

The First Wave: The Beginnings of Radio in Canadian Distance Education

George H. Buck

Abstract

This article describes one of the first developments and deployment of radio for distance learning and education in Canada, beginning in the early 1920s. Anticipating a recent initiative of public-private partnerships, the impetus, infrastructure, and initial programs were provided by a large corporation. Description of the system, its purpose, whom it served, and the problems encountered during its development are described and discussed. The reasons for the demise of this system in the 1930s and the effect of this early innovation on the further development of radio distance education in Canada are elucidated.

Résumé

Cet article décrit l'un des premiers développements et déploiement de la radio pour l'apprentissage et l'éducation à distance au Canada, à compter du début des années 1920. Les premiers programmes, l'impulsion de départ, l'infrastructure, anticipant une récente initiative de partenariats publics-privés, ont été donnés pas une grande entreprise. Une description du système, de ses objectifs, des personnes qu'il desservait et des problèmes rencontrés au cours de son développement, sont commentés et discutés. Les motifs de la disparition de ce système dans les années 1930 et des effets de cette innovation sur le développement de l'éducation à distance à la radio au Canada sont expliqués.

When we encounter the term *technology* used in respect to education, most people think of computers. Indeed, computer technology is considered by some as having the potential to change education fundamentally much as Gutenberg's invention of movable type resulted in the widespread production of relatively inexpensive books. However, Morgan (1930) wrote in reference to another technology, "Not since the invention of movable type by Gutenberg in the middle of the fifteenth century has there been any force so revolutionary in its effect on the human mind" (p. 68). The technology referred to was radio, and psychologist Gordon Allport recognized the educational potential of radio stating, "Educators are confronted with a new medium for public instruction whose magnificent possibilities daze them, but whose technical and psychological

peculiarities they do not yet fully understand" (Cantril & Allport, 1935, p. 248). Before World War II, Canada was ideally suited to use radio technology for instructional purposes, especially distance education, for several reasons. The large physical size of Canada, its scattered population, the difficulty of accessing remote areas, the disparity of education between rural and urban areas, and the ability of the technology to access vast areas with a minimum of infrastructure were among the most compelling reasons why radio could be used as an educational medium (Lambert, 1963; Lyseng, 1978).

Although rudimentary radio communication existed before World War I, the promotion of radio for public use did not occur until the early 1920s (Codell, 1930; Lambert, 1963; Pittman, 1986). In spite of crude radio receivers such as galena crystal sets and the large-tube, tuned radio frequency (TRF) sets that were expensive, complicated to operate, in almost constant need of adjustment by the user, and yielding poor quality sound, commercial radio rapidly became popular (see Figure 1). Although the early radio receivers were as relatively expensive and as complicated to operate as some of the early microcomputers introduced in the late 1970s, many people purchased radio receivers because radio was considered entertaining, informative, and potentially useful for other purposes (Codell, 1930).

Technological impetus

Lambert (1963), Cantril and Allport (1935), Girling (1968), and Pittman (1986) trace the beginnings of educational radio in North America to the rise of commercial radio broadcasts in the United States and from research at universities. However, Moore (2003) contends that although radio technology was sufficiently advanced in the 1920s to permit the use of that



Figure 1. An early TRF radio with headphones (author's collection).

medium for distance education, its use for that purpose was delayed until the 1930s, primarily because universities and other educational agencies either did not wish to commit funds to develop the necessary infrastructure, or they simply did not recognize the opportunities of radio technology. Maskow (2000) as well as Pittman (1986), however, claim that early educational broadcasts emanating from US postsecondary institutions were unsuccessful for other reasons. These included: programs considered boring by listeners; minimal interest by faculty to deliver instruction by radio; uncertainty about the size and nature of potential audiences; low enrollments in distance education courses delivered by radio; and minimal public recognition for the need for courses delivered by radio. In consequence, Maskow notes, "by 1940 educational radio in higher education in North America was history" (p. 59).

Although such observations were largely the case in the US, at least one noneducational agency in Canada invested in radio infrastructure and perceived the need and opportunity of educational radio for education in general, and scholastic education in particular, beginning in the early 1920s.

