offer general statements indicating that the use of films and television in their schools is substantial. In New Brunswick's English schools, film is used extensively in most grades and in all subjects, and approximately 10 per cent of teachers use the small television inventory available. In British Columbia, 30 per

cent of teachers in the primary and intermediate grades use film or television or both. In the Northwest Territories, a majority (60 per cent) of teachers in all grades use films in their teaching, especially in science and social studies. In the Yukon, several courses of study, including French, science, English, and social studies, prescribe audiovisual components. As a result, the great majority of teachers use film and television.

In French-language schools in New Brunswick and Manitoba, 30 per cent to 50 per cent of teachers in subjects where French-language programs are available (science, social science, French, and English) are regular users of films and television. In Prince Edward Island, a considerable number of television programs for use in second-language instruction has been purchased. The second-language teachers tend to be heavy users of television.

In summary, a substantial proportion of Canadian teachers see films and television as a valuable means of helping students learn. A lack of detailed information for every province makes comparisons difficult. It seems clear, however, that the small supply of television programs in several provinces limits the use of television in these areas.

Demand for programs. Several provinces share the view of British Columbia that the demand for additional programs is increasing in all subjects. Most provinces are increasing their program inventories for all grades. Some provinces say that the present inventories are generally adequate.

During the past three years, the demand has increased for programs that are designed to complement the curriculum or that can be easily integrated into an existing course of study. The Northwest Territories estimates that 80 per cent of its inventory is curriculum-specific and the rest is used to provide enrichment. In Prince Edward Island, the video materials that are bought tend to be specifically related to the curriculum while more of the films purchased are selected for purposes of enrichment.

The relationships among the number of programs available, the amount of use, and the demand for additional programs are complex. In some cases, education officials acquire programs

in a specific subject and entice teachers into using them regularly. Or media centre personnel, in an attempt to increase the use of their collection, may buy programs for subjects or grades where the use of the existing programs is low or where few materials are available. In other situations, the demand by teachers shows that additional programs are needed and should be purchased.

Demand for films and television. In all provinces, there is a greater supply of films and film equipment than of television sets and programs. Compared to television, films have the advantage of a larger screen image and higher resolution of detail. In recent years, however, many departments of education and school boards have been making television more available while maintaining the existing support for films. As suggested earlier, television generally produces a series of programs that are related to the curriculum. Films, on the other hand, are usually produced as single programs. Teachers also report that television programs are more up-to-date than films. The lower cost of videotapes and the ability to make duplicates cheaply have also encouraged a shift toward videotape purchases.

Education in media literacy for students. Across Canada, only minimal steps have been taken to offer courses in media literacy to students. Such courses can provide an understanding of what audiovisual media do and how they are used, or they can teach students how to use these media as a means of expression.

Perhaps the most systematic attempt to provide media education is found in British Columbia, which offers a Grade 11 course in media literacy. This course relies heavily on the media kit, "Understanding Film and Television," prepared by the Provincial Education Media Centre in British Columbia. In Alberta, courses in media production have been developed at the local level.

In Ontario, the Association for Media Literacy estimates that seven per cent of secondary students are enrolled in media-related courses developed at the local level. These courses may concentrate on media literacy and critical viewing, on media production skills, or on a combination of

both. In New Brunswick, a course in media communications is offered as an option in some high schools in Grade 12. In Prince Edward Island, a media literacy course is being tested at one high school. In Manitoba, a vocational course in radio and TV production is being developed for high schools.

Across the country, the study of media is sometimes included in regular school subjects, most often in English, language arts, or drama courses in junior-high or high schools. Occasionally, courses in art, industrial arts, social studies, business advertising, or geography include some aspects of media study. These activities rely heavily on the initiative of the individual teacher or school board.

In Nova Scotia, teachers can take advantage of assistance from the National Film Board, which offers programs in media literacy, animation, and so on. In Prince Edward Island, lists of materials on media literacy are distributed to all schools and are used by teachers in a variety of subjects. TVOntario has developed a variety of television and support materials for teachers interested in media education. In 1981, TVOntario conducted 100 workshops for seven- to fourteen-year-olds, using drama, games, and critical television viewing to introduce basic television technique.

In the elementary schools, media literacy is at the discretion of the individual teacher. Some efforts in this area are being made in Manitoba and Ontario.

Summary

Films are firmly established as an aid used by approximately half of Canadian school teachers. The use of television in Ontario, Alberta, Quebec, British Columbia, Manitoba, and Prince Edward Island is also considerable, but it has not reached the level of film use. In some places, a shift in the emphasis on television is closing the gap, and television use is increasing in regions where inventories are expanding. This may soon be the case in New Brunswick and the Northwest Territories where small new production facilities are being planned.

