

Introductory Accounting on Distance University Education Via Television (DUET): A Comparative Evaluation

Drana R. Carl
Bruce Densmore

Abstract: The research evaluated the effectiveness of a videoconferenced course delivered from a studio classroom as a method of distance education delivery. Student performance was measured on assignments, examinations, and composite grades. There were three treatment groups: distance, on-campus studio, and on-campus normal classroom. Maturity level of the student was used as a covariate. It was concluded that given the same course materials and the videoconferencing system, distant students can be expected to perform as well as on-campus studio and on-campus normal classroom students. They also can be expected to perform as well as on-campus mature students. Videoconferencing technology did not adversely affect the performance of on-campus studio students. In this study, it was demonstrated that a university credit course can be effectively transmitted using videoconferencing to provide the same education for mature distant students.

INTRODUCTION

The proliferation of a variety of advanced technologies not previously available suggests some ways in which obstacles to continued professional education can be overcome. Particularly, the combination of cable television service, live television signals, telephone, and audio conferencing bridges into an "educational videoconferencing" service has been used to overcome problems associated with limited access to university courses due to transportation problems, time constraints, or other pressing commitments (Bisesi & Felder, 1986; Carl, 1984; Carver & McKay, 1986; Catchpole, 1985). Through networks such as these, it is now possible to have access to a university education without being in attendance in a campus classroom. Although some work has been done to document and examine videoconferencing exclusively to distant students (i.e., where the professor is alone in front of a camera, has no students in the room, and addresses distant students using television and telephone), little work has been done to examine an adapted classroom presentation, intended to simultaneously serve both on-campus students participating in this studio classroom, and distant students participating via the technology.

There are a number of questions about the effect this kind of delivery

system has on the learners. Some questions relate to the effect of distance education methods in general. For example, the parity of distance education courses with on-campus courses is still debated (Dodds, Lawrence, & Guiton, 1984; Jevons, 1984; Shaw & Taylor, 1984; Smith, Daniel, & Snowden, 1984). Other questions relate to the ability of the videoconference medium to effectively deliver the elements of a university education as well as specific subject-matter areas.

In adapting a classroom presentation for videoconferencing, questions about the effects extend into the on-campus classroom itself. An unresolved question revolves around the impact of the technology used for videoconferencing on the quality of education delivered to both on-campus and distant students. A further question is whether, and if so how, the experience is qualitatively different from the same instruction delivered in a "normal" university classroom (i.e., one which is not enhanced with this kind of technology).

Some authors recommend against simultaneous teaching to both an on-campus and distant group. For example, Parker and Olgres (1980) recommend that in an audioteleconferenced course, no students be in the same room as the instructor, since there is a tendency for the instructor to disregard the presence of the distant students. This appears to have been generalized to videoteleconferencing (Catchpole, 1985), although there is some question as to whether this is appropriate, since more elements of the classroom presentation are available to students than through audioteleconferencing. Blackwell (1984) and Wakshlag (1984) found that the lack of visual stimuli in audioteleconferencing appears to have an effect on the quality of interaction between the instructor and students. The professor teaching in this study found the face-to-face interaction with the studio students helpful in judging student comprehension of the material being presented.

The appropriateness of the face-to-face presentation as the basis for the videoconferenced course has also been questioned. In the majority of instances, separate course and administrative structures have been designed for distance education to by-pass the on-campus structures which have been "problematic" for distance educators (Carl, 1985; Dennison & Robertson, 1986; Jevons, 1984; Harrington, 1977; Holmberg, 1985). Yet, there are economic and organizational factors which make videoconferencing of on-campus presentations worthy of attention. While the on-campus presentation has been labeled inappropriate for distance education, a search of the literature reveals little analysis of the traditional face-to-face presentation for the purpose of preparing it for delivery via technology. Russell and Russell (1983), Tinterow (1984), and Bisesi and Felder (1986) were the few who examined distance delivery of the classroom presentation. No documentation was found to support the conclusion that the face-to-face presentation is an unsound basis for adaptation to distance education using videoconference technology.