Canadian National Railways

The initial impetus for extensive educational radio in Canada came from a seemingly unlikely place, the Canadian National Railways (CNR). The CNR began as a government-run operation at the end of World War I and consisted chiefly of extensive but defunct private railways. The effects of the war, coupled with excessive competition, led to the economic failure of these railroads, and given the number of people they employed, plus their commercial importance, the federal government believed it crucial to rescue these railroads and operate them as a public company. The CNR had a formidable competitor in the Canadian Pacific Railway (CPR), the first Canadian transcontinental railway, which remained both a viable and private company with political interests (Buck, 1997).

Although radio was considered ideally suited for train operations, much as radio is used by railroads at present, the bulkiness, fragility, and unreliability of early equipment meant that early radio was not feasible for railroad operation. Rather, radio was initially used as a form of entertainment for passengers and railway hotel guests. Ironically, perhaps, one of the greatest proponents of radio in Canada was Sir Henry Thornton (1877-1933), a flamboyant and experienced railroader who became President of the CNR in 1922. Making competition with the CPR a personal obsession, Thornton introduced many innovations to make the CNR more attractive to the traveler than the CPR (Buck, 1997). One of these innovations, begun in 1923, was placing radio sets in parlour cars of the CNR's transcontinen-

tal passenger trains as well as in its hotels (Thornton, 1924; Thompson, 1926a). Although radios by this time could operate loudspeakers, in the interests of privacy, the radios in parlour cars were equipped with headphones, as shown in Figure 2.

By themselves, the radio sets would be useless, especially on moving trains, because commercial stations in Canada were few and far between at that time. Moreover, among the pioneer stations broadcasting, the content and quality of broadcasts varied considerably. The solution as Thornton saw it was for the railroad to create a network of radio stations to serve the CNR transcontinental main line from coast to coast, with the CNR sponsoring and controlling the content carried on its network (Thornton, 1924). Thus CNR programming across Canada could be consistent if desired.

Technical Infrastructure

Apart from studios, transmitters and broadcasting antennas at each broadcast location, the CNR already had infrastructure for a trans-Canada radio network in the form of its telegraph system, which consisted in part of miles of pole-mounted wires, usually placed alongside the CNR's railway tracks. The CNR's network of wires included several lines of solid copper

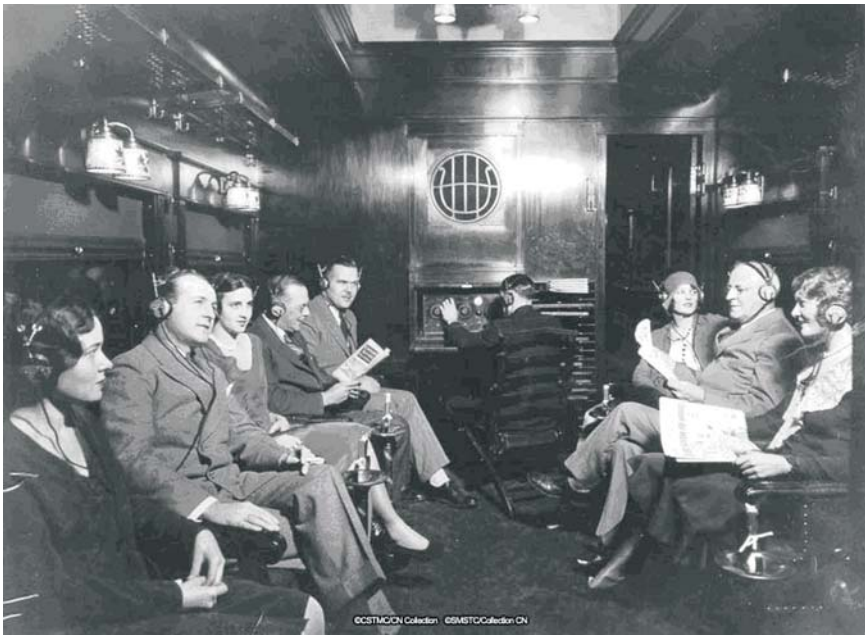


Figure 2. A radio installation in a CNR parlour car, circa 1924 (CN Collection, Canada Science and Technology Museum).

wire, and the ability to send relatively high-quality analogue signals from one broadcasting transmitter to another by means of a carrier current system (Thompson, 1926a). Basically, the apparatus of a carrier current system enables a weak radio broadcast signal to be superimposed on an existing, high-strength current already passing through the wires. The carrier current thus adopts the fluctuations of the broadcast signal. The resulting combined carrier and broadcast signal is strong, and this minimizes the effect of atmospheric or inductive interference (Thompson, 1927a; Burnet, 1996). At broadcast points, the carrier/radio signal passes through apparatus that removes the carrier signal, leaving the original radio broadcast signal, which is then sent through transmitting apparatus to the broadcast antenna. In this way, a broadcast originating in, say, Ottawa could be broadcast simultaneously in Winnipeg. At that time, amplitude modulation (AM) was the only broadcasting mode used by publicly accessible broadcasters in Canada.