In some places, there is concern that the recent demand for computers in schools will draw funds away from film and television programs.

The differences among provinces in the availability of equipment, programs, and training for teachers affect the amount of films and television used and the ways they are used in the classroom. There are also differences among regions, within provinces, and among schools in the same region. However, the decision to use the available resources rests with the individual teacher.

Research studies have generally sought to describe the use of films and television, but they rarely explain why certain media are used or not used. To what extent is the use of film and television limited by a shortage of equipment, by a scarcity of suitable and attractive programs, by difficulties with program distribution, by a failure to make teachers aware of what is available, by a lack of opportunity for teachers to assess the programs, or by the inadequacy of teacher training? Questions about the educational benefits of different types of programs or of different ways of using them also remain unanswered. A series of reports now being prepared in Quebec will provide new information pertinent to some of those questions. Efforts to understand these educational dynamics can be of great value in developing future policies and programs.

COMPUTER TECHNOLOGY IN CANADIAN SCHOOLS

Provincial policies

Since as early as 1979, individual teachers, schools, school boards, and parents' groups have been buying microcomputers for their students' use, reflecting the growing availability of computers in business, industry, and private homes. At the same time, provincial departments and ministries of education have been working to develop programs and policies suited to the expanding role of technology in Canadian education and society.

Seven provinces - Nova Scotia, New Brunswick, P.E.I., Ontario, Manitoba, Saskatchewan, and Alberta - have developed curriculum guidelines for teaching computer science and/or computer literacy, and/or data processing in secondary schools. Fewer provinces have introduced instruction in computer literacy in the elementary or intermediate grades.

Alberta Education has established a Computer Technology Project which acts as a courseware clearinghouse to identify and evaluate educational software. Alberta selected one brand of computer, Bell and Howell's Apple, and bought a large number for sale to schools. British Columbia also facilitated the purchase of Apple computers as part of an early study. In Manitoba, a consortium of several school jurisdictions and the Department of Education has produced a series of computer-based instructional programs for children and adolescents.

In 1983, the two largest provinces, Quebec and Ontario, announced that they would give financial support to rapid increases in computer hardware and software for schools. Over the next five years, the Quebec Ministry of Education will invest $150 million to place microcomputers in classrooms, and to provide high-quality software written in French. Canadian-made computers will be purchased to increase the present 800 computers to 25,600 in primary and high schools, and there will be an additional 2,850 computers for the Collèges d'enseignement général et professionel (CEGEP).

In March, 1983, the Ontario Ministry of Education announced a series of policies which promote the production

and distribution of both hardware and software for use in schools. For the hardware, the Ministry has published functional requirements for a family of sophisticated educational microcomputers with networking and other advanced features. To produce this hardware, the Canadian Educational Microprocessor Corporation (CEM Corp) was formed with support from the Ministry of Industry and Trade as well as the Ministry of Education. Two million dollars have been allocated for the purchase and testing of prototype systems, and an additional $8 million will be used to subsidize three-quarters of the cost of computers purchased by school boards in 1983 or in 1984. Computers produced by other manufacturers to meet the functional requirements will also be eligible for subsidy.

The Ontario Ministry of Education also announced its support for the development of software by the private sector. The Ministry will spend $5.4 million in 1984, raising to $10 million per year by 1986, for the Ontario school distribution rights to software produced according to its specifications by private companies. The Ministry has also asked TVOntario to assume responsibility for cataloguing and distributing computer software.

In the remaining provinces, studies are being conducted and policies are being developed at a slower pace.

In all provinces, more and more computers are appearing in the schools. The rest of this section describes the ways computers are being used in the classroom, the availability and distribution of educational software, the programs for training teachers, the hardware that is now available, and the potential impact of computers on equal access to education. A final section describes the educational applications of newer technologies such as satellite communications, videotex, and videodiscs in elementary and secondary schools.

Computers in the classroom

The use of computers by students in schools can be loosely divided into four types. First, computers are used for courses in computer literacy, computer science, and computer applications in business. These courses teach

students how computers work, how they are used, and how to program them.

Computers are also used for computer-assisted learning (CAL),* which makes use of software designed to teach the basics of mathematics, languages, or other subjects in the curriculum. This software may take the form of drills, exercises, games, tutorials, simulations of science experiments or social phenomena. Computer-assisted learning often resembles traditional school activities, but it uses the computer for instant feedback, automatic score keeping, and individualized pacing. These features are especially attractive in teaching students with learning disabilities, or less capable students.

