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ABSTRACT

This examination of the use of teleconferencing as an educational tool in Canada begins by clarifying educational teleconferencing terminology and describing teleconferencing systems and equipment. Focusing on the uses of teleconferencing in Canadian universities, the second section describes extensive or innovative uses of the technology at Memorial University of Newfoundland, Mount Saint Vincent University in Nova Scotia, the University of New Brunswick, and the University of Calgary in Alberta. Teleconferencing activities in Canadian colleges and in continuing professional education are also described. The third section discusses the characteristics of learning and teaching with teleconference systems and considers some of the issues and educational implications of teleconferencing, including the need to continue the development of print, audio, and video support materials to supplement teleconferencing lessons, the amount of teacher preparation necessary for a successful teleconferencing presentation, the changes in instructional techniques that often occur in response to student needs, and the need to develop methods of evaluation of student performance in teleconference courses. A discussion of expectations for the continuing development and application of teleconferencing concludes the report. Notes and a list of other sources cite 25 published references. (DB)

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NEW TECHNOLOGIES IN CANADIAN EDUCATION

PAPER 14

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EDUCATIONAL TELECONFERENCING IN CANADA

By Mary Graham

Study Coordinator
Ignacy Waniewicz

January 1984

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- 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
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- Paper 9 Applications of new technologies in nonformal adult education in Canada: Two examples
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- 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

For many years, the distance education programs in Canada have offered people in remote locations or in isolating circumstances an opportunity to pursue postsecondary studies by postal correspondence. In recent years, teleconferencing has been introduced in several distance education settings in order to provide direct personal interaction among learners and teachers in different locations.

Educational teleconferencing links participants through the use of various electronic media. The addition of this electronic link provides an opportunity to seek clarification immediately and express personal opinions. What is most significant is the creation of a "class." Students in remote areas begin to feel connected as class members because of the personal contact during teleconferencing sessions.

The first section of this report clarifies educational teleconferencing terminology and describes teleconference systems and equipment. The second section focusses primarily on the diverse uses of various forms of teleconferencing in Canadian universities. Several cases are presented in detail to describe extensive or innovative uses of educational teleconferencing. Teleconference activities in Canadian colleges and in continuing professional education are also described. The third section discusses the characteristics of learning and teaching with teleconference systems and considers the issues and educational implications of teleconferencing. The final section looks at expectations for the continuing development and application of educational teleconferencing in Canada.

TELECONFERENCE SYSTEMS AND EQUIPMENT

The term "teleconferencing" has become the generic heading for several interactive media. The word is most often used for group conferences using the telephone. For the vast majority of teleconference users in Canada, both in education and in business, the telephone conference (audio-teleconferencing) remains the primary mode. Various other media (i.e., television and computers) are being used in teleconferencing on an experimental basis.

A teleconference is defined as a "meeting of three or more people in two or more separate locations using an optimal mix of telecommunications." Two major types of teleconferencing emerge from this definition. The first type is called point-to-point teleconferencing. A point-to-point teleconference involves two locations with more than two people involved. This is the simplest type of teleconference. Participants are joined together by a long distance call (telephone) plus a group audio teleconferencing terminal at one or both locations. The second type is called multipoint teleconferencing which includes three or more locations with more than three people involved in a meeting.

Whether point-to-point or multipoint, teleconferencing can occur in various forms defined in accordance with the technology that is employed. The four terms used in this report to differentiate teleconference systems are:

- audio-teleconferencing
- audio-plus (audio-teleconferencing plus audiographic support systems)
- video-teleconferencing
- computer teleconferencing

Audio-teleconferencing is telephone conferencing between three or more participants. Persons in several locations can be linked for an audio-teleconference anywhere along the telephone network. Participants in an audio-teleconference can be provided with graphic, written, or even video materials by mail in advance of the teleconference sessions. Audio-teleconferencing is the most commonly used form of

teleconferencing and provides the basis for audio-plus and video-teleconferencing.

Audio-plus refers to the addition of several audiographic communications techniques which are used to support audio-teleconferencing for educational purposes: electronic blackboard, slow-scan video images, and videotex.

Video-teleconferencing is two-way full-motion video, which provides participants with moving pictures and sound simultaneously. This system requires broad-band television transmission. Conference 600 is the video-conferencing source available in Canada which provides a point-to-point teleconference with two-way full-motion video. Conference 650 is a multipoint audio-teleconference with one-way video. This form of teleconferencing is most accurately described as asymmetrical video-teleconferencing.

Computer teleconferencing allows two or more persons to conference by computer, bound neither by distance nor by time. The participants do not have to be available at the same time because messages from one participant can be stored until another participant is ready to receive them.

Audio-teleconference components

The three main components of any teleconference system are the transmission network (regular or dedicated service), the conference bridge, and the terminal equipment.

Audio-teleconference networks. The two main types of networks used for audio-teleconferencing in Canada are the regular telephone network and a dedicated network.

The regular telephone network links the telephone to the local central telephone office and the long-distance network. A voice-switching mechanism is needed. With this mechanism a speaker can be interrupted only when another speaker talks loudly enough to override the original speaker's signal. This reduces the possibility of electronic interference from equipment that has been improperly set up or from a room that has poor acoustics.

A dedicated network is composed of private communication lines used exclusively by the subscriber for teleconferencing. With this network a permanent twenty-four-hour-a-day connection between the teleconference centre and the remote sites is maintained. (This network system can be owned independently or rented from a telephone company.) It is possible to install a four-wire network because the dedicated lines are laid separately. Four-wire networks have two separate transmission paths: one for sending and one for receiving. This provides better audio quality and eliminates the need for voice switching. In addition, dedicated systems often contain a package that permits two-wire contact (dial in) with individual students for teleconferencing over the regular telephone network.

Most teleconferencing in Canada is transmitted via the regular telephone network. There are only a very small number of dedicated systems in Canada at the present time, including those at Memorial University and Acadia University.

Audio-teleconference bridges. The teleconference bridge is an electronic device that joins together a series of three or more telephone lines. It may be owned and operated by the public telephone network or it may be purchased or rented privately. Teleconference bridges can be located within the telephone company, or in some provinces, on the premises of the user. Users can own and operate equipment on their own or can rent one of many combinations of equipment and service. If teleconferencing is used extensively, ownership or dedicated service is recommended. (The Telecom Canada Telemarketing Group can evaluate an organization's teleconference activity and provide advice regarding bridge ownership or dedicated bridging service.²)

There are several kinds of bridges available for use in Canada. The most common bridge owned by universities is the Darome 20-20. This is a two-wire bridge with either ten or 20 ports (i.e., the capacity for ten or 20 linkups with teleconference centres) that can be subdivided into four mini-bridges with five lines each. With this bridge, it is possible to have 20 centres participating in one teleconference or four separate but simultaneous teleconferences with five centres each. It is also possible to link together multiples of 10 or 20 ports so that, if necessary, more than 100 ports may participate.

The Darome 20-20 can be operated manually or automatically. With the manually operated bridge, a full-time bridge operator is on site with the bridge to coordinate the teleconferences and to control interference from noise, poor connections, and so on. The operator is also responsible for "mixing" teleconferences so that, for example, the class can be subdivided part way through a teleconference. This makes it possible for some groups to talk to one another while others continue to communicate with the main centre.

The basic cost of a Darome bridge is approximately \$57,000 (Canadian funds) plus \$2,000 to install the bridge in a studio in the originating teleconference centre. An additional \$1,000 to link up with a second studio plus shipping costs and taxes bring the total cost to approximately \$70,000. Because of its established reputation and despite its cost, the Darome bridge remains very popular with educators.