Although copper wires and carrier currents result in a higher quality signal than by simply applying the radio broadcast signal to a circuit, the system was not perfect. The tonal range that could be transmitted was limited, and the complexity of the apparatus meant that it was prone to malfunction. In spite of such limitations, the CNR invested considerable funds in infrastructure and established a 10-station network by the end of 1925 by the addition of amplifiers, transmitters at broadcast points, and the purchase of air time from radio stations in locations where the CNR had yet to install equipment (McEwan, 1925). Each CNR transmitter or affiliate had its own call letters. The first three were always the initials of the railway followed by another letter, usually the initial letter of the transmitter's location, for example CNRM in Montreal and CNRV in Vancouver (McEwan). At its zenith in 1930, the CNR trans-Canada radio network consisted of 27 stations, 87 amplifiers, eight studios, plus the services of 27 radio engineers and many telegraph engineers and line repair staff (McDowell, 1932).

The main control room for the network was in Toronto, and from that point stations could be linked or permitted to broadcast locally. The operator could communicate with individual stations by means of voice link, or by means of a telegraph key (McDowell, 1932). Figure 3 shows the interior of the Toronto control room.

Because the CNR radio network's broadcasts could be received by the general public within range of its transmitters, the CNR issued printed program guides periodically for free distribution to those who requested them. An example is shown in Figure 4.



Figure 3. Interior of CNR radio control room (McDowell, 1932, p. 8).

Service pro bono publico

Although the main purpose of the CNR radio network was entertainment for their passengers and hotel patrons, Thornton also saw both the social and commercial value in providing educational programming as a public service. As early as 1925, educational programs intended for young children were being broadcast both network-wide and locally. Educational programs were also offered for adults during evening hours. An example was a series, *An Introduction to the Gilbert and Sullivan Operas*, which consisted of lectures about the pieces as well as performances (McEwan, 1925). It is important to note that although several provincial educational broadcasts were begun in the 1920s such as the University of Alberta's CKUA broadcasts that started in 1927 and the Department of Education of Nova Scotia's broadcasts over station CHMS beginning in 1928 (Keast, 2005), the CNR had been broadcasting for several years before these initiatives and often across several provinces.

The success of the CNR educational programs, as ascertained by audience feedback, usually by letter, encouraged Thornton and the CNR to expand their educational offerings and to use the technology to reach people who were deemed to be learning-disabled. By 1926, experimental broadcasts were made from CNRV especially for reception at the Point Grey School for Deaf and Blind in Vancouver. It was thought that radio



Figure 4. A CNR Radio Network Program Guide, 1927 (author's collection).

broadcasts of music and storytelling would help stimulate the minds of blind students, and the amplification of volume possible with radio sets might permit the broadcasts to be heard by those students who were not completely deaf (Thompson, 1926c). Although a novel use of radio for distance education, the Point Grey broadcasts also signified one of the first uses of radio in Canada for what became known as special education.

Other broadcasts on a regular basis by the end of 1926 were intended for schools and school-aged children in broadcast range, both in urban and rural areas. Besides lectures, recitations, and music, broadcasts often entailed activity sessions, where instructions to create projects would be given, and the students would follow along. Of course, advance knowledge of the activity session by the teacher was necessary so that the appropriate materials could be gathered before the broadcast, another justification for the broadcast schedules. Naturally, accompanying the broadcasts

were reminders that the service was being provided by the CNR, and usually brief advertisements of the CNR's services.