Third, (and this is really a subcategory of CAL), computers can be used as a tool by the student who directs the computer's operation in ways that help him or her to learn. For example, when using word-processing programs, the computer follows the student's typing and editing commands, thereby supporting and encouraging creative writing. Another application, LOGO, allows students to use very simple commands to explore mathematical and logical relationships. A third application, VisiCalc, enables secondary-school students to see the results of changing economic givens and relationships.

Finally, computers are used to retrieve information stored in central data banks. Thus they can provide students with information available previously only in large libraries. (A fifth educational use of computers, computer-managed learning, is being used at the postsecondary level

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* In this report, the term "computer-assisted instruction" is used to describe software that teaches a course of study or instruction by means of a computer, with little or no participation by the teacher. "Computer-assisted learning" refers to computer applications called upon by teachers to help the students to learn. "Computer-based education" is the broadest term - it includes all uses of computers in education. "Computer-managed learning" is the use of computer software that leads students through a program of study, directing them to resources and assessing their progress through the course.

and is just beginning to be developed for some elementary and secondary situations. Computer-managed learning directs students through a course of study and a variety of learning resources, either in a traditional classroom or outside it, using the students' answers to questions to assess and guide their progress.)

In the secondary schools, computers are used primarily to teach computer literacy, computer science, and business. Computer-assisted learning is found in some mathematics and science classes and occasionally in geography, social studies, language arts, library science, music, or other subjects. The use of computers in those subjects is limited by the shortage of good-quality software, as discussed in the following section.

In Manitoba and the Maritime Provinces, computers are also used to provide access to a vocational guidance program for secondary students called "Choices," as well as a program produced regionally that describes postsecondary educational opportunities in the region. Ontario has developed a Student Guidance Information Service which provides data about careers, training requirements, and institutions. At 100 secondary schools and libraries around the province, students and others can retrieve this information directly from a central videotex database. In other locations, requests for information are handled by mail.

In elementary schools, the use of computers generally relies on the individual teacher's initiative. Computers are used mainly to teach computer literacy, mathematics, and language skills, and to provide remedial or enrichment activities suited to individual students. The use of computers in science, social studies, music, and other subjects is found in some elementary classes.

A small but growing number of teachers are using the LOGO language on an experimental basis to assess its educational usefulness. Some schools are teaching word processing to young students as a tool they can use in developing their composition and writing skills. Some work with computers is encouraged in order to develop students' ability to reason.

A May 1983 report from British Columbia presents information about the use of computers in B.C. schools. The table reprinted below shows that in secondary schools

computers are used mainly in teaching computer science but also in teaching computer literacy and computer applications in business. In elementary schools, the use of computers is almost evenly divided between teaching about computers on the one hand and developing academic skills and providing remedial work or enrichment (computer-assisted learning) on the other.

Educational Applications of Microcomputers, British Columbia, 1983

	Percentage of Total Use	
	Elementary	Secondary
Compensatory-remedial	20	7
CAL Basic academic skills	18	3
Learning enrichment	13	2
Computer literacy	44	16
Computer science	2	54
Business education	--	14
Other	3	3

In addition to the educational uses described above, many schools with microcomputers are now using them for administrative tasks, such as correspondence, recording marks, keeping attendance records, scheduling or timetabling, scoring tests, and maintaining financial records.

Educational software

The use of computers to provide computer-assisted learning or to enable students to direct the computers' operation, as in LOGO and word processing, is limited by the shortage of good-quality software. The di ficulty in finding suitable software is especially acute in French-language schools.

Current Software. Much of the software now used in schools is written for their own students by pioneering teachers who have a great deal of enthusiasm and dedication, but who have little experience in designing software and limited free time at their disposal. This software is considered to be in the public domain and can be duplicated free of charge; in many schools it forms the bulk of the software available. An Ontario Software Catalogue describes and offers 900 public-domain programs for microcomputers produced by Commodore Business Machines, Inc.

Because it is difficult to design good software and to prevent software from being duplicated, commercial interests and publishers have so far been slow to invest in the development of educational software. Nonetheless, commercial producers and several American educational institutions supply some of the software used in Canadian classrooms. For Apple computers, the Minnesota Educational Computing Consortium and several small educational producers are significant sources of software. Because Commodore computers are less popular in American than in Canadian schools in the eastern part of the country), less educational software is available for them. Several hundred programs in both English and French for Radio Shack computers (and more recently for Commodore and Apple computers as well) have been developed by the Manitoba Computer-Assisted Learning Consortium. In Ontario, software produced by school boards such as London and Scarborough is now beginning to be distributed, and the results of 57 software development projects funded by the Ministry of Education's Exemplary Software Project are expected early in 1984. Software is also being developed by the Association of Large School Boards in Ontario.