In this scheme, the instructor addresses two distinct populations at once during the videoconference. Most distant students are mature and attend

university part-time, while handling other commitments (Feasley, 1983; Holmberg, 1985; Purdy, 1986). The other population, full-time university students (also known as "traditional" students), tends to be younger and primarily concerned with completing a university education. Mature students have generally performed better than traditional students in both on-campus and distance university courses (Browns, 1976; Jevons, 1984; Harrington, 1978). Experience at Mount Saint Vincent University, where videoconferencing is used supports this. Since normally 100% of the distant students at Mount Saint Vincent University are mature, the question arises as to whether the technology has a differential effect on the performance of both mature and traditional students taking these courses.

This paper describes the comparative evaluation of the performance of students enrolled in Business 200: Introduction to Accounting, which was delivered through videoconferencing to distant students, and which had on-campus students in the studio classroom. The same professor during the same academic year delivered another section of this course to an on-campus group in a "normal" classroom atmosphere, so it was possible to compare the performance of these two populations with a third group who received the instruction in this normal classroom.

BACKGROUND

Description of DUET

Distance University Education via Television (DUET) uses one-way videoconferencing to deliver university courses to distant students. One-way full-motion videoconferencing is the combination of a live television signal sent to students at distant locations coupled with a return telephone link to the studio classroom. The television signal can be sent by a number of means: land lines, micro-wave, open transmission, or satellite. DUET uses cable and direct-broadcast satellite to deliver the courses.

The live classroom presentation delivered to an on-campus group is simultaneously delivered to distant students. DUET courses "piggyback" on existing university courses scheduled to be offered on-campus. That is, professors teach simultaneously to the students they see in the classroom and to the distant students. Distant students participate in the class by means of a telephone connected to a teleconferencing bridge, enabling them to talk with the professor, students in the studio classroom, and students at other locations. Distant students complete the same requirements as do on-campus students and work to the same schedules and deadlines.

One-way, full-motion videoconferencing was selected by Mount Saint Vincent University because it enabled the university to reach a distant student population without investing in a separate course or distance delivery structure. Using a standard university classroom modified for videoconference, the existing academic, resource, and administrative structure of the university, it

was possible to deliver distance education economically. Depending on the effect of the videoconferencing medium on the presentations, and on the ability of the distant students to participate using the technologies, the on-campus course is adapted to ensure distant students can a) clearly see and hear the presentation, and b) interact and complete course requirements in ways defined as important to the intent of the course.

Distant students participated in the presentation from their homes or from receiving centres at work. Some students were alone at the site, while others were in small groups. Those in small groups interacted with each other and with the professor.

Distant students interacted with the class using the telephone and teleconferencing bridge to speak with the professor, students in the classroom, and those at other receiving centres. All students were able to interact with the professor after class and during office hours either in person or using the telephone.

Videotapes of all sessions were available throughout the year to all students taught by this professor. On-campus students obtained the tapes through the library. Distant students either recorded the sessions themselves or were sent tapes upon request.

Students were expected to take the class at the time it occurred and to write examinations under the same conditions and at the same time as the on-campus groups. But in some cases, distant students elected to participate in the course primarily through videotape.

The majority of distant students were female and employed in full-time clerical positions. All distant students were mature and were observed to have other commitments. They appeared to fit the profile of distant students described in other studies.

The Effect of Videoconferenced Distance Education Courses

There are many case and evaluation studies of distance education in general. It has been long-established that the use of televised methods are not significantly different in their educational effects from face-to-face methods (Mielke, 1971; Perrin, 1977). Evaluations of videoconferenced distance courses, however, are difficult to find.

In Canada, most distance education using videoconferencing or the televised classroom presentation has been developed exclusively for a distant student population (Catchpole, 1985; Croft, 1986; Haughey, 1983; Holmberg, 1985). In a few instances, such as distance education at Carlton University, Wilfred Laurier University, and University de Moncton, classroom presentations have been videotaped or sent live over television channels, but have no mechanism for direct interaction of the distant students during the presentation.

A review of the literature revealed few evaluation studies of videoconferenced courses presented to both a distant and face-to-face population. TOTE at North Carolina State University videotapes and distributes classes to

distant students whose progress is not synchronized with the on-campus calendar (Russell, 1984). Russell and Russell (1983) reported an evaluation of language teaching by videotape using the classroom format as the basis for the presentation. The study reported no differences in learning between the group viewing the videotape, and those in the classroom with the instructor during the recording. Of the group receiving the videotape, all reported ease in perceiving the important elements of the presentation. In terms of the experience itself, more than half indicated they did not learn as much as they would have in a regular classroom setting and felt disadvantaged in not being able to ask questions. A strong majority, however, said they would take another TOTE course. All participants in the group in the classroom with the instructor (during the taping) indicated they learned as well as in a regular classroom, and would take another TOTE course. Slightly over half indicated the technology enhanced their learning experience.