Although most educational programs were intended to provide either information or a particular skill to listeners, the limitations of merely broadcasting information to a largely passive audience was realized by some individuals involved with the CNR network. George Wright, the manager of CNRV in Vancouver, the station that began broadcasts to the Point Grey School for the Deaf and Blind, believed that to maintain interest in their programs, participation and suggestions from the audience were essential (Thompson, 1927b). This insight probably protected the CNR programs from the flagging interest that bedeviled many broadcasters in the US once the novelty of the approach had worn off (Maskow, 2000).

As the CNR programs intended for school-aged children had proved popular with many students in general and with students at the Point Grey School in particular, Wright hired a blind adolescent student (Ronnie) from the school to work as one of several announcers for a program called *Radio Train*. The program entailed an imaginary train that in each episode traveled to a new geographical location. Presented in an entertaining manner, the program would provide information about the location,



Figure 5. Schoolchildren with Panpipes made through a CNRV broadcast, 1927 (author's collection).

important sights, and the history of the locale. In addition, the travelers would also encounter some mysterious problem that could only be solved at the end of the episode by the recall of facts and events that had been described. As Ronnie was himself blind, it was believed that he would be better suited to describe locations in such a way that it would make sense to blind listeners (Thompson, 1927b).

It was found that the use of several announcers, including women and people who represented distinct segments of the intended audience, resulted in increased positive audience feedback. In addition, it was thought that involving the audience in the educational broadcasts would not only increase the number of listeners, but would also help sustain audience attention (Thompson, 1927b). In consequence, audience participation was encouraged in all CNR programs. Children and their parents wrote to their local station either with suggestions for program content or with offers of particular skill or talent. The result was a greater variety of program content and sometimes guest presentations of recitations, songs, or instrumental performances. In addition, special listening competitions were held regularly, where the audience was asked a question at the end of an episode about something revealed during that episode. Listeners then had a given time to mail their response to the radio station. Successful responses would result in the receipt of a small prize (Thompson, 1927b).

To encourage audience participation and to advertise the CNR further, promotional picture postcards were prepared that were distributed widely both to listeners who had communicated with one of the radio stations and to potential listeners. An example of such a postcard, this one advertising CNRV's *Radio Train* program, appears in Figure 6. Although the postcard mentions the program and depicts the major characters in *Radio Train*, it also advertises the CNR's mainstay, rail travel. Although the

CNR's educational programs proved popular with the general public, the concomitant advertising of the CNR led to criticism that the CNR's venture into educational radio was not benevolent or altruistic, but was a devious means of directing advertising at young children.

Other Considerations and Impediments

Broadcasting information from transmitters and connecting the transmitters into a network was only a part of the equation of using radio for distance education at that time. Although by the late 1920s TRF radios were displaced by the smaller, simpler, and more powerful super-heterodyne receivers, all sets required considerable power to operate because of the vacuum tubes used (Beech, 1927). Sufficient power was especially problematic in rural areas without electricity. In such cases, portable sets requiring three different batteries could be used (Thompson, 1926b). Moreover, the further a set was from the transmitter, the weaker the signal. To receive sufficient signal strength, most homes and schools had to install a roof-mounted antenna, a lightning arrestor, and a suitable ground, the latter two items being necessary to protect both the radio and the building from lightning (Lyseng, 1978).

Although the CNR proved that widespread dissemination of educational information via radio network was possible, and it made its expensive infrastructure available for educational purposes free of charge, several factors adversely affected the CNR's venture into distance learning via radio. First, education is a provincial responsibility in Canada, and the