Conference 300, a second kind of bridge, is a dedicated, dial-in/dial-out teleconference bridging service available through most Telecom Canada member telephone companies. (Telecom Canada, the association of the nine major telephone companies across Canada, is the provider of the national long distance network.³) This service allows up to 10 individuals to participate from different telephone locations. It also allows the instructor/coordinator to call out from the bridge to get additional information or bring other people into the teleconference. This system is fully automated. Additional features provided by the bridge include: security coding (incoming callers must input the appropriate code prior to gaining access to the teleconference), bridge lock/unlock (prevents incoming callers from gaining access to the teleconference), station count (determines the number of participants on a teleconference), and several disconnect options.

Two companies are presently manufacturing equipment that can be used to provide Conference 300 Service. The N.B. Tel bridge, designed by the New Brunswick Telephone Company, is manufactured by Interdaco Limited of Ottawa. Wescom Canada, a division of Rockwell International, has developed the Wescom "HUB" teleconference bridge. Both bridges provide all of the features required for Conference 300. In addition, the Wescom bridge allows for five more individuals (for a

total of 15) to participate in the teleconference. The cost of these bridges, at the present time, is approximately \$10,000.

A third bridge, Interlink, is manufactured by the Western International Communications bridge in Toronto and Vancouver. The technological concepts used in designing it were originally applied in the creation of radio talk-show equipment. This bridge is expandable by any number of ports. It is either operator-assisted or automatic. The bridge itself contains only the port link-ups. Added features such as "mixing" options are also available, and a recording feature can be installed. The cost of the Interlink bridge, including servicing, is comparable to the Darome bridge.

Operator-interface bridging service, or Conference 100, is also available from provincial or national telephone companies. It is offered across Canada by all telephone companies which are members of Telecom Canada. With this service, up to 58 locations may be linked at one time. Regular long distance telephone lines are used. After scheduling a conference time with the participants, the operator links the locations.

The Conference 200 (called the Meet-Me conference service) is available through operators in Montreal, Quebec; Toronto, Ontario; and Ottawa, Ontario. For this service, the participants call a special conference number. Twenty locations can be linked through Ottawa or Montreal, and 24 can be linked through Toronto. The conference operator must be informed in advance of scheduled teleconferences. As a security measure, participants are announced by the operator as they enter the conference.

Bridging costs vary among provincial/territorial telephone companies. All teleconference services, whether offered by the telephone company or by private companies, permit international dialing.

Audio-teleconference terminal equipment. Terminal equipment is added to standard telephones to enable several teleconference participants to send and receive information. Several terminal equipment systems are used for educational purposes in Canada, including the following:

- The Northern Telecom's Companion 1 for small groups (approximately three people) is connected to the standard telephone. It has an accessory for hands-free operation (speaker phone) and voice switching. The cost is \$250.
- The Northern Telecom Conference 200 has a capacity for three to 20 participants. It has a speaker-microphone cylinder with voice switching, added to the standard telephone. This equipment can be purchased for \$1,500 or rented for approximately \$50.00 a month.
- The Phillips Conference System, manufactured by Rauland-Borg, includes press-to-talk speaker-microphone units that are coupled to standard telephones. It has a capacity for three to 19 participants.
- The Darome convenor has a large capacity that can link more than twenty participants. It consists of a control box which connects to a standard telephone. Included are press-to-talk microphones and a portable case for the equipment. There are two separate series: a one-microphone series and a four-microphone series. Each is available in several technical options (voice switched, full duplex, no voice switching, a connectable two- or four-wire option). Rental costs range from \$75 to \$220 a month. The purchase price ranges from \$900 to \$3,000.

Teleconference support materials

In advance of a teleconference session, graphic, written, or video materials can be mailed to the participants. With specific reference to educational teleconferencing, many things can be done with materials to enhance teaching and learning. Transparencies, slides, films, videotapes, and audiotapes have often been used with audio-teleconferencing.

Graphic techniques added to audio-teleconferencing ("audio-plus") include the following:

- Slow-scan video allows the transmission of still pictures over regular telephone lines by a process that breaks the picture apart and identifies each point by its position and voltage. The image is thus reduced to fit audio channels. A memory unit restores the picture at the place of reception. It is important to note that

simultaneous transmission of a slow-scan picture and voice is not possible. Unless two separate lines are used the voice link must be interrupted while data is being transmitted.

- The electronic blackboard is a system designed to transmit illustrations, charts, written messages, etc., over telephone lines. The sender writes on an electronic apparatus which resembles a standard blackboard. The written images appear in another location on a television monitor which is connected to a receiver (an electronic box much like a tape deck). The television monitor has a memory unit which holds the "picture" on the screen. If both locations have television monitors and electronic blackboards, two-way transmission is possible.
- Videotex is an information delivery system that uses a telecommunications link such as a telephone line, coaxial cable, optical fibre, or broadcast signal. Users can select information stored in a central computer and the information is then displayed on a television screen or monitor. The Canadian videotex system is Telidon (described in Paper 11).

Teleconference technology in education

The specific use made of teleconferencing at various centres depends, by and large, on the needs of the learners and the needs and characteristics of the institution. Monica Jordanoff, in the report "Teleducation in Canada," outlined general basic applications of teleconference technology suitable to Canadian educational institutions.

Teleteaching is the transmission of a lecture in one place to a group of students in several remote locations. Students are usually gathered in groups in these remote locations, or they may be at home. The structure and general presentation format for these applications will usually depend on the instructor's own educational philosophy. Predictably, personal orientation to education influences teaching strategies, and the norms and procedures established early in the course. Format and preparation time may also vary according to whether teleconferencing occurs with an on-campus group involved in the class or completely independent

of on-campus sessions. There are three variations to this method of telephone-based instruction:

1. Point-to-point teleconferencing is highly appropriate in regions where distances are vast, population is sparse, and terrestrial communication systems are in operation. This method is used for all teleconference activity at Confederation College in Thunder Bay, Ontario.
2. Simple multipoint teleconferencing uses the basic conference-call method, in which ordinary telephone lines are linked together by either a conference operator or a teleconference bridge.
3. Complex multipoint uses full-time dedicated facilities, as in the cases of Memorial University in Newfoundland and Acadia University in Nova Scotia.

Teletutoring or teleseminars enable students to interact with an instructor or seminar leader for individual or group discussion about the course or individual learning activity. The usual delivery mode is audio-teleconferencing, either point-to-point or multipoint.

Guest lecturers participate in teleconferences so that students can talk with them and obtain specialized knowledge that the instructor cannot provide. Conference operators or bridge operators can coordinate guest lecturers during a teleconference. This technique enables the students to benefit from the knowledge of additional resource people.

In education, as in business, teleconferencing is employed for administrative functions, including meetings, consultations, and reports.

TELECONFERENCE ACTIVITY IN CANADIAN EDUCATION

The majority of Canadian educational institutions foresee an increase in the use of communications technologies in the next five years. Teleconferencing, with its comparatively inexpensive operating costs, has high potential for distance education (discussed in Paper 5).

Many Canadian educational institutions report that they are using teleconferencing (audio- and computer) for administrative purposes. Fewer institutions report the use of teleconferencing for educational purposes, that is, for instruction, discussion and tutoring.

At present, approximately 20 of Canada's 65 universities and approximately ten of the 195 Canadian colleges use teleconferencing to deliver distance courses. In addition, several professional organizations such as the Manitoba Law Society and the Canadian Science Writers' Association have extended the use of teleconferencing to the continuing education of their members.

Since a substantial proportion of the students taking teleconference courses are employed full- or part-time, most educational teleconferencing takes place in the evening.

Almost all educational teleconferencing for course delivery uses audio-teleconferencing with support materials (texts, readings, audiotapes, videotapes, and slides) sent by mail. At the present time, the broadband width required for two-way full-motion video-conferencing and the additional equipment required for audiographic support make these systems too expensive for use beyond experimentation. It is predicted that with continued research in communications technologies, the development of telecommunications consortia and resource sharing will become a priority. It is also expected that with advances in satellite transmission, in which the cost of telecommunications is independent of distance, costs may eventually decrease.

