

**An Investigation of the Instructional Role of
Communication Technologies in Distance Education**

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ABSTRACT

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It is often assumed that the use of communication technologies in distance education will provide an interactive learning context which will support higher levels of learning. The purpose of this study was to provide a framework for investigating the use of communication technologies in distance education from a learning perspective

In this study, two courses from the McGill Distance Education program with very different learning goals were examined to investigate the instructional role of two communication technologies (i.e., fax and e-mail) in distance education. The design of this study employed a mixture of both quantitative and qualitative data collection and analysis procedures. The data set included verbatim e-mail and fax transcripts, instructor interviews, course syllabi and course assignments. Triangulation procedures were followed to examine the following within the context of two distance education courses with very different learning goals: 1) the general instructional purposes for which the technologies were used; 2) the levels of learning reflected in the mediated interactions; and 3) the relationship between the use of the technology, the instructors' perceptions of its use and the stated learning outcomes of the courses.

The findings indicated that e-mail and fax were used for different purposes. Electronic-mail provided the interaction necessary for encouraging discussions of course

content in the Instructional Design course, whereas fax was used more for the transmission of knowledge in both courses. An examination of the relationship between course learning objectives, course transcripts, and instructor interviews indicated that the instructors were consistent in their views on different communication technologies, their purpose for using the chosen technology, and the way in which they used the specific communication technology. However, this consistency was not reflected in the students' use of the communication technologies since the students responded only at Bloom's lower levels of learning even though the transcripts showed all levels of learning. These findings indicate that communication technologies have the potential for multiple instructional use aimed at various levels of learning. Further investigation is required to better understand how to incorporate these communication technologies into distance education courses in order to foster more meaningful learning.

RÉSUMÉ

Une recherche sur le rôle pédagogique des technologies de communication utilisées en formation à distance

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Il est souvent assumé que l'utilisation des technologies de communication en formation à distance soutient l'interaction nécessaire pour supporter l'apprentissage. Le but de cette étude était de réaliser un plan pour l'investigation de l'utilisation des technologies de communication en formation à distance d'une perspective d'apprentissage.

Dans cette étude, deux cours du programme de formation à distance de l'Université McGill avec des objectifs d'apprentissage très différents ont été examinés afin de pouvoir établir le rôle pédagogique de deux technologies de communication en particulier: le messagerie électronique et le facsimilé. Cette étude a employé des données et des procédures d'analyse quantitatives et qualitatives. La base des données a été composée des interactions médiatisées, d'entrevues avec les instructeurs, et les travaux de cours. Les procédures de 'triangulation' ont été suivies pour examiner trois aspects du contexte de cours en formation à distance qui ont des objectifs d'apprentissage très différents: 1) le rôle pédagogique des technologies de communication; 2) le niveau d'apprentissage refleté dans les interactions médiatisées; et 3) la relation entre le rôle pédagogique des technologies, la perception des instructeurs vis-à-vis l'utilisation de ces technologies, et les objectifs d'apprentissage des cours en particulier.

Les résultats démontrent que le facsimilé et la messagerie électronique sont utilisées pour de différents buts pédagogiques. La messagerie électronique soutient l'interaction

nécessaire pour encourager des discussions du contenu du cours 'Instructional Design'.

Parcontre, le facsimilé a été utilisé pour répondre à des questions plus simple et pour clarification. Les instructeurs ont démontré une certaine conformité dans leurs vues des différentes technologies, les buts pour lesquels ils ont utilisé ces technologies, et la manière que ces technologies ont été utilisées. Parcontre, cette conformité n'est pas en évidence avec les étudiants parce que les étudiants ont utilisés seulement les niveaux les plus bas de Bloom même si l'instructeur du cours 'Instructional Design' a utilisé tous les niveaux. Ces résultats démontrent que les technologies de communication peuvent être utilisées pour différents niveaux d'apprentissage. Parcontre, plus d'étude est nécessaire pour développer une compréhension plus profonde du rôle pédagogique des technologies de communication afin de pouvoir encourager un apprentissage plus profond.

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CHAPTER 1

Introduction

The last decade has seen an increase in the importance of distance education as a viable and useful instructional mode for postsecondary education. Since its very beginning, defining distance education has proven to be a much more difficult task than anyone might have anticipated. "The variety of distance education frameworks in use worldwide has caused considerable argument amongst theoreticians who attempt to define and describe boundaries to the field" (Mason, 1989, p.1). At the same time, distance education has been distinguished by others as a distinct area of inquiry (Sparks, 1983; Keegan, 1986). Several theoretical frameworks have been proposed by Peters (1982), Moore (1972, 1973, 1983), Holmberg (1982, 1985, 1986), Keegan (1986), Garrison (1989), and Verduin & Clark (1991). Despite differences in perspective, a central theme which emerges from these frameworks and from current research is that of interpersonal communication (or lack thereof) in distance education.

The lack of a direct, continuous link between teachers and learners is often the primary variable used to characterize distance education. Indeed, the separation of student and teacher is the primary element of the commonly cited

definitions of distance education (Holmberg, 1977; Keegan, 1980). The evolution and use of communication technologies within the distance education context therefore has been welcomed, in part to refute the criticism that distance education is a form of passive (versus active) learning.

Nipper (1990) describes three generations, or models, of distance education, which he states are linked historically to the production, distribution, and incorporation of communication technologies. The "first generation" model is that of correspondence teaching and the medium used is written or printed material. Feedback mechanisms are slow, infrequent, and mostly restricted to feedback on assignments submitted by the student to the teacher.