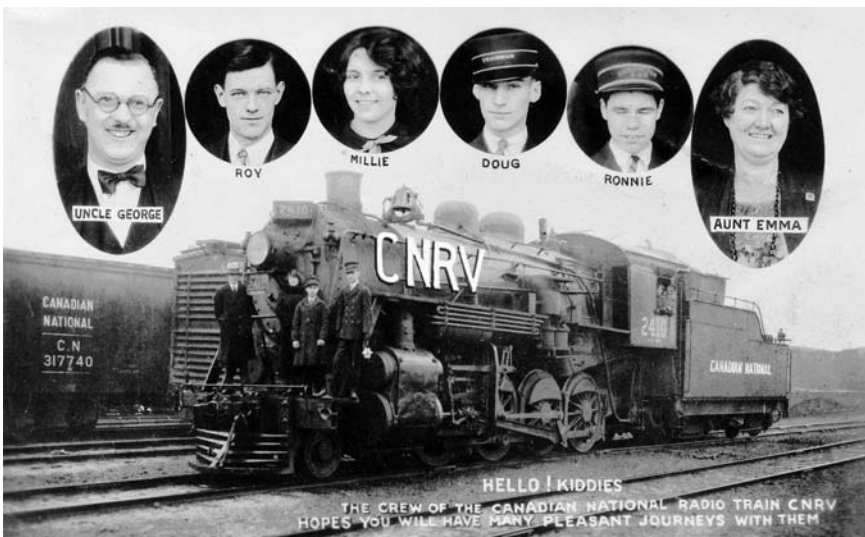


Figure 6. A CNR radio promotional postcard, 1927 (author's collection).

CNR discovered that some provinces did not appreciate educational programs originating in other provinces. The objection was not solely a matter of jurisdiction. Curricular differences meant that some offerings were incompatible with approved curricula in particular provinces (Lambert, 1963). Second, although the cost of the broadcasting infrastructure was borne by the CNR, radio receivers remained relatively expensive, complicated to operate in areas without electricity, and the technology was rapidly changing. This meant that many schools either lacked the funds to purchase a radio or that their priorities for funding went to other instructional material such as textbooks (Lambert, 1963; Lyseng, 1978). Third, in spite of the technology being used, it was not yet possible to record productions for broadcast later in other time zones. Instead, programs were either broadcast at a particular time, which meant that because of time zones, the broadcast would be heard in other parts of the country either earlier or later than the in the originating location, or programs were produced locally (Lyseng, 1978). Fourth, the CPR as well as other corporate and political bodies complained that by providing educational radio with advertisements, the CNR was engaging in unfair competition.

Competition, Economics and Politics

Initially, the Chairman and President of the CPR Sir Edward Beatty (1877-1943) dismissed the CNR's radio network and programming as gimmickry (Cruise & Griffiths, 1988). However, when people expressed loyalty to the CNR because of its educational radio programs, and when passengers preferred the CNR's trains because of the radio entertainment, the CPR began to fight back. The lead that the CNR had with its radio network infrastructure meant that the CPR could not immediately compete in this medium. It would take time for the CPR to create its own radio network.

After several false starts, construction began in 1930 with the installation of several transmitters in cities served by the CPR (Beatty, 1931). The start of the CPR radio network coincided with two important events that had a profound effect on both networks, but the CNR network in particular. One was the Great Depression. The economic cataclysm meant that the CPR radio network was unable to develop the business of its competitor. For the CNR it became increasingly difficult to justify the expense of educational programming, especially as most of the CNR's operating funds came from the taxpayer. The second important event was the federal election that placed R.B. Bennett and the Conservatives in power. Before becoming Prime Minister, Bennett had been a corporate lawyer for the CPR and remained loyal to the company. Moreover, Bennett and his party were strongly opposed to government-owned corporations, especially those that competed with the CPR. Bennett shared the

belief that although the CNR ostensibly offered educational programming as a public service, it was really pitching advertising to children (Buck, 1997). In consequence, one of Bennett's priorities was the elimination of the CNR radio network. To achieve this goal, it was thought important to remove Sir Henry Thornton, who was the radio network's strongest advocate, from the CNR and then sell the radio network to another company, possibly the CPR (Buck, 1997; Cruise & Griffiths, 1988). Although Bennett was successful in having Sir Henry Thornton dismissed, selling the CNR radio network to the CPR would have been politically explosive. Nevertheless, Bennett was determined to remove the radio network from CNR control.

In 1933, the federal government extracted the CNR radio network from the railway, and placed the network under the aegis of the newly formed Canadian Radio Broadcasting Commission, which was a government-owned corporation like the CNR. With the addition of more stations, the network emerged as the government-owned Canadian Broadcasting Corporation (CBC) in 1936 (Gormick & Potts, 1998). In consequence of the allegations that the CNR educational broadcasts also comprised advertising, the CBC was structured so that it was not permitted to engage in advertising (Lambert, 1963).

The CPR radio network, which was essentially a much more costly copy of the CNR system, did not develop educational programs. The economic difficulties caused by the Depression and not wishing to be accused of the sort of advertising allegedly conducted by the CNR network were factors that prevented the development of distance learning programs. Although R.B. Bennett had left the CPR network alone, it was closed in 1935 because of fiscal considerations (Beatty, 1936).