The desirability and necessity of video-teleconferencing are seen as questionable by many users of educational teleconferencing. Thus far, most users consider audio-teleconferencing supplemented with high-quality support

materials to be the most suitable and cost-effective method for the majority of courses.

Universities and colleges that have traditionally offered correspondence courses and are now using teleconferencing to enhance distance education have found a marked decrease in the attrition rate for distance courses. The expected rate of attrition for the noninteractive distance course is 55 - 60 per cent.⁴ The average attrition rates for both teleconference courses and face-to-face instruction are the same: between 12 and 15 per cent.⁵ In the case of the University of Ottawa, not one student dropped a distance course before completion in the last session (Fall, 1983).⁶

Educational teleconferencing in Canadian universities

Memorial University of Newfoundland, one of the pioneers in educational teleconferencing, offered its first credit course via audio-teleconference in the winter of 1977. As a teleconference experiment, Child Psychology 1 was offered to nine students at a small town 112 kilometres away. Students met from 1900 to 2200 hours once a week.

David Snow and Malachy Mandville of Memorial University reported on that first course:

"Some dissatisfaction, needless to say, stemmed from this first experiment and the time frame was quickly changed to two nights per week with one and a half hours each night. We were still... keeping strictly to the on-campus course design... One of the strong characteristics of teleconferencing was its interactive nature and therefore it was very important to structure a course accordingly. The workload, or the bulk of the information in any course was to be carried by... print, videotape and audiotape. For straightforward lectures, a professor could use audio tape or print. For lectures, leaning heavily toward visual materials, we decided to use videotape. The instructor, as far as the teleconferencing system was concerned, became a motivator and learning manager..."⁷

The typical Memorial University teleconference student is a professional, e.g., a nurse, public or elementary school teacher, business person, or physician.

Memorial offers a variety of courses by teleconference through the Division of Part-Time Credit Studies. Many of the advances in educational teleconferencing (such as, course format, the use of audiotapes and videotapes, etc.) have been achieved through research and development in telemedicine (see Paper 15), and through teleconference activity in the Faculty of Education. Telemedicine at Memorial University is a major enterprise, and consequently many of the 67 teleconference sites in Newfoundland are in hospitals. (Other sites are in vocational schools.)

It is useful to look closely at one teleconference course recently offered by Memorial University in order to understand more clearly the operation of educational teleconferencing. Professor Phillip Warren of the Faculty of Education at Memorial taught a teleconference course for Newfoundland teachers that dealt with the human rights of teachers in schools. The course was transmitted to Labrador City, Grand Falls, Gander, Fogo, and Wesleyville, each of which had from five to 10 students.

This course consisted of a one-and-a-half-hour teleconference session each week; there was a great deal of independent study aided by readings, audiotapes and videotapes. Professor Warren believes that these materials are important in meeting the needs of students in remote areas where local resources are scarce. The professor also arranged for supplementary teleconference evenings, particularly before exams. Any student who missed a regular or supplementary session could obtain an audiotape of the session. All educational teleconferences at Memorial are taped at the University.

The teleconference course began with an informal teleconference session planned to familiarize the students with the equipment, and to encourage their active participation. It remained a principal objective of Professor Warren to keep the students talking to one another and assuming an active role in the class. For this course, students were highly motivated to participate as the subject matter was of importance to them. In some regions, students met on their own time. Professor Warren stated that teleconference instructors attempted to facilitate a student network, at least among students of one region and possibly between distance centres. "We depend on the individual to take responsibility."⁸

Regarding the adaptation of teaching methods for teleconferencing, Professor Warren reports that he has begun to think differently about instruction and the use of various strategies. He attempts to involve students more directly by lecturing only for very short periods. "I try to get as much information as I can about students. They have seen me on videotape so I also like to have a picture of them."⁹ Professor Warren varies the time periods of activities (lecture, discussion, etc.). "For this I rely on communication theory and techniques."¹⁰ He has found some drawbacks to teleconference courses. Greater emphasis is placed on examinations and written assignments for evaluation and pressure to adhere rigidly to content outlines is increased.

All regular-term teleconference courses at Memorial University run for 13 weeks and are based on 30 teleconference hours each term. There are two sessions approximately one-and-a-half-hours in length each week. Materials which augment the teleconference sessions are primarily print, i.e., a course manual and readings. Audiotapes and videotapes are also used but to a lesser degree. A course offered in the 1984 Winter term on Shakespearean tragedy included six plays on videotape to make up 18 hours of viewing, 13 lectures on audiotape, and one-and-a-half-hours per week of teleconferencing.

In the 1983 Fall term, Memorial University offered teleconference courses that dealt with the following: exceptional children, schools and the law, reading materials on current approaches to teaching, educational psychology, business communications, organizational behavior, introductory mathematics, the Victorian novel, as well as special courses for nurses.

Centres participating in Memorial's teleconference courses include Bell Island (a few miles from St. John's), St. Anthony (in the north of Newfoundland), Goose Bay, Labrador, and Labrador City (which is Memorial's most distant teleconferencing site, 2,400 kilometres to the north on the mainland).

Memorial University's teleconference system is one of two dedicated four-wire teleconference networks in Canada used primarily for education. The bridge developed for Memorial University by the Newfoundland Telephone Company is owned by

and situated at Memorial. The system is booked during the term for regular teleconferences. Special arrangements can be made with the teleconference system coordinator for additional time. The heavy use of the bridge necessitates promptness and precise organizing so that a teleconference ends on time.

Each teleconference centre is equipped with a Darome convenor and five or six press-to-talk microphones. This is an adequate number of microphones since there are usually five or six students at each centre for one teleconference. "Furniture is usually arranged in a circle, board-room style."¹¹ One of the students at each centre is responsible for setting up and taking down the equipment, distributing the course material to students, and ensuring that the students are ready to begin on time.

Thus far, feedback from Memorial University teleconference students has been very positive. Students say that, because of the informality and the interaction, the teleconference courses are preferable to television and correspondence courses.

Memorial University 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 education purposes and will also provide the Labrador region with a means for community interaction.

Mount Saint Vincent University in Halifax, Nova Scotia, has set up an audio-teleconference network with one-way video transmission and two-way audio communication. It is known as Distant University Education via Television (DUET). This program uses a classroom equipped as a studio (located at Mount Saint Vincent) capable of originating a television signal that is carried by microwave to the Maritime Telephone Company. The signal is then redistributed to a cable television company in Halifax and the Atlantic Satellite Broadcast Network. There are 15 receiving centres in four provinces: Nova Scotia, Prince Edward Island, New Brunswick, and Newfoundland.

Eight centres are linked directly to the classroom so that the students can speak to the instructor. Other remote centres are linked through the Maritime Telephone and

Telegraph (MTT) conference operator. Students who do not live in Halifax may call in toll free. Their calls will be placed in sequence as they wait to speak to the professor and the other students. This system allows eight students (ports) to interact at one time. Students in Halifax dial directly into a bridging device that MTT has designed for the DUET program. This system can accommodate ten centres at one time; others are placed on hold in priority-sequence.

For special "one-time only" teleconference events, such as professional education workshops, Mount Saint Vincent makes use of the Conference 300 service. A recent example of this application is the one-day workshop in museum studies for museum personnel.

Mount Saint Vincent is offering courses in introductory psychology, introductory sociology, gerontology, and introductory business administration. These are delivered as live telecourses with interaction by audio-teleconference. Each of the courses provides the equivalent of one full university undergraduate credit. Noncredit teleconference courses at Mount Saint Vincent consist of training and development courses for specific professions, e.g., management training with the Atlantic Region Management Training Centre.