Kirman and Goldberg (1982) described a study in which the effectiveness of a videoconferenced course in teacher education was tested against the face-to-face course given to a control group. They found no significant difference between the performances of the control and treatment groups. The authors noted that the treatment group was composed primarily of mature students while the control group was composed of younger, mainly full-time students. Some discomfort with using the videoconferencing technology was expressed by members of the treatment group.

Haughey (1983), in her description of videoconferenced nursing and educational administration courses, limited her discussion to the interactions between instructor and students. She noted that interactions were different: more serious, centered on administrative matters, and more controlled than in the classroom environment. In a related study of the same system, Collins (1983) concluded that the educational effects of videoconferenced courses are comparable to those outcomes achieved in the classroom.

Carver and McKay (1986) described the use of DUET by Dalhousie University School of Nursing. The instructor taught exclusively to a distant student population. Student achievement for this course was comparable to the achievement of students on-campus.

Carl (1984) summarized the findings of pedagogical evaluations for DUET courses taught to both a face-to-face group and a distant population, noting that the performance of distant students was normally equal to, or better than, the performance of the face-to-face group. Some professors informally noted that the average grade achieved in DUET sections (i.e., distant and face-to-face combined) appeared to be higher than that for other sections of the same course taught by the professor.

Most of these studies were concerned with videoconferenced courses delivered exclusively to distant populations. Little attention has been paid to the issue of addressing both an on campus and distant group simultaneously. The effects of the videoconferencing technology on the on-campus group compared to effects in a normal classroom does not appear to have been examined.

Distance Accounting Courses

The literature regarding distance education accounting courses appears scarce. Brown (1976) compared the performance of distant students with that of on-campus students taking introductory accounting from the State University of Nebraska. (Scigliano, 1978, also described the use of this course at Nova University.) The course differed from that described in the present study in that the package was pre-produced, consisting of a mixture of videotapes and other print and non-print media. The Nebraska study compared the performance of three groups: distant students taking the pre-produced course, on-campus students taking the pre-produced course, and on-campus students taking the traditional classroom format. Distant students were allowed to take the course at their own pace while on-campus students were required to adhere to academic timetables.

Brown concluded that the distant learners who completed the course could be expected to achieve as well, or better than, the on-campus learners using the same materials in the on-campus setting. Performance for both groups was comparable to those enrolled in the normal classroom. He also noted that mature learners appeared to perform better than younger students.

The present study differs from this in several respects: Business 220 was a full year, one unit, introductory accounting course. The same course content and format was used to teach all students in the study. The independent variable was the technology. In the normal classroom the technology employed was that normally associated with on-campus teaching (chalkboard and overhead projector). In the DUET classroom (DUET in-class group) the presentation was the same, except that visuals normally viewed on the overhead projector were viewed on the television screens. Students in both these groups participated in face-to-face exchanges with the professor. Distant students experienced the classroom presentation and all visuals through the television. They participated using a telephone line linked into the DUET classroom. All class materials, in-class problems and examinations were the same for both the DUET and normal classroom sections. All students had to meet the same time requirements for completing assignments, examinations and the course itself. Introductory Accounting was a required course for all programs offered by the Business Administration and Office Administration departments at Mount Saint Vincent University. The DUET in-class group and the normal classroom group consisted of approximately equal numbers of Business Administration and Office Administration students. The remainder of on-campus students took the course as an elective (one in the DUET in-class group, two in the normal classroom). All distant students were enrolled in the Business Administration Program. Mature student status is defined by Mount Saint Vincent University to include any individual over the age of twenty-five years or an individual that has not taken a secondary or post-secondary course in five years. This was the definition used for this study.

Using the results obtained by Brown (1976) as a basis, the following hypotheses were generated:

- 1) there will be no significant differences between the performance on assignments, tests, and final grades between the DUET group and the section taught in the DUET Classroom;
- 2) there will be no significant difference between the performance on assignments, tests, and final grades between the DUET group and the normal classroom group; and
- 3) there will be no difference between the performance on assignments, tests, and final grades of students in the DUET classroom and students in the normal classroom.