Many American programs and some Canadian programs are available from publishers and commercial software distributors. Software produced by commercial interests

(whether private companies or educational institutions) is, on the whole, considered of better quality than the public-domain programs in circulation. But the shortcomings of both types of software are widely recognized. Alberta's Computer Technology Project recently began evaluating mathematics software, and of almost 100 programs considered, only three were recommended for use in Alberta schools. Prince Edward Island's recent Advisory Committee Report (1983) advises caution in introducing computer-assisted learning "until good courseware is available" (p.9).

More successful experiences are reported with software designed for students to use as tools rather than for computer-assisted instruction. For example, some teachers are enthusiastic about programs like the Bank Street Writer or Storywriter, which allow young children to do word processing, and LOGO, which encourages students to discover mathematical concepts by themselves. However, it took several researchers at the Massachusetts Institute of Technology (MIT) 10 years to develop LOGO, suggesting that a sizable investment is needed to produce substantial educational computer programs.

Development of software. The large investment of time and money necessary to develop high-quality software is seen as the main impediment to realizing the potential of computers in education. The results of the expenditures planned in Ontario and Quebec should reveal what kinds of educational software can be expected in the near future.

Provinces with less money to spend are encouraging the development of software in other ways. Some provinces are providing training in programming to teachers interested in courseware design. Software writing contests have been, or will soon be, sponsored in Nova Scotia, New Brunswick, Alberta, and British Columbia to encourage some small-scale development. British Columbia is coordinating the evaluation of software produced by teachers on their own initiative and is assisting teachers to develop software that can be sold beyond the province in return for distribution rights for British Columbia. The smallest jurisdictions - Prince Edward Island, the Northwest Territories, and the Yukon - are following these developments closely.

Investments in the development of software are expected to result in high-quality educational programs. The benefits and appeal of such software are expected to increase the demand for sizable numbers of microcomputers for students in all subjects and grades and perhaps to alter the school curriculum and the role of the teacher. In considering the broader implications of computers, the 1983 Alberta Task Force Report recommends "that the Minister of Education initiate a review of the Program of Studies to:

- introduce components related to technology and its current and future impact on society.

- adapt the sequence, structure, and design of the Program of Studies to accommodate continuous student progress and to encourage a personalized, self-directed learning approach.

- modify the content of appropriate courses to allow for the use of computers in ways that will stimulate the problem-solving and creative abilities of students."[1]

Cataloguing, evaluating, and distributing software. Across the country, systems for cataloguing, evaluating, and distributing software are being developed. In 1982, Alberta, British Columbia, New Brunswick, the Northwest Territories, Nova Scotia, and Ontario sponsored the Joint Study of Courseware Cataloguing and Indexing which recommended a centralized system. Today, attempts are being made to evaluate and catalogue courseware cooperatively among provinces, when feasible, in order to minimize costs and avoid a duplication of effort.

Some inter-provincial cooperation is already underway. Alberta, British Columbia, and Manitoba are cooperating in evaluating software for their schools. Each province will evaluate software in specific subjects for particular brands of computers. The Northwest Territories, and the Yukon are expecting to cooperate with these provinces. P.E.I., Newfoundland, Nova Scotia, Ontario, and Saskatchewan are now considering policies concerning software evaluation. Ontario expects to extend its textbook evaluation policy to computers and to publish a list of approved computer courseware similar to its list of textbooks.

At present, Alberta, British Columbia, and Manitoba are developing provincial cataloguing systems. In Ontario, the Ministry of Education has asked TVOntario to assume responsibility for cataloguing and distributing software. The other provinces have not yet taken steps to develop a central catalogue.

Systems for distributing software are just beginning to be developed in most parts of the country. PEMC in British Columbia has made licensing arrangements with the Minnesota Educational Computing Consortium (MECC) and some other small courseware producers to copy and distribute software. The PEMC is now the primary source of computer programs for B.C. schools. At present, teachers - individually, in associations, or through computer clubs - are playing a large part in finding and distributing software. In most provinces, teachers are recognized as a major source of software for their colleagues.

In several provinces, the departments or ministries of education are beginning to distribute software to their schools. In some provinces, school boards, district and regional offices, and individual schools are distributing software locally.