The University of New Brunswick in Fredericton began using teleconferencing in 1980 to deliver both degree and nondegree courses to off-campus centres. Five credit teleconference courses are offered through their extension department. The remote centres at Bathurst, Campbellton (which is the farthest at 355 kilometres from the originating centre), Chatham, Newcastle, Florenceville, Moncton, Perth/Andover, St. John, St. Stephen, Sussex, and Woodstock are linked through the New Brunswick Telephone Company (N.B. Tel) bridge.

The equipment used at each centre includes a Darome convenor and press-to-talk microphones. Instructors are situated on-campus for the weekly one-hour sessions.

The four-wire dedicated system at Acadia University in Wolfville, Nova Scotia is the only one of its kind in Canada. Rather than using a bridging device, Acadia has had special lines layed down for its exclusive use. This provides twenty-four-hour teleconference service.

Most of the students who participate in Acadia's teleconference courses (computers in education, children's literature, philosophy, business administration, and economics) are professional teachers or business people. There is also a growing number of senior citizens who take the courses although they have no interest in acquiring university credits.

The lack of provincial funding for participants not registered for formal credit will become an increasingly important issue as the number of these students increases.

Two courses are being offered at St. Frances Xavier University in Antigonish, Nova Scotia on a trial basis. Students can participate in teleconference sessions for a political science course and an English course in Canadian literature. At Dalhousie University in Halifax, Nova Scotia, teleconferencing is included in some distance courses as part of, but not as the primary mode of, delivery. Centres are located at Chester, Barrington, Yarmouth, Digby, Annapolis Royal, Bridgetown, and Middleton. Yarmouth is the farthest from the centre at Dalhousie - 320 kilometres away.

L' Université de Moncton in New Brunswick and Mount Allison University in Sackville, New Brunswick, now employ teleconferencing for education on a limited basis.

A process resembling the Mount Saint Vincent DUET is operated by the University of Victoria in British Columbia on the west coast of Canada. The British Columbia Telephone Company bridge is used to offer a course to 230 nursing students at 20 centres throughout the province. (The video portion is broadcast via the Knowledge Network.) Students taking this course, Nursing Theories and Concepts, may gather in groups at one of the centres or remain at home, where they can call collect into the originating classroom.

The University of Victoria is also using teleconferencing as a means of monitoring students during their practicum. With an increasing number of programs requiring practical training, Victoria has found teleconferencing to be an economical and effective way of supervising the practical components of such programs.

The locations of the 20 educational teleconference centres in British Columbia were chosen jointly by the Open

Learning Institute in Richmond, the British Columbia Institute of Technology in Burnaby, Simon Fraser University in Burnaby, the University of British Columbia in Vancouver, the Knowledge Network based in Vancouver, and the University of Victoria. Through the collaboration of those institutions, Darome convenors and speaker phones were provided to each of the centres. Each of the institutions using the centres has the option of doing so through the University of Victoria Wescom bridge or the British Columbia Institute of Technology Interlink bridge.

The University of Victoria has recently offered a ten-part teleconference course in child care as a regular credit course for child care workers in British Columbia. The enrollment was approximately 90 students, of whom approximately 10 participated in the course by teleconferencing.

In the Province of Alberta, the Faculty of Education and Continuing Education at the University of Calgary is extensively involved in the practical applications of educational teleconferencing and in conducting research. Teleconference courses at the University of Calgary include both credit and noncredit offerings. Past credit courses have included Common Legal Rights and Responsibilities of Classroom Teachers, Conflict Resolution/Problem Solving for Administrators, Management Communications (a course for Management Certificate and Local Government), and graduate level courses such as Personnel Administration and Human Development. In the 1983 Fall term, five credit courses were offered (two in social work and three in education) and six noncredit courses (two computer science courses, one course in the care of garden and house plants for senior citizens, two courses for medical continuing education, and one course on personal development). The average enrollment was 25 students for credit courses and 80 for noncredit courses.

The 30 odd centres that receive teleconference courses from the University of Calgary are scattered throughout Alberta, from High River, approximately 65 kilometres away, to High Level, some 800 kilometres from the University. In addition, 39 hospitals in rural Alberta are linked to the University of Calgary Medical Teleconference Program (see Paper 15).

The University of Calgary's teleconference courses model the on-campus courses in that they include both lectures and discussions. The instructor is situated at the University's teleconference centre (or occasionally at a remote centre). He or she does not instruct a campus class at the time of the teleconference.

Each remote centre is equipped with a Darome convenor, a videocassette player, an overhead projector, and a carousel slide projector. Centres can hook a small cassette recorder to the convenor to record the lesson for those who missed it. At each centre a Local Program Administrator (LPA), employed by the university, operates the equipment, collects course fees, and acts as a proctor at examinations on behalf of instructors. An acoustic coupler connected to the convenor allows students who cannot go to any of the centres to join the class from their homes by telephone.

In 1980, a pilot study was conducted at Calgary to test the operation and feasibility of teleconferencing and Telidon combined. The course chosen for the trial dealt with the teaching of grammar and was offered by the Curriculum and Instruction Department. The instructors found that they needed a way to display graphic materials that illustrated sentence structure. Telidon signals, transmitted by telephone lines, were chosen for use with audio-teleconferencing. Six teleconference centres participated in the experiment. Each was equipped with a convenor, a microphone, a Telidon terminal, and a voice-to-data switching device. Fifty-two students enrolled in the course; the number of students at each centre ranged from three to seven.

Telidon signals were sent over the teleconference system using the University's Darome bridge. "Pages" from a Telidon database were accessed from the University of Calgary and sent to sites as far away as Jasper, 360 kilometres from Calgary.

"The grammar course was completely redesigned to take advantage of the graphic capabilities of Telidon. This involved a complete replanning of the content of the course, the design and preparation of over two hundred and fifty graphics, and their input as 'pages' into Telidon. To this end, two people with experience in entering data into Telidon were hired. As it turned out, their knowledge of the system, and their advice to us,

led to the redesign of nearly all of the graphics. These were entered into the system...

"The spoken parts of the course were delivered in the normal way for teleconferencing, that is, with the two instructors talking to the centres, asking questions, answering queries, conducting discussions, and so on. When it came time to send a graphic, one of the instructors would state that a graphic was about to be sent. The technician in the Teleconference Centre control room would then switch the system from voice to graphic mode, the Local Programme Administrators (LPA's) in the centres would likewise switch their systems from voice to graphics, and the instructor would key in a page number to the computer, which would then transmit the data. The last thing to appear on the screen for each page was the University of Calgary logo. As soon as LPA's saw this, they knew that the graphic had been transmitted, and they switched back to voice mode. Though cumbersome, this system was at least functional."¹²

Feedback about the marriage of these two systems was mixed. There were problems with legibility (the size of the print and the screen, the arrangement of the room, and so on), but it was also found "to be a device that motivates, adds interest, focusses attention, expands and illustrates."¹³ Since the experiment, an automated voice-to-data switching system has been designed that has streamlined the operation of Telidon with teleconferencing. With this device, graphics can be transmitted without the need for a manual operator to interrupt the audio portion of the teleconference.

Calgary has continued its use of teleconferencing accompanied by Telidon. At present, two teleconference courses are being offered with this audiographic support: a course in educational administration and a course in computer literacy for educators. Thirteen University of Calgary teleconference centres are equipped with Telidon terminals.