METHOD

Two separate sections of the introductory accounting course were offered by the same professor during the time of the study. Students chose which section of the course they would attend. Determining factors in the decision appeared to be the time the class was offered, the reputation of the professor, and the availability of the course through DUET. The sessions were taught on the same day of the week, the DUET section in the morning, the normal classroom section in the afternoon. All assignments were subject to identical deadlines and were marked from a common marking key. Midterm and final exams were administered to both groups at the same time in a common test sitting. All groups used the same textbook, and the professor's overhead notes were identical for all sections.

The section which met in the DUET classroom experienced the class through a face-to-face presentation augmented with visuals of accounting problems viewed on television screens placed around the classroom. Distant students were heard over speakers in the room. Distant students experienced the same class simultaneously over television, viewing the presentation and all visuals over the television screen. The rooms where they viewed had a telephone adjacent to the television so the students could be linked into the classroom by telephone. Students in the normal classroom experienced the presentation as normally as would be expected in an on-campus presentation. Visuals were presented using an overhead projector and the chalkboard.

Statistical analyses were performed to compare performance of students in three treatment groups: distance, DUET classroom, normal classroom. Several studies concluded that maturity of the student is a factor in academic success (Brown, 1976; Harrington, 1978; Jevons, 1984; Kirman & Goldberg, 1982). Therefore, maturity was treated as a covariate. A total of eight dependent measures were taken over the entire academic year to enable longitudinal effects to be studied: first semester assignments, first semester midterm examination, Christmas examination, Christmas mark, second semester assignments, second semester midterm examination, final examination, and final grade for the course. The MANOVA allowed partial correlation of these

measures to be used in analyzing the effect of treatment and maturity. This procedure also controlled for the effect of attrition. The Christmas mark and final grade correlated highly with all measures which preceded them, so it was decided to conduct a separate MANOVA for these measures so that differences independent of these two measures could be studied.

RESULTS

Tables 1 and 2 (see next page) show the means and standard deviations for each measure by each treatment group and maturity level. At the beginning of the year, there were 84 observations, 13 of which were distant students, 35 in the DUET classroom, and 36 in the normal classroom. Of the 84, 17 were classified as mature students while the other 67 were traditional students. By the end of the year, attrition diminished the total number of observations to 71: 13 distant students, 26 in the DUET classroom, and 32 in the traditional classroom. The final number of mature students was 16 while the final number of traditional students was 55. Results of the MANOVA indicate that across most of the measures there were no differences between the groups. The specific analyses follow.

On the fall assignments, no significant differences were found between sections, $F(2,66) = 0.03, p = .97$. No differences were found for levels of maturity, $F(1,66) = 2.40, p = .13$, although the results appear to tend towards significance. Performance on the fall midterm examination did not differ across section nor maturity level, $F(2,66) = .21, p = .82$ for section, and $F(1,66) = .90, p = .35$ for mature groupings. Differences in performance on the Christmas exam were found between levels of maturity but were not found between sections. For the mature variable, $F(1,66) = 10.03, p < .01$, while $F(2,66) = .55, p = .58$ for the section variable. In total, across the three measures taken during the Fall semester, one significant difference was found for maturity level on one measure: the Christmas examination. Mature students performed better on the Christmas examination than did the traditional students. While no significant difference was found between sections, it is notable that the means of the distant students and students in the DUET classroom were higher than those of the normal classroom with the exception of the Fall midterm. The means for mature students were consistently higher than those of traditional students across all measures.

Analysis of the Christmas mark, which is an indication of total performance for the Fall semester across the three above measures, seems to support this same trend. Mature students did significantly better than traditional students, $F(1,66) = 7.37, p < .01$. No difference in performance was found between sections, $F(2,66) = .45, p = .64$.