Reliable procedures for evaluating, cataloguing, and distributing software are now being formulated. Ideally, a balance will be found between local differences in curriculum and hardware, and the economies that can result from inter-provincial cooperation.

Teacher training

The rapid increase in the number of microcomputers used in schools has been accompanied by considerable pressure on teachers to learn the fundamentals of operating computers, using computers in education, and programming computers. In all provinces, a variety of workshops, seminars, and short courses have been developed to provide this training as quickly as possible.

Initially, it was left to high school teachers of mathematics, science, and business to seek out whatever training they needed from universities and colleges, so that

they could teach computer science, computer literacy, and data processing to their students.

In other secondary school subjects and in elementary schools, teachers eager to use this new technology sought training in local colleges or universities or taught themselves. Those teachers played a major role in creating a place for computers in their schools, in developing software for their students, and in organizing training and conferences for interested colleagues.

Early in 1983, TVOntario broadcast an introductory course, called "The Academy on Computers in Education." The materials for the course included 12 half-hours of television. This series was accompanied by a printed guide to the basic information presented, a manual introducing the participants to the computer's operation and to BASIC programming commands, a booklet describing classroom applications of computers, and computer-managed correspondence in which the participants mail in their answers to the questions provided and receive a computer-generated response letter.

Thirteen thousand participants registered for the Academy during the first half of 1983, including over 7,000 teachers and educators and many parents. Additional registrants are expected in Ontario during the 1983-84 school year. Several school boards have acquired the Academy learning materials and now make them available direct to their own teachers. With arranagements facilitated by the Council of Ministers of Education, seven other provinces have acquired the Academy materials. A French version of the Academy materials is now available.

At present, the colleges and faculties of education that give preservice training are introducing courses or units on the educational applications of computers. In some faculties, advanced courses leading to specialist certification are being offered to practising teachers in the evening and summers. In some parts of the country, community colleges, too, are offering pertinent programs in computer literacy.

School boards and teachers' organizations are now starting to organize in-service programs. In many regions,

teachers' demand for training, especially for more advanced instruction, is far greater than the opportunities available.

Computer equipment

In a very short time, Canadian schools and school boards have bought large numbers of computers: in Manitoba, for example, the number of microcomputers in the schools grew from 169 in 1980-81 to 1610 in 1982-83, an increase of 950 per cent. The Alberta Task Force Report[2] lists the numbers of computers in Canadian schools as follows:

School Computers by Province, April 1983

Province	Number of Students	Number of Microcomputers
British Columbia	520,000	2,500
Alberta	440,000	3,535
Saskatchewan	200,000	1,500
Manitoba	200,000	1,610
Ontario	2,000,000	8,000
Quebec*	1,037,000	800
New Brunswick	125,000	1,000
Nova Scotia	180,000	800
Prince Edward Island	25,000	150
Newfoundland	135,000	200

* Not including CEGEPs (junior colleges)

Over 85 per cent of the schools in Nova Scotia and British Columbia and all of the secondary schools in most of the other provinces have at least one microcomputer. However, in Newfoundland, only 20 per cent of secondary schools had microcomputers in June 1983, a proportion substantially lower than the rest of the country.

The proportion of elementary schools with microcomputers ranges from fewer than 10 per cent in Newfoundland and New Brunswick to 20 per cent in Prince Edward Island, to almost 40 per cent in Manitoba and the Northwest Territories, to 50 per cent in British Columbia and Ontario, and 75 per cent in the Yukon.

In Ontario and the four Atlantic Provinces, over 75 per cent of schools' computers are Commodore machines (mainly PETs and some 64s). Apple and Radio Shack computers make up most of the remainder, with some computers from Atari or Texas Instruments. Manitoba is unique in having one-third Radio Shack computers. In Saskatchewan, the computers are evenly split between Commodores and Apples; farther west in Alberta, British Columbia, and the Yukon, Apples predominate.

Schools have generally been happy with the computers they are using, and there have been relatively few technical problems with any of the makes. In some situations (such as word processing and LOGO), printers are needed as well as computers. In other cases, peripheral devices are needed: disk drives, game paddles, large monitors, sound capability, and so on. Teachers are sometimes delayed in using computers by the lack of such peripher devices.

Undoubtedly, the number of computers in schools will continue to increase. In order to teach secondary-level computer science and business courses, most secondary schools are developing computer labs, with one machine for every two or three students. In some courses and schools, the goal is a class complement of 25 to 30 computers.