Through teleconferencing, residents of Yellowknife, Northwest Territories can take university credit courses from Athabasca University in Alberta. Athabasca is an institution devoted to distance education. In the 1983 Fall term, three courses were offered by teleconference:

introductory psychology, business administration, and economics. Yellowknife is participating in teleconference courses from Athabasca University along with 19 centres in Alberta. At present, the student enrollment for teleconference courses at Athabasca is approximately 125. The minimum required registration per centre is three students, and the maximum is ten students, although one centre exceeded this maximum with a group of 17 students. Athabasca owns a Darome 20-20 bridge and equips teleconference centres with Darome convenors and push-to-talk microphones.

Athabasca University has developed a "package" for teleconference instructors to help familiarize them with the system and to acquaint them with special techniques (e.g., bringing in guest speakers).

The University reports that since teleconferencing was introduced, there has been a much higher course-completion rate and many students are enrolling for additional courses.

The University of Alberta in Edmonton rents the Athabasca University bridge for occasional use, e.g., to offer continuing education for nurses in the Northwest Territories.

On two occasions, the University of Regina in Saskatchewan served northern regions by offering teleconference courses to members of the Arctic Cooperative Limited. The mandate of this organization is to assist Native Canadians in the Northwest Territories in developing sound management skills with which they can operate their own independent cooperative enterprises. Introductory Accounting was taught in March of 1980 to six communities in the Northwest Territories, three of which (Holman Island, Cambridge Bay, and Broughton) are inside the Arctic Circle. Among the other centres were Rankin Inlet, Eskimo Point, and Cape Dorset.

Teleconferencing was chosen as the mode of delivery for this course for several reasons. Classroom-centred instruction would have made it necessary for Inuit and Indian students (who live in remote settlements) to leave their communities and families for the duration of the course. This would not only have been stressful for the students but would have disrupted their communities. Travelling

instructors are impractical and uneconomical, and postal service is infrequent in many northern communities.

Since northern communities have reliable telephone service, teleconferencing was selected to deliver 30 hours of instruction supplemented by 20 hours of slides and audiotapes. The course was offered again in March of 1982 to five other communities.

The Arctic Cooperative Ltd. itself offers eight hours of instruction to every community across the Northwest Territories (eight communities at a time). This program takes the form of four one-and-a-half-hour sessions each week over a period of seven weeks. The course covers topics that deal with family money-management, saving, credit-buying, insurance, wills, and so on.

Within the Province of Saskatchewan, the University of Regina offers two teleconference courses each term. An average of eight students at each of approximately four centres participate in the courses. In the 1983 Fall term two computer science courses were offered, each with a total enrollment of 35 students.

The University of Regina leases time on the Saskatchewan Telephone Company (Sask Tel) bridge for the 'Conference 300' service. Remote centres are equipped with Darome convenors and hands-free microphones.

The University of Saskatchewan in Saskatoon is the only institution that has reported using slow-scan television images as visual support for educational teleconferencing.

Teleconferencing was used at the University of Saskatchewan to replace supervision meetings for intern-teachers on a 16-week practicum. This was conducted as part of the Saskatchewan Telephone Company's experiments with communications technologies. Evaluation data for the intern-teachers were transmitted as slow-scan video images from a teleconference centre at North Battleford, Saskatchewan, to the University in Saskatoon.

Two direct educational applications of slow-scan video were used to teach a particular supervisory concept to teaching supervisors at North Battleford. Diagrams and brief notes were also transmitted as slow-scan images. The course

supervisor found that the slow-scan images were more effective than advance mail delivery of materials because it allowed greater control over the use of the materials.

Teleconferencing with the teaching supervisors is continuing without the use of slow-scan images. Funding would be necessary for continuation of data transmission with this system.

The University of Manitoba in Winnipeg uses a N.B. Tel bridge to offer teleconference courses to Portage la Prairie, Morden, Arborg, and Gypsumville. The distances of the three cities range from 50 to 150 kilometres from the originating centre at Winnipeg. Four courses were offered in the 1983 Fall term on such topics as religion, political studies, Canadian history, and educational curriculum development. The latter is a graduate level course.

Brandon University in Manitoba is also offering four courses by teleconference in 1983-84. A special education course, a sociology course on rural society, and a course on the history and development of organizational theory were offered in the Fall term. Another special education course by teleconference began in January 1984.

Brandon's remote centres are located in southern and central Manitoba, and two centres are in Saskatchewan. The nine ports linked for teleconferencing include groups at centres as well as individual students in their homes. Centres have included: The Pas, Manitoba, near the Manitoba-Saskatchewan border; Moosomin, Saskatchewan; Dauphin, to the south of Lake Winnipegosis; and Notre Dame de Lourdes, southwest of Winnipeg. Some of Brandon's teleconference sites are in the far northern portions of Manitoba, an area in which a large number of native students participate. The Manitoba Telephone Company is lending its Interdaco bridge to Brandon for six months as a trial operation.

For approximately 15 years before experimenting with teleconferencing, the University of Ottawa in eastern Ontario offered courses to off-campus students by sending the instructor to the remote centres. This procedure was a response to direct requests for face-to-face instruction. When it was no longer feasible (because of economic restraints and staff shortages) to offer courses this way, teleconferencing was chosen as a replacement.

In the Fall of 1981, an introductory course in child psychology was taught by point-to-point teleconference at Cornwall and Hawkesbury. The two locations alternated as the centres for transmission and reception in order to give both groups (20 students in each) face-to-face contact with the instructor. At that time, providing face-to-face instruction was still a priority for Ottawa. A second course in child psychology was offered to the same centres in January 1982; adolescent psychology was added in May of 1982, and adult psychology was added in July, 1982.

Three additional centres were equipped for teleconferencing in the Fall of 1982, Pembroke, Barry's Bay, and Deep River (which was the farthest at 240 kilometres from Ottawa). A course in children's literature was offered by point-to-multipoint teleconference. The introductory child psychology course was offered again between Cornwall and Hawkesbury.

In January, 1983, Renfrew (approximately 100 kilometres from Ottawa) was added as a fourth centre for multipoint teleconferencing. A course in modern short stories was offered to the four centres. One instructor continued to rotate from centre to centre.

A first-year credit course entitled "Children's Literature" was offered first by Conference 100, then by Conference 300. The Conference 300 was subsequently used for all teleconference activity at the University of Ottawa. In April of 1983, it became clear that the volume of teleconferencing was substantial enough to require a privately-owned bridge and the University purchased a Darome 20-20.

Fifteen teleconference courses were offered by the University of Ottawa for the 1983 Fall term. Courses were offered in the humanities, nursing sciences, engineering, and computer sciences. A course on the general history of Canada will soon be offered in French and English to seven students at Cornwall and to 17 students at Hawkesbury. The same system of instructor rotation will be used for the established centres.

For some recent courses, professors remain at the University of Ottawa and teach to an on-campus class while teleconferencing with remote sites. In the 1983 Fall term,

three nursing courses, three engineering courses, and one computer science course were taught from the centre at the University.

So far, off-campus groups have reported no difficulty with the system. There have been very few difficulties for on-campus groups. One course for example, (on the process of aging), had an expected enrollment of 20 but the actual enrollment reached 65. Students in the on-campus classes must go to microphones to address the professors and other students or to ask a question. Large groups make the coordination of this procedure quite awkward.

Teleconference users at the University of Ottawa believe that the method of teaching to campus and remote groups simultaneously is preferable to offering the course twice, concurrently, in one term.¹⁴

Most educational teleconferencing at the University of Ottawa takes the form of audio-teleconferencing with support materials (audiotapes, videotapes, slides, and course text) sent by mail. An anatomy course offered to nurses in the Pembroke, Brockville, and Cornwall areas includes 1,000 different slides and six one-hour videotapes designed especially for this teleconference course.

The University of Ottawa is experimenting with audio-teleconferencing plus audiographics transmitted by an electronic blackboard. Four graduate courses - computer sciences, electrical engineering, data communications, and a thesis-directed course in atomic theory - will receive graphic images from the originating centre at the University during their teleconference.