Fallout

In spite of the political tumult associated with the CNR radio network, the demonstrated effectiveness of radio for distance education prompted people in many provinces to advocate using radio for this purpose. Fullan (2001) contends that if an innovation is to succeed, there must be an evident need for it. Innovations and their applications to novel situations must not be "solutions looking for problems," but demonstrable improvement to a particular situation (Glaser, 1965). Radio was ideally suited to address some critical deficiencies in the education system as it existed in much of rural North America between the 1920s and 1950s. During this period, most rural education consisted of small, one- and two-room schools placed at convenient points to serve rural residents who were hampered in their mobility both by poor roads and by rudimentary motive power. In addition, schools were often poorly equipped with text-

books and other instructional resources. Moreover, the requirements for teacher education were minimal by today's standards, and many teachers had both inadequate knowledge of the curriculum and knowledge of how to present material appropriately for various ages (Collins, 1956). Although there were initiatives such as the consolidation and centralization of schools into larger units, the Depression, as well as an unwillingness of many people to accept the idea of larger schools located farther away from home, meant that something else had to be done to alleviate the inadequacies of existing schools.

Radio was seen as one solution, especially when most of the expensive infrastructure was paid for by a company, and programs and air time were underwritten as a public service. Economically, and practically, the use of radio for distance education made much more sense than portable teachers and classrooms. As noted above, by the late 1920s, universities and governments in several provinces began promoting and investing in radio education, in part because of the successful example of the CNR network. For example, both the University of Alberta and the Alberta Department of Education began school broadcasts using the facilities of CKUA in Edmonton, starting in 1927 (Cormack, 1981). In Vancouver and environs, the British Columbia Department of Education continued using the services of CNRV when it became part of the CBC network to produce and disseminate school broadcasts (Lambert, 1963). In 1928, Nova Scotia began broadcasting educational programs from Halifax through the facilities of CHMS to serve the needs of rural education as well as an instructional supplement for better equipped schools (Collins, 1956; Lambert, 1963; Keast, 2005). Other provinces eventually followed suit, although some did not begin school broadcasts until the late 1930s, largely because of the Depression (Lambert).

The CBC, although a national broadcaster much like the predecessor CNR radio network, carried programs developed in specific provinces, and it also offered generic programs that were approved for use in many provinces (Lambert, 1963). The CBC also continued the tradition of offering educational broadcasts for adult learners. Norquay (1986) reports that as early as 1935, a series of half-hour broadcasts were provided for the benefit of members of the Agricola Study Clubs. It is reported further that in November 1937, the CBC began national broadcasts of a series called *Enquiry into Co-operation*, sponsored jointly by the CBC and the Canadian Association for Adult Education. As the series often discussed current affairs, and given that the CBC was a creature of the federal government, broadcasts of the series were suspended during federal election campaigns (Norquay). Other programs offered nationally by the CBC for adult

learners were devised. The longest-lived of these was the *National Farm Forum*, which began in 1941 and ceased in 1964 (Norquay).

Although the proliferation of educational radio in Canada did not reach its greatest expansion until after World War II (Collins, 1956; Norquay, 1986), the early efforts of the CNR radio network demonstrated the practical and some pedagogical capabilities of using radio as a means of distance learning, including instruction for students with disabilities. Moreover, the CNR network enabled Canada to gain a head start on the use of radio for distance education over many areas in the US.

The use of AM radio broadcasts for the dissemination of courses and learning materials is largely an historical curiosity in the context of current distance education practice. Nevertheless, the example of the CNR radio network shows that it is possible for a commercial enterprise to underwrite the development of an expensive new technology, and with little additional expense make the technology available for educational purposes. In addition, the interactive approach adopted by several CNR broadcasts early on presaged some of the instructional designs used by Open College during the 1970s and 1980s (Norquay, 1986). Although it is unlikely that such technology will again gain the prominence it once enjoyed, some of the ideas it embodied and other ideas that were tried and found wanting may be worthwhile to consider in light of “new” approaches such as podcasts and netcasts.