Analysis of the performance on tests and assignments during the Winter semester showed a decrease in variance between all groupings as the semester progressed. No differences were found between sections or level of maturity on

TABLE 1
Means and Standard Deviations for Sections

Measures	Distant		DUET Room		Traditional Room	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Fall Assignment	8.32	1.16	7.08	2.41	6.97	2.19
Fall Midterm	69.42	12.27	58.86	21.32	59.81	20.27
Christmas Exam	78.04	11.10	60.31	26.16	59.69	21.84
Christmas Mark	38.26	4.89	30.26	11.48	29.35	11.40
Winter Assignment	6.85	3.92	7.35	1.89	7.04	2.71
Winter Midterm	71.70	23.53	56.94	19.19	57.42	22.89
Final Exam	62.58	37.72	62.94	21.20	61.86	16.55
Final Mark	71.21	19.58	66.62	15.59	63.95	15.93

Note: Distant, $n = 13$; DUET Room, $n = 35$; Traditional Room, $n = 36$.

TABLE 2
Means and Standard Deviations for Maturity Levels and Total Sample

Measures	Mature		Traditional		Total	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Fall Assignment	7.97	1.93	7.04	2.23	7.22	2.19
Fall Midterm	67.77	15.81	59.16	20.51	60.90	19.87
Christmas Exam	75.50	22.27	59.52	22.41	62.92	23.19
Christmas Mark	37.02	9.16	29.59	11.03	31.08	11.05
Winter Assignment	7.00	3.59	7.15	2.39	7.12	2.68
Winter Midterm	71.53	21.86	56.46	21.22	59.86	22.14
Final Exam	65.31	30.09	61.54	18.67	62.39	21.58
Final Mark	72.74	18.26	64.37	15.61	66.26	16.49

Note: Mature, $n = 17$; Traditional $n = 67$; Total, $n = 84$.

the winter assignments ($F(2,66) = .17, p = .84$ for sections; $F(2,66) = .04, p = .85$ for levels of maturity). Analysis of winter midterm grades reveals a difference for levels of maturity, $F(2,66) = 5.64, p < .02$, but no difference between sections, $F(2,66) = .20, p = .82$. No difference in performance on the final examination was found for either maturity level or section ($F(2,66) = .62, p = .54$ for section, $F(1,66) = .25, p = .62$ for maturity). As during the Fall semester, a difference was found for only one measure: the winter midterm exam, and for the covariate: levels of maturity. Mature students received significantly higher marks on the winter midterm exam than did traditional students. No differences were evident between sections across all measures.

Analysis of the final grade, which is based on performance on all measures taken during the year, revealed a tendency toward significance for levels of maturity, $F(1,66) = 3.23, p = .08$, but not between sections, $F(2,66) = .33, p = .72$. In total, the MANOVA procedure indicates that differences exist between the means of mature and traditional students on both the Christmas and winter midterm examinations, and on the Christmas mark. All three hypotheses were upheld. A graph of the F values for each measure, based on the sequence from first measure to last, demonstrates that differences between levels of maturity were greatest in the middle of the academic year and least at both ends, while variance between sections remained low throughout the year and appeared to have no pattern (see Figure 1 next page).

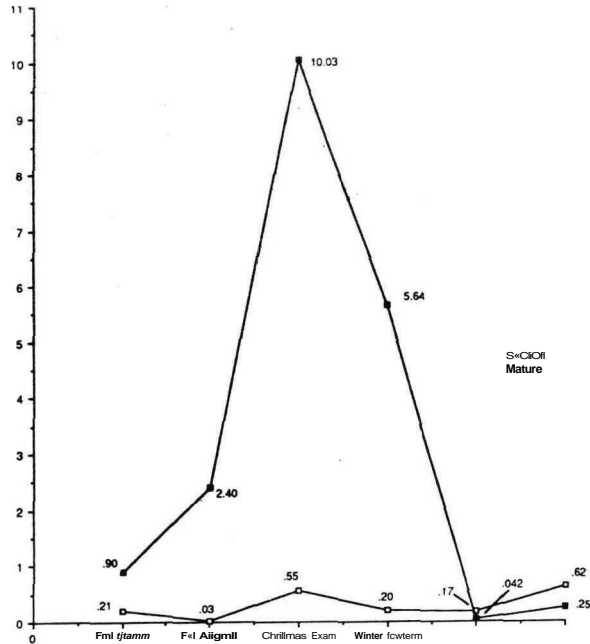
DISCUSSION

No differences in performance were found between the three sections but differences in performance on some measures were found for level of maturity of the student. Distant students, students in the DUET classroom, and students in the traditional classroom appeared to perform equally as well across all measures. Mature students performed significantly better than traditional students on the measures taken during the middle of the year and on the Christmas mark but no difference was found between the two levels of maturity on other measures.