Students study by teleconference with electronic blackboard transmissions at their workplace in Kanata, about 30 kilometres outside Ottawa. Courses are offered from Monday to Thursday from 1730 to 1930 hours. At these times, professors deliver the courses to on-campus classes, where the regular blackboard has simply been replaced by the electronic blackboard. Both graphic and audio transmissions can be recorded for any student who misses a session.

Students in the remote centre have found the equations and diagrams transmitted via the electronic blackboard to be an asset to the teleconference course. At the transmission

end however, evaluative comments have been mixed. Some professors find the electronic blackboard too small, and some have described it as "silly."¹⁵ The latter comment is due primarily to the fact that it is necessary to push a button to clear the screen electronically. If an instructor forgets this step, he or she will write over what is already on the board. Other professors report that they are satisfied with the system.

The most valuable aspect of the course for the Kanata students is the interactive component provided by the teleconference. In addition, the opportunity to study at the workplace directly after working hours makes a crucial difference to many students. The convenience and the travelling time saved assist people in combining work, study, and family responsibilities.

At the University of Western Ontario in London, distance courses have been offered by teleconference since the Fall of 1982. Five centres in Southwestern Ontario receive courses from the University of Western Ontario through the "The Royal College Teleconference Project" bridge. A joint teleconference course with the University of Waterloo is planned for the Fall of 1984. Another Ontario university, York, located in Toronto, offered its first teleconference course in the 1983 Fall term. The Ontario Institute for Studies in Education, a graduate institution in Toronto, has used teleconferencing in the form of teletutorials. It expects to resume the use of teleconferencing in the near future.

In the Province of Quebec, the distance education institution, Télé-université (part of l'Université du Québec) has expanded its one-to-one telephone tutoring to a teleconference system. Large groups of teleconference students have an animator; smaller groups have a monitor, whose primary role is counsellor. Group animators remain at the centre in Quebec City at l'Université du Québec; monitors work from the remote centres. Students "dial-in" individually from their own homes for teleconferences at a pre-arranged time.

Télé-université is in the process of purchasing a bridge to accommodate its extensive teleconference activity. Previously, bridging service was the Conference 100 and

students paid ordinary user fees to participate in teleconference sessions.

Télé-université also uses PLATO (a set of computer-assisted instruction programs and a computer-assisted authoring program) as the basis for a computer course. Interaction does not occur by audio-teleconference. Students communicate with one another by the electronic mail of computer terminals which are temporarily installed at centres until the course is completed. Because of the need for intensive "hands-on" experience with the computer, only two students (and a tutor) use the terminal at any one time. Communication by computer conferencing allows messages to be stored. This characteristic creates a class at one centre by permitting students to send information to, and receive information from, others who use the terminal at different times.

A report from Canadian colleges

Teleconferencing has been adopted by several Canadian colleges. At the present time, however, a smaller proportion of colleges than of universities are offering teleconference courses.

Confederation College in Thunder Bay, Ontario serves students across an expanse of 61,642 square kilometres. This area includes 93 communities, the most remote of which is 1,232 kilometres, by road, from the college.

Four northern Ontario communities, Grassy Narrows, Ignace, Dryden, and Kenora have been linked to Confederation College for teleconference courses. These centres are equipped with hands-free speaker-phones and press-to-talk microphones. All teleconferences at Confederation are point-to-point through the regular telephone system.

The Kelsey Institute of Applied Arts and Sciences in Saskatoon, Saskatchewan, offered five teleconference courses this year. The participating centres included Biggar, Kindersley, Unity, Kerrobert, and North Battleford. The Kelsey Institute's courses were for persons who will work with developmentally handicapped people. The centres were linked through the N.B. Tel bridge rented by the Kelsey Institute. Assistance for the development of the

teleconference courses was provided by Prairie West Community College located in Saskatoon and Biggar. Teleconference bridging was coordinated by the Saskatchewan Telephone Company's conference operator. Darome convenors and press-to-talk microphones were used at the remote centres.

In the Province of Alberta, six colleges operate teleconference courses: the Southern Alberta Institute of Technology (SAIT) in Calgary, Red Deer College, Grant MacEwan Community College in Edmonton, Lakeland Community College in Lloydminster, Lethbridge Community College in Lac La Biche, and the Alberta Vocational Colleges in Grouard. The number of adults enrolled in credit courses at SAIT on a part-time basis, though small within individual communities, is quite large province-wide. As a result, SAIT's outreach program which sends instructors to remote centres, has expanded to 200 instructors teaching 500 courses a year to 7,000 remote students.

In the Winter of 1981, as a solution to the over-extended program, SAIT offered three teleconference courses. These were a business course, a course in literature for young adults, and a course on medical terminology. SAIT has also offered teleconference courses in efficient reading, nursing science, business administration, and several library technician courses. Approximately 300 remote students in 30 centres, including Fort Smith in the Northwest Territories, are participating in SAIT's teleconference courses this year.

Red Deer College, (whose mandate is to serve the educational needs of central Alberta) uses teleconferencing for course instruction, student support, and community-development education. The psychology of aging, the psychology of sexuality, a criminology course and a history course are offered this year at Red Deer for university transfer credits. The courses consist of one three-hour teleconference session a week; support materials are sent through the mail. Red Deer has offered, and will continue to offer, two or three courses for older learners and special courses for staff training and development in the hospitals in small towns in central Alberta.

Teleconference centres at Red Deer are located close to the College, i.e., from 50 to 100 kilometres away. The instructors rotate among the remote centres. The college has found that many people are hesitant to use the system at

first and that meeting the instructor face-to-face helps them to become more comfortable with teleconferencing.

Red Deer uses the Alberta Government Telephone Company bridge. Terminal equipment includes the Darome convenor and press-to-talk microphones. Grant MacEwan Community College in Edmonton occasionally rents the Athabasca University bridge for nursing courses in the Northwest Territories.

The British Columbia Institute of Technology (BCIT) in Burnaby is offering three teleconference courses. A course in medical laboratory technology, an accounting course, and a computer science course are being delivered to seven centres including Bowen Island just off the coast of southern British Columbia. Additional use of the teleconference system at BCIT includes tutorials for forestry students and a one-day seminar for British Columbia land-surveyors, who rent time on the BCIT Interlink bridge to reach participants at seven locations throughout British Columbia.

Holland College in Prince Edward Island has recently begun educational teleconferencing trials. An accounting course has been offered with audio-teleconferencing supported by the electronic blackboard. A remote centre at Summerside is linked via the Island Telephone Company conference operator to the main centre in Charlottetown. A teleconference course on farm management is in the planning stages.

Teleconferencing and continuing professional education

Continuing professional education via teleconferencing provides resources and educational opportunities for professionals in remote areas. Members of professional organizations face the same barriers to education as those which confront other distance students. Logically, teleconferencing ameliorates problems of distance, time and cost in continuing education for professionals.

Law societies in British Columbia, Manitoba, and Ontario are using teleconferencing to include lawyers and legal-office personnel living in distant places in continuing education activities. In Ontario, the Law Society of Upper Canada delivers its bar admission course from Toronto to centres at London and Ottawa.

This year, two of the Society's 10 continuing legal education seminars will be delivered by teleconference to seven Ontario cities. To link the centres, the Law Society leases time on the "Telemedicine for Ontario Project" bridge.

Recently, a one-day seminar for legal secretaries consisted of two hours of teleconferencing in the morning, followed by small discussion groups at all centres and two hours of teleconference-lecture and teleconference-discussion in the afternoon. Attendance at most of the locations was approximately 25 with the exception of London and Toronto, which had 40 and 185 registrants respectively. Formal evaluations for the event were not completed at the time this report was compiled, but informal comments were very favorable.