References

- Beatty, E.W. (1931). *Annual report for 1930*. Montreal, QC: Canadian Pacific Railway.
- Beatty, E.W. (1936). *Annual report for 1935*. Montreal, QC: Canadian Pacific Railway.
- Beech, J.L. (1927). Heard two continents on ocean. *Canadian National Railways Magazine*, 13(3) pp. 34, 40.
- Buck, G.H. (1997). *From summit to sea: An illustrated history of railroads in British Columbia and Alberta*. Calgary, AB: Fifth House.
- Burnet, R.G. (1996). *Canadian railway telegraph history*. Etobikoke, ON: Telegraph, Key & Sounder.
- Cantril, H., & Allport, G.W. (1935). *The psychology of radio*. New York: Harper & Brothers.
- Codel, M. (Ed.). (1930). *Radio and its future*. New York: Harper & Brothers.
- Collins, K.E. (1956). *Survey of radio in Canadian schools: A report of the radio research project committee of the Canadian Teachers' Federation*. Ottawa: Canadian Teachers' Federation.
- Cormack, B.V. (1981). *Beyond the classroom*. Edmonton, AB: University of Alberta, Faculty of Extension.
- Cruise, D., & Griffiths, A. (1988). *Lords of the line*. Toronto, ON: Viking.
- Fullan, M. (2001). *The new meaning of educational change*. New York: Teachers College Press.
- Girling, B.T. (1963). A gauntlet thrown down for school radio. *Audiovisual Instruction*, 8, 741-743.
- Glaser, R. (1965). Toward a behavioral science base for instructional design. In R. Glaser (Ed.), *Teaching machines and programmed learning, II: Data and directions*. Washington, DC: National Education Association of the United States.
- Gormick, G., & Potts, J.L. (1998). *History of Canadian broadcasting*. Retrieved December 7, 2005, from: <http://www.broadcasting-history.ca/networks>

- Keast, R. (2005). *A brief history of educational broadcasting in Canada*. Retrieved April 4, 2006, from: http://www.broadcasting-history.ca/programming/History_of_Educational_Broadcasting
- Lambert, R.S. (1963). *School broadcasting in Canada*. Toronto, ON: University of Toronto Press.
- Lyseng, M.J. (1978). *History of educational radio in Alberta*. Unpublished master's thesis, University of Alberta.
- Maskow, M. (2000). Radio as a learning technology. *New Directions for Adult and Continuing Education*, 88, 59-68.
- McEwan, A.R. (1925). *Canadian National Railways radio programmes*. Montreal, QC: Canadian National Railways.
- McDowell, F.E.D. (1932). The hook-up. *Canadian National Railways Magazine*, 18(12) pp. 8, 35.
- Moore, M.G. (2003). *From Chautauqua to the virtual university: A century of distance education in the United States*. (ERIC Document Reproduction No. ED 482357)
- Morgan, J.E. (1930). Radio and education. In M. Codel (Ed.), *Radio and its future*. New York: Harper & Brothers.
- Norquay, M. (1986). Educational radio. In I. Mugridge & D. Kaufman (Eds.), *Distance education in Canada*. London: Croom Helm.
- Pittman, V.V., Jr. (1986). *Pioneering instructional radio in the U.S.: Five years of frustration at the University of Iowa*. (ERIC Document Reproduction No. ED 297104)
- Thompson, W.S. (1926a). Joint broadcasts CNR programs. *Canadian National Railways Magazine*, 12(12), p. 38.
- Thompson, W.S. (1926b). 1925 year of notable achievement. *Canadian National Railways Magazine*, 12(1), pp. 7-10, 50.
- Thompson, W.S. (1926c). Radio invades the silent world. *Canadian National Railways Magazine*, 12(2), pp. 28, 56-57.
- Thompson, W.S. (1927a). Wrote history in telegraphy. *Canadian National Railways Magazine*, 13(12), pp. 9-10.
- Thompson, W.S. (1927b). Kiddies enlisted for radio. *Canadian National Railways Magazine*, 13(1), p. 35.
- Thornton, H.W. (1924). *Annual report of the Canadian National Railway system for the year ended December 31, 1923*. Montreal, QC: Canadian National Railways.

George Buck is an associate professor in the Department of Educational Psychology, University of Alberta, Edmonton. George's research interests include the use of technology for instruction; the historical development of ideas, practices, and theories in education; ethical issues in educational research; and educational research methodologies. He is presently the Editor of the *Alberta Journal of Educational Research*.