"Second generation" distance education, developed since the late 1960's, characterizes most distance education programs today. This model has been described as a multi-media system as it involves the integration of print with one-way communication technologies such as broadcast media, cassettes, and minimal use of computers. Feedback processes are similar to those of "first generation" distance education, except that telephone communication and some face-to-face tutorials are also used.

The primary emphasis of these two models of distance education has been the production and distribution of teaching/learning materials to learners.

Communication between teachers and learners is minimal and communication amongst learners is nearly non-existent. This is primarily due to the limited possibilities for two-way communication in these models.

"Third generation" distance education focuses on the use of two-way communication technologies such as computers to improve communication between teachers and learners. The processes involved in this model are much more social and interactive. Bates (1986) states that computer-mediated communication places distance education in a situation very similar to that of traditional education, except that there remains a physical distance. The advantage this latest model has over the first two is that the instructor can be more attentive to the progress of students, more sensitive to the needs of each individual, and is able to respond to students' demands without delay (Henri, 1989).

The newer two-way communication technologies have been heralded partly because of the commonly held assumption that providing interpersonal communication between teachers and learners, and amongst learners, would automatically improve the quality of learning. Hall (1987, p.47) cautions that: "The revolution in telecommunications has the potential to increase access to learning... But such access to knowledge does not necessarily in itself produce a learning situation..." One of the problems has been the approach to the use

of communication technologies in distance education. Course design has often focused on the technology rather than the promotion of learning. The question is often "What technology should we use in this program?" instead of, "What kind of learning should result from this course and how can the technology be used to support this learning?"

Course Design in Distance Education

Instructional materials development in distance education has often mirrored campus-based instruction and offered "print-based lectures" or become locked into an "instructional design formula" resulting in courses which look alike, regardless of desired learning outcomes or the structure of knowledge in the subject content.

Bates (1990) suggests that there are significant differences in the educational applications associated with different technologies since each medium represents knowledge in different ways. This is significant for media selection because different subject areas have different requirements for the representation of knowledge. "The design of multi-media distance learning materials which encourage active learning requires ... an understanding of both media and learning" (p.23).

Similarly, Hall (1987) argues that the "nontraditional" methods of instruction such as correspondence, television and computer assisted courses

have proven highly efficient in facilitating fundamental aspects of learning such as acquisition of information and communication skills. However, the intellectual abilities of analysis, synthesis, application and evaluation, critical to the acquisition of knowledge in some subject areas, has not been addressed systematically in higher education in general and even less so in distance higher education. The new communication technologies hold potential in accommodating teaching and learning pedagogies which nurture and elicit such advanced abilities, but distance education course designers need well-defined concepts of what higher learning is really about and how it can be encouraged and supported by various technologies.

Baath (1982) has been somewhat more specific regarding the appropriateness of two-way communication to different learning outcomes. He proposes that instruction in which the learning goals are more fixed tends to require a greater emphasis on the teaching materials than on interpersonal communication between the student and the distance education tutor. Conversely, instruction with less fixed goals tends to require greater emphasis on interpersonal communication.

In the general education literature, there is evidence that certain instructional methods are effective for specific kinds of learning. Weston and Cranton (1986) developed a classification of instructional strategies linking

instructional method to desired learning outcomes. Their work suggests that less interactive learning tends to be more effective with learning outcomes which can be stated in more explicit behavioral terms, such as factual-procedural learning or skill development. By contrast, content which is less easily defined in behavioral terms tends to profit from instruction which includes more interaction. In a variety of studies concerned with higher-level cognitive learning, expository methods were less effective than methods where learners interacted with the content or with other learners (McKeachie, 1986).

The fact that different course content require different kinds of learning will be reflected in both the learning objectives and in the level of interaction required to achieve the learning goals. It is this required level of interaction which should influence the choice of communication technology and the way in which it is used. Dillon, Hengst, & Zoller (1991) echo these views by calling for research efforts that will provide distance educators with systematic guidelines for selecting instructional strategies, including the choice of communication technologies

To summarize, the design of distance education course materials incorporating specific communication technologies has been approached from two perspectives: as a variant of distance education, and as an extension of classroom activities. However, holding on to these perspectives may limit our

understanding and realization of the full potential of communication technologies to promote learning (Harasim, 1990), and may be emphasizing efficiency over the qualitative instructional advances which these innovations could offer (Vallee, 1982; Harasim & Johnson, 1986; Kaye, 1987).

The rationale for this study has evolved from a critical review of the current research which address the use of communication technologies in the instructional context. Although this literature is quite extensive, most of the work to date has focused on providing descriptions of existing communication technology systems and/or user problems and benefits. Past research has shown that there are benefits in using such technologies, both for administrative purposes (e.g., registration) and for student support (e.g., decreased isolation and increased communication which leads to increased student motivation and improved attitudes) (Evans, 1984; Holmberg, 1985, Moore, 1983; Rekkedal, 1983; Scales, 1984). However, little has been reported on how these communication technologies improve the quality of learning or what their instructional role might be in doing so. Any research efforts to date, that the author is aware of, have looked at the use of these technologies from a structural perspective - using such techniques as Intermassage Reference Analysis (IRA) which uses Message Maps; Message Act Analysis (IRE sequences); or Message Flow Analysis which examine the

flow of messages over time (Winkelmann, 1988; Harasim, 1990; Romizowski & de Haas, 1989, Latham, Moore, Ritchie, Rothwell, & Wilde, 1990). In order to investigate the instructional role of various communication technologies, the content of the messages rather than their structure must be examined. With the exception of some preliminary work done by Henri (1989), there has been little consideration of this perspective.

The purpose of this study is therefore to provide a framework for investigating the use of communication technologies in