The Manitoba Law Society scheduled three teleconference events for continuing education this year. Teleconferencing gives rural Manitoba lawyers a chance to hear an authority speak about a special topic. Their only alternative within the province would be to travel to Winnipeg.

The Manitoba Law Society notifies lawyers throughout the province about an expected guest speaker. When the number and location of interested lawyers and other legal office personnel are determined, the location of teleconference centres can be established. Most law offices used as teleconference sites have hands-free speaker-phones. The conference operator links the centres at the appropriate time. Similar activity takes place in British Columbia with the use of teleconferencing in continuing legal education.

Continuing medical education by teleconference is linked closely with telehealth activity. Telehealth is defined as "the use of telecommunications systems to assist in the delivery of health care at a distance."¹⁶ The range of applications of telehealth includes medical diagnosis, consultation, and treatment, administration, and health education for professionals and the public. (See Paper 15.)

Professional continuing education in Veterinary Medicine used the Kelsey Institute bridge in Saskatoon for a teleconference course in October of 1983. Participating veterinarians were connected to Brandon, Manitoba and six locations across Saskatchewan. A set of slides was sent to each location in advance as visual support for the material

covered during the teleconference. While there were some technical difficulties associated with the bridge, the experience was considered successful and will probably be repeated.

An increasing phenomenon in continuing professional education is one-time events held by specialized groups. A recent example is the Canadian Science Writers' Association's National Teleconference. This event took the form of a point-to-multi-point teleconference, plus one-way video transmission via satellite (the first time ANIK-C3 was used for teleconference support). It was organized to link teleconference centres at the British Columbia Institute of Technology, the University of Calgary in Alberta, Carleton University in Ottawa, Ontario, the University of New Brunswick, and Dalhousie University in Halifax, Nova Scotia. The originating centre was at the Royal Ontario Museum in Toronto. It is interesting to note that on this occasion, the Canadian Science Writers' Association used teleconferencing as the medium for their education about new developments in communications technologies.

ISSUES IN LEARNING AND TEACHING WITH TELECONFERENCING

It is the interactive capacity of teleconferencing that sets it apart from correspondence courses and home study with television. The success of educational teleconferencing is reflected in the decreased rate of attrition with teleconference courses. In distance education, the feeling of being connected with others who share a similar interest is desirable for many learners. However, some students prefer privacy in learning activities and therefore will find greater satisfaction from one-way learning materials, including print, audio and video. For these students, continued development of such materials remains a priority.

There is some debate about what kind of preparation is needed for teaching by telephone and to what degree teleconferencing techniques differ from those of other learning/teaching systems. Nonetheless, there is a consensus that learning and teaching by teleconferencing are not the same as learning and teaching in on-campus classes. Gary Jeffrey at Memorial University compared a teleconference group and an on-campus class:

"The teaching of this teleconference course required more time and quite different preparation than did the conventional classroom course. Because one lacks immediate access to the regular classroom's blackboard or overhead projector, it was necessary, before beginning the course, to anticipate all those drawings, etc., which might be used and to prepare these in some form of a handout. Advance preparation was also needed for all other handout materials such as tables, figures, lists, assignment descriptions, bibliographies, etc. One can use a workbook or a more flexible system such as worksheets (i.e., on three-hole-punched paper) which can be distributed during the course. The considerable lead time which was often necessary for the production and distribution of these materials needed to be taken into account.

"Advance preparation of slides, films, videotapes, etc., was also necessary. This preparation included slides being duplicated or put on to a videotape, films being copied or multiple copies procured, etc. It was also necessary to ensure that suitable reproduction equipment

was available in all the centres for these special materials.

"Lectures and assignment descriptions also needed to be very clearly written and carefully prepared in advance. It was felt that clarity and care would pay off handsomely as a considerable amount of class time could be consumed both in answering questions and in offering explanations...

"It was found to be useful, though slightly more time consuming, to prepare more detailed commentaries on students' assignments. This was intended to help to compensate for their difficulty in obtaining possible additional verbal feedback on their work."¹⁷

The nature of the teleconference process has prompted a number of other instructors to give careful thought to instructional techniques. Malachy Mandville and David Snow from Memorial University discussed special techniques used in educational teleconferencing:

"As a general statement, it is fair to say that a good teacher in a regular classroom will also be a good teacher in a teleconference classroom. But certain techniques admittedly must be developed or adapted for this medium. With the authority figure removed, at least physically, from the classroom, students are more easily distracted. Conversations can take place within a centre without the instructor's knowledge. This, needless to say, is at first a threatening situation because you seem to be losing the element of control which all teachers dearly love. To overcome this disadvantage the instructor must make the students participate. They cannot be listeners only; they must be drawn into the discussion, otherwise the experience for the student is not a good one.

"Pacing is also important. The visual cues of the classroom no longer exist. You cannot, in the usual way, tell when the student is bored, perplexed or just plain confused. Therefore, the rate at which you speak becomes important; the pause for questions or comments takes on added meaning."¹⁸

It should be noted that where teleconferencing and on-campus classes are taught simultaneously (Ottawa University), instructors do rely on visual cues from on-campus students as a means of monitoring the level of student interest for both on-campus and teleconference groups. The "best method" can only be decided by teleconference users. The determining factors are the needs of the students and instructors, the nature of course content and the resources available to the institution.

Mandville and Snow have also found that with the lack of visual cues the "pointed question to a centre or a particular student becomes a necessity."¹⁹ Professor Phillip Warren, also from Memorial University, has learned, however, that directing questions to specific students is awkward for them in that many students are intimidated and embarrassed at having their names called and being asked to reply. To overcome this, Professor Warren relies on two techniques: devoting time early in the course to help students become comfortable and directing questions to centres, e.g., "Could someone in Gander respond to this?"

Ron Ellis of the Law Society of Upper Canada explained that designing programs with teleconferencing in mind means including variety in the format. For example, three or four different kinds of activities were used in the seminar for the legal secretaries. The course designers avoided techniques that would involve an extra layer of organization, such as audiographics and slides. The teleconference lecture consisted of small group discussions and question periods that made good use of the interactive capacity of the system. The first lecture period lasted for 45 minutes and was followed by questions, then a coffee break, a second lecture, more questions and an open discussion.

Ellis also advised lecturers to exercise caution when using materials. He suggested that they should refer to the materials more often with teleconferencing than with live lectures. The visual presence of the materials adds an interesting element to the voice-only teleconference. The legal secretaries' seminar also included a role play between two lawyers. This not only added variation to the format but registrants at remote centres found that the exchange broke the monotony of one voice. It is also important, according to Ellis, that lecturers not read directly from material while teleconferencing. This technique has proven to be too

monotonous for the teleconference mode. Ellis maintains that attention spans are often lower without visual stimuli.

Most teleconference users report that students, when comfortable in the teleconference class, will make helpful suggestions about format, pacing and so on. Variety in teaching modes is crucial to successful teleconferencing.

"Students' presentations, group work involving different centres, interviews with knowledgeable people, videotaped segments--all work very well with the teleconferencing system.

"The personality of the teacher, too, plays an important role in teleconferencing. A sense of humor, for example, appears to be of tremendous help, since it tends to humanize the electronically cold and disembodied teaching voice. The more the voice becomes a person in the fullest sense, the better."²⁰

Several institutions made reference to the increasing number of older learners taking teleconference courses at university and college levels. Many of these students do not desire accreditation but wish to study solely for personal interest and for the interaction that teleconferencing makes possible; therefore, they audit the courses. As most Canadian educational institutions receive funding on a "per student-enrolled-for-credit basis" there is no provincial funding to cover the institution's cost for offering courses to older people.