In the elementary schools and in secondary schools when computers are used in subjects not directly related to computers, a ratio of one computer for every five or six students is a goal in Nova Scotia and Ontario. Newfoundland has a goal of providing two to three periods a week of computer use for each student. Alberta's Task Force Report sets a goal of one computer for every eight students and one period of computer work per student every day. Educators in Ontario, Alberta, and British Columbia consider that it may become desirable to have one computer (or terminal) for each student.

As mentioned earlier, the Ontario Ministries of Education and of Industry and Trade have drawn up specifications for a

family of Canadian educational microcomputers. Two levels of student computers will be produced. The Standard Student Microcomputer will include a 16-bit CPU, 128K RAM expandable to 256K, trackball and trackball interface, and accompanying software as well as many other features. The Advanced Student Microcomputer will have a 32-bit CPU, 256K RAM, expandable to 1024K, a voice synthesizer, and other features. A "fileserver" will also be available to enable sharing of disc storage, printers and other peripheral devices.

Much of the equipment now in schools is used to provide instruction about computers and how they are used in business. In many schools, more equipment is needed for that purpose alone. In the coming years, the extent to which computers are used for computer-assisted instruction and for other educational applications such as LOGO and word processing will depend on the availability of software with demonstrable educational benefits, and on the ability and willingness of teachers to use it. An increase in the use of the information retrieval capabilities of computers would also add to the demand for more equipment. The total amount of hardware needed will depend on such developments.

The influence of computers on equal access to education

Several provinces believe that computers and advanced technology will make education more accessible to some groups that are at present disadvantaged, and educators are encouraged by the new experiences that technology can provide to handicapped students or students with learning disabilities.

Newfoundland, Ontario, Manitoba, Saskatchewan, and the Northwest Territories express optimism about the ability of technology to provide a greater range of learning opportunities to students in rural or remote areas. In the Northwest Territories, the Department of Education is investigating the possibility of using microcomputers for courses in native language literacy. But from the Newfoundland point of view, many technologies, including computers, could have positive influences if used to provide distance education in remote rural areas. There is a fear, however, of a negative effect since usually it's the urban areas that have readier access to most technologies and hence the inequalities of opportunities become more and more

pronounced. In Saskatchewan, rural schools are buying computers and they see these purchases as a priority, thereby easing fears that the inequity of educational opportunity between the larger city schools and the small rural schools in Saskatchewan would increase.

At the same time, fears have been expressed that students with less access to equipment and training will be at a disadvantage, and that existing differences in educational opportunity will increase. The present disparities between jurisdictions, both in equipment and in the training of teachers, are of some concern. Until the rapid changes now underway have slowed down, it is impossible to distinguish differences in pace from permanent differences stemming either from a scarcity of funds or from differences in plans and priorities.

Of more widespread concern are the differences among students' families and home environments. It is feared that students without educational technology at home as well as at school will be at a disadvantage. And conversely, children will be at an advantage if their parents have one or more computers in the home and provide software that promotes their learning.

Some educators are concerned that sex differences in access to education may increase because of the increasing place of technology in education and the documented tendency for boys to show greater interest in technology than girls do. Alberta's Task Force Report asks, "What is the explanation for the reduction in interest in computing by girls as they advance to higher grades?"[3]

On the other hand, it is also feared that deprivation will result, not from too little emphasis on technology but from too much. In education, as in society as a whole, the increasing emphasis on technology may limit the development of people's capacities for intuitive, social, aesthetic, and spiritual experiences.

Other new technologies

In addition to computers, several other technological developments - satellite transmission, videotex, and videodisc - are being studied for their educational

applications, primarily in extending the opportunities for distance education. At present, TVOntario is broadcasting school programs via the Anik C satellite.

Ontario, Alberta, British Columbia, the Northwest Territories, and the Yukon are interested in using new technologies to facilitate distance education, i.e., to offer high-quality instruction to the many small communities in remote parts of the country where there are too few secondary students to warrant the cost of qualified teachers for all subjects. In Ontario, the Lake Superior Alternative Delivery Project pilot tested the teaching of a Grade 13 physics course to students in two communities in the far north of the province, using correspondence materials, television, microcomputers, and Telidon in the videotex mode. In the second year of the project, audio satellite channels on Anik B, made available by the federal Department of Communications, were used to improve Telidon transmission and make information in additional data banks accessible. All students and teachers in the three participating schools had access to those data banks during the second year. A subsequent project (Northern Ontario Distance Education Project) will continue to explore the use of satellite transmission of courses and the feasibility of interactive data communications capable of supporting educational applications of Telidon by means of two-way satellite.