It appears that neither the distant section nor the DUET classroom section were adversely affected by the technology used to deliver the course, as their performance was not significantly different from that of the normal classroom group. While no significant differences were found, the means of the distant student group and the DUET classroom group were consistently higher than those obtained for the normal classroom. This might be attributed to a novelty effect, as this was their first exposure to this kind of course delivery. The decrease in differences between means which occurred during the Winter semester would support this explanation.

An alternative explanation of the decrease in variation between groups as the year progressed might relate to the course content. It was observed that most of the mature students had more previous experience with the content presented through the winter midterm examination than did traditional students. Content treated after that exam appeared to be foreign to both

Figure 1.
*Chronological Graph of F Values for Mature
 and Section Groupings.*



mature and traditional students. Thus, the possibility exists that previous learning acquired by mature students may account for the significantly higher marks on the Christmas exam and Winter midterm. However, this does not explain the lack of variation between groups on the Fall midterm and assignments.

This study appears to indicate that, given the same course materials and the videoconferencing system, students receiving the course at a distance via the technology can be expected to perform as well as students receiving the instruction in a normal classroom setting, and as well as students receiving the instruction in the DUET studio classroom. It would appear that the university credit course developed for on-campus students was effectively transmitted over videoconferencing to provide the same education for both on-campus and distance students.

The materials and presentation for this course were slightly modified from those used in the regular classroom to facilitate video transmission, and to allow distant students to meet the same requirements as on-campus students. No other separate materials were generated for this course. The results of this study seem to cast doubt on the need to develop separate courses and materials specifically for distant students.

Other factors in the DUET videoconference environment were not part of

this study, but may be important in more fully describing its effects. While performance measures were treated in this study, attitudes were not assessed. The acceptability of the course to both distant and on-campus students deserves attention.

The amount and quality of the interactions in the videoconference environment also merit study. The frequency of interaction in the DUET classroom was observed to be less than that in the normal classroom. However, the frequency of personal interaction between the professor and students either face-to-face or via the telephone appeared to be greater than it was in the normal classroom. No records of interaction were kept so analysis was not possible. The question arises as to what effect the technology has on student interaction.

Both on-campus and distant students indicated in discussions with the professor that they used video tapes of the class for studying. The ability to review a class may have provided both an initial learning and a review advantage. While this has not been treated here, the effect of this access deserves attention.

Attrition rates for this kind of delivery system merit study. It was noted earlier that there were no drop-outs among the distant students, nine among the students in the DUET classroom, and four in the normal classroom. Several sources (Feasley, 1983; Holmberg, 1985) indicate that the drop-out rate for distant students is normally higher than that for on-campus students. For this course, the drop-out rate for distant students was the lowest of the three groups while attrition in the DUET classroom was highest. The question is asked whether attrition is related to the presence of the technology or to other factors.

In this study, all sections were taught by the same professor. During the year, there were six other sections of the same course taught by other professors. It is interesting to note that the overall final grade mean for the sections of Introductory Accounting studied approximated the final grade means for the other six sections, which were taught using the same course materials and examinations.

The concept of "piggybacking" a distance education course on the one developed for on-campus delivery is attractive for universities with few resources. The existing course and resource structure can be used with slight modifications to enable professors to teach a broadened student population. In using this structure, integration of distance education with on-campus education avoids some of the problems associated with the development of a separate distance course structure. This study has demonstrated that in one instance, Introductory Accounting over DUET, this kind of integration is pedagogically feasible.

More differences in performance were related to the maturity level of the student. This is consistent with literature concerning the performance of mature students. The question of whether there is an interaction between the technology and maturity level of the student remains unanswered. Since all distant students were mature, analysis of differences due to this interaction

was not possible. It appears to merit further study. The question also remains as to whether the technology has differential effects on different learner populations. Learning style, past experience with technology, gender, and so on, may interact with the videoconference presentation and yield different results for different learners.

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AUTHORS

- Diana R. Carl is an instructional technologist at Bell Laboratories, Naperville, IL 60555.
- Bruce Densmore is a Chartered Accountant in the Department of Business Administration, Mount Saint Vincent University, Halifax, NS.