Interactive systems suit older people who may find it impractical to travel. Because many older people find print material difficult to read, teleconferencing is a desirable alternative for learning. With the expected increase in the number of older learners choosing teleconference courses, educators might consider the practicability of designing teleconference support-materials with a larger, more readable type-face when possible and necessary. In the future, distance education planners will have the task of persuading provincial governments to help them meet the needs of a larger percentage of Canada's adult population.

Traditional measures are still used to determine the effectiveness of distance education by teleconference. One such comparison was conducted at Memorial University in the

Faculty of Education in 1980. Comparisons were made of teleconference groups and on-campus classes. All students completed the same assignments and examination. For assignments and final grades, no significant difference was found between the two groups. A significant difference was found however, between examination results. In this case, the teleconference students did better than the on-campus students.

It may be important for course designers and instructors to reconsider their use of examinations for judging the effectiveness of a course. Many adults study at the postsecondary level for the first time by teleconference. Comparisons of test results may not be a suitable means of determining the success of adult education endeavors. Educational teleconferencing may require its own set of success criteria. Without an independent framework for the design and evaluation of teleconference courses, energy will be misdirected into re-creating the on-campus classroom.

Students and instructors often require training in the use of electronic equipment (e.g., the training package designed by Athabasca University). Most practitioners reported that they were aware of only a few problems with educational teleconferencing beyond the initial period of adjustment to the technology. Other difficulties were usually occasional incidents of electronic interference.

For those who prefer the teleconference mode, it is crucial that efforts be made to refine the support media. Particular attention should be devoted to the evolution of print materials. In the foreseeable future, two-way full-motion video-teleconferencing will be economically impossible for most universities and colleges, except where special funding permits isolated, short-term experiments. The use of audiographic support will also remain limited without special funding. The success of any teleconference system will, to a large extent, depend on the quality of the materials designed for its support.

Once successful teleconference-based courses are developed, questions arise concerning their availability in remote areas, and the ability of smaller institutions to attract sufficient participants to cover expenses.

Few institutions can afford to embark on a full-scale educational teleconference program with privately-owned equipment without first experimenting with pilot courses. Organizations that make sporadic use of the systems are not in need of privately-owned bridging equipment. Consequently, sharing equipment and renting bridge time are common in all provinces.

The sharing of educational teleconferencing resources in Canada takes place without any policy to guide this activity. Some organizations, like the Atlantic Provinces Association of Continuing University Education, have come together for the purpose of creating mechanisms through which professors may share services; through which resources can be shared; and through which the overlapping of programming can be minimized.

In addition, teleconferencing itself may be used for planning cooperative ventures in the design of materials and general course management. The inaugural meeting of the Canadian Association for Distance Education was held by teleconference. This audio-teleconference was chaired in Halifax, Nova Scotia, and used "The Royal College Teleconferencing Project" bridge in Toronto to unite the participants who had gathered at the centres in Calgary, Ottawa, Edmonton, Toronto, Vancouver, Guelph, Yellowknife and Regina. Calgary, Edmonton, and Vancouver were linked with additional communities (12 in total). The meeting was attended by over 100 people representing universities, community colleges, technical institutes, CEGEPs (Collèges d'éducation général et professionnel), government councils of higher education, and government agencies.

FUTURE DIRECTIONS IN EDUCATIONAL TELECONFERENCING

Educational institutions reported the following projections for future uses of educational teleconferencing:

- More course offerings by current users (Regina, OISE, Ottawa, Mount Saint Vincent, Dalhousie, Victoria, Memorial and others).
- Adoption of educational teleconferencing by current nonusers.

"... UPEI will have to develop the capacity, either alone or in cooperation with other institutions, to deliver such programming to the whole of Prince Edward Island."
(University of Prince Edward Island)

"Insofar as development over the next five years [is concerned] teleconferencing is a most promising form of technology particularly for distance education."
(University of Manitoba)

The latter prediction was echoed by Simon Fraser University in British Columbia, and the Universities of Waterloo and Windsor in Ontario.

- Development of audiographic and television support for audio-teleconferencing.

"The University of Regina is involved in several research projects to develop interactive capacity utilizing microcomputers and telephone lines. The off-campus use of technology will see an increase in teleconferencing with the integration of videodisc, videotape, and computer graphics, over the next two years."

Simon Fraser University foresees an increase in "...teleconferencing with learning centres using closed circuit television or audio-teleconferencing with broadcast television."

At the University of Saskatchewan "most faculties have continuing and extension education programs and are introducing slow-scan television and videotex to achieve

greater economy and other benefits. The increased use of these technologies will continue for the next five years."

Memorial University suggests that an area "quite eligible for off-campus expansion is noncredit courses using various combinations of television and telephone." The development of these support materials will require a significant investment of time and resources. Designing materials specifically suited to teleconference systems has been more successful than adapting materials designed for other media.²²

- Computer conferencing.

"Among the realistic possibilities for the next five years is electronic mail for correspondence with students, and question and answer assignments." (Simon Fraser University)

- Other institutions reported that they must await funding or the results of experimental teleconferencing activity before predicting future use of this system.
- Mount Saint Vincent University called for "...more interuniversity cooperation in developing and using [communications] technologies." Institutions that also appealed for more cooperation in the design and management of teleconference systems include the University of Ottawa, the University of Western Ontario, Brandon University, and the University of Calgary. Strategic planning for cooperation and sharing of resources, and collective planning and furnishing of educational teleconference centres and joint teleconference courses are likely to increase proportionately with the desire to offer courses by teleconference.

The trend toward cooperation through shared resources and consortium-owned networks is evidence of a new educational and organizational philosophy - cooperation rather than competition. Though the potential for competitive and possessive sentiments about programs and innovations exists, the sharing of resources may be a practical solution to the problems of the increasing demand for teleconference courses.

This report does not set out to evaluate the educational applications of teleconferencing or to promote its use. Nonetheless, it is difficult to remain uninfluenced by the enthusiasm of teleconference users. Enthusiasm for the system, however, should be tempered with the practical considerations of economic feasibility and suitability both to course content and to the priorities of learners.

NOTES

1. Jordanoff, M.T. (Telecom Canada), personal communication with author, 6 January 1984.
2. Ibid.
3. Ibid.
4. Jordanoff, M.T. (Telecom Canada), personal communication with author, 15 September 1983.
5. Ibid.
6. Ibid.
7. Snow, D.R. and Mandville, M.L. "The Jack in the Box: Toying with Teaching." In A Man's Reach Should Exceed His Grasp: Distance Education and Teleconferencing at Memorial University. Compiled by M.L. Mandville. St. John's: Memorial University of Newfoundland, 1982, p. 57.
8. Warren, P. (Memorial University of Newfoundland), personal communication with author, 15 September 1983.
9. Ibid.
10. Ibid.
11. Snow and Mandville, "Jack in the Box," p. 61.
12. Ellis, G.B., and Winn, W. Educational Teleconferencing and Telidon: A Marriage of Two Technologies Creates an Experimental Course in English Education at the University of Calgary. Department of Curriculum and Instruction, Faculty of Education, University of Calgary, Alberta (no date), pp. 2-3.
13. Ibid., p. 4.

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15. Ibid.
16. Cervinskas, Jenny. "Telehealth: Telecommunications Technology in Health Care and Health Education in Canada." In New Technologies in Canadian Education. Toronto: TVOntario, Office of Development Research, 1984, p. 4.
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18. Snow and Mandville, "Jack in the Box," p.58.
19. Ibid.
20. Ibid., p.59.
21. The information in this section has been taken from the responses to a questionnaire sent to all Canadian universities by the Association of Universities and Colleges of Canada, 18 April 1983.
22. McNamara, C.W. "Telecommunications and Long Distance Education." Telephony, June 1979, p. 28.

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MAP OF CANADA, with names and locations of educational institutions which use teleconferencing to deliver courses.