In 1981-82, Alberta's Correspondence School pilot tested a project in which a course (Mechanics 12) was transmitted in part via Telidon. In British Columbia, a number of interactive in-service programs for teachers have been conducted via satellite. The Northwest Territories is very interested in the distance education potential of satellite transmission; however, the costs are high and at this stage the groundwork is being laid for development over a long period of time. The Yukon Native Communications Society will soon be using communications satellites for such projects as native language broadcasts for the schools.

Another TVOntario Telidon project will install 100 terminals in schools, libraries, and employment centres. Through these terminals, users can gain access to a videotex database that presents up-to-date information in French and English on careers and training opportunities. A second service, Edutel, offers a broadcast teletext magazine with

current information on news, weather, education, and local events.

Videodisc technology is also being developed in Ontario, Alberta and British Columbia (see Paper 13). Educational applications of videodisc are being developed mainly in the area of industrial training, either on the job or in a school. Some work is being done in providing training for machinists, using a videodisc linked to a microcomputer.

The educational applications of the new technologies discussed in this section are still experimental, and the economic feasibility of such endeavors is not yet clear.

An overview

In all parts of the country, instruction in computer technology is becoming a standard feature of school curriculum; the aim is to provide all students with a basic introduction to computers and to offer interested students opportunities for further study. In Ontario, for example, 100,000 secondary school students, or one of every five, are taking computer-related courses (computer science, data processing, and computer technology).

In many places, there is great interest in giving students new kinds of learning experiences or opportunities by using such applications as LOGO, which allows students to develop mathematical concepts through their own experience, or word-processing programs that eliminate the physical impediments to creative writing. Where the necessary funds and support are available, growing numbers of teachers are providing such opportunities to their students.

Much of the enthusiasm about the educational applications of computers revolves around such applications. It is important to note, however, that the development of LOGO resulted from the work of many people with a clearly defined educational philosophy over a ten-year period, and that word-processing is an educational adaptation of a business system, also devised over a lengthy period. These types of applications are the most difficult to create. They appear the most promising in enhancing students' development, but the least likely to appear quickly in substantial quantities.

Research on the impact of these applications on students and teachers is now being conducted in several provinces.

The most controversial aspect of computer-assisted learning is computer use that replaces or mimics traditional educational activities. Most of the software now used in schools falls into this category, and much of that software is of questionable value. Its greatest success is in providing remedial work for slow students. Some research in this area is now underway.

To some, the idea of developing a large array of computerized learning modules that can be used to meet individual students' learning needs seems appealing. This approach changes the teacher from an instructor to a "facilitator" who directs students to instructional resources, monitors their progress (often with the aid of computer-managed learning systems), and provides personal instruction or help when needed. The technology industry, discussed in Paper 16, favors such an approach.

But one can question the wisdom of pursuing the development of computer-assisted instruction. The use of computers to replace other types of learning experiences, which usually include human contact with teachers and other students, seems undesirable in many circumstances. Many people fear that the interaction between student and computer might lessen the invaluable human component in learning, with the result that students develop a limited range of abilities and interests. It should also be noted that so far instructional software has had limited success. It seems that both the objectives and the practicality of most computer-assisted learning as it now exists are questionable.

Schools are integrating computer studies into their curricula and are experimenting with a few appealing applications. The impact and potential of computers in education are being studied, and the search for new kinds of educational experiences and resources continues.

CONCLUSION

With its large territory and small population, with two official languages and notable regional differences, Canada has always been quick to use new communications technologies as they appear and has historically played a role in their development. Federal responsibility for communications and provincial governance of education have collaborated somewhat uneasily in developing applications for each of the technologies in teaching and learning.

It is an established tradition in Canada that the use of technology in education is determined by the individual teacher. For that reason, the widespread use of technology depends on a sufficient inventory of appealing programs and effective teacher training that demonstrate the uses and benefits of technology.

During the beginnings of educational television, it was widely expected that a large assortment of educational activities would be simplified by the new medium and that educational structures themselves would be reconsidered. Although television is considered invaluable by many teachers, the initial expectation now seems unrealistic. In fact, attempts to define audiovisual media as essential educational tools rather than aids to live teaching, have had limited success.

Computer technology and the ongoing development of new hardware continue to spark the imagination. However, the enthusiastic predictions about the impact of this new technology are tempered by the tasks of developing software that provides new educational experiences, and of encouraging teachers to use it.

With the growing assortment of electronic tools at our disposal, educators are faced with new pressures and decisions. The broad public policy decisions are the most difficult. Douglas Parkhill writes:

> "The principal limitation upon what we can accomplish with our technologies lies in our ability to decide what it is that we want to do."[4]

NOTES

1. Alberta Education. Computers in Schools; The Report of the Minister's Task Force on Computers in Schools, June 1983, p. 43.

2. Ibid., p. 20.

3. Ibid., p. 102.

4. Parkhill, Douglas. "The Necessary Structure." In Gutenberg Two, edited by D. Godfrey and D. Parkhill. Toronto: Press Porcépic, 1979, p. 72.

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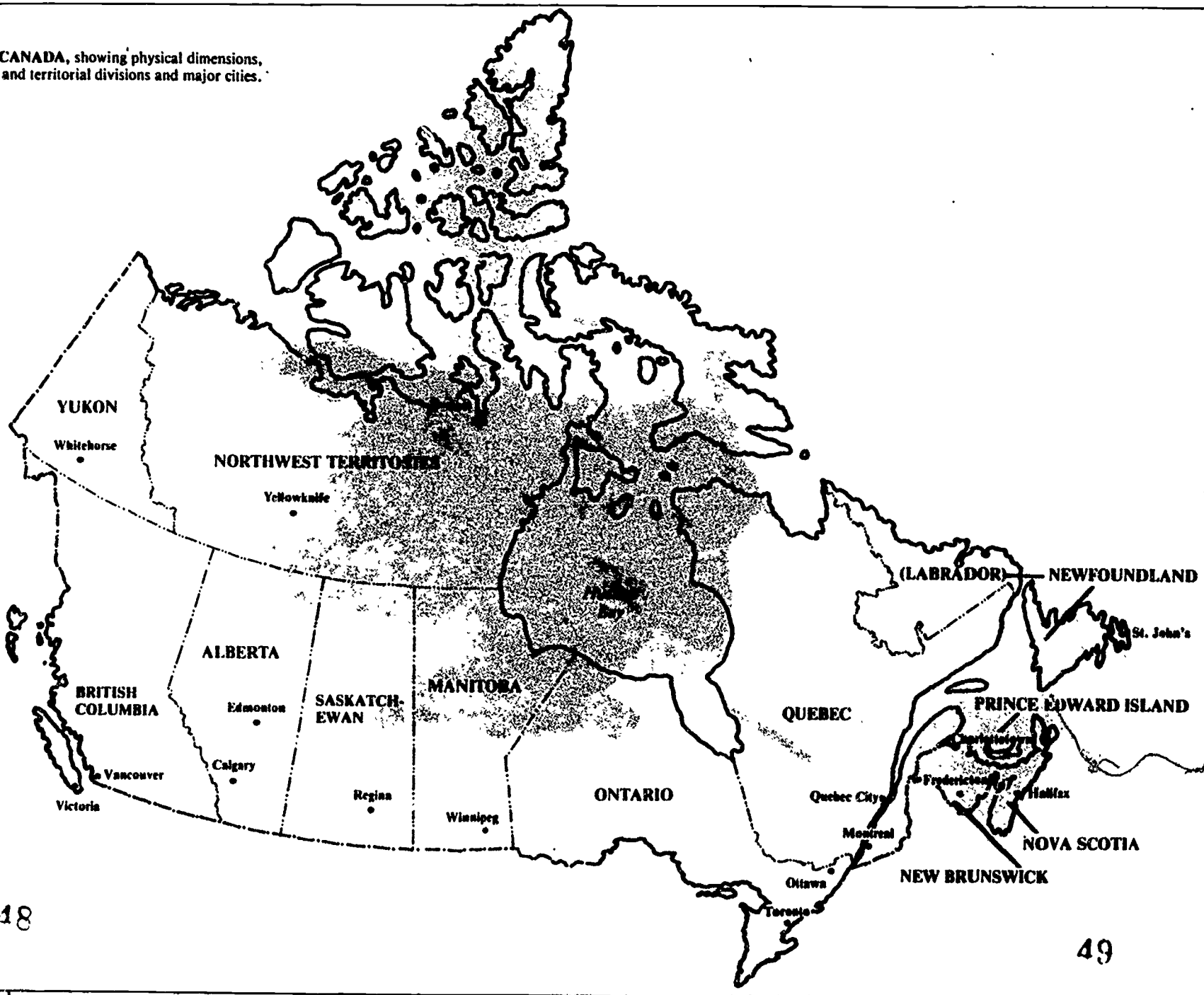
MAP OF CANADA, showing physical dimensions, provincial and territorial divisions and major cities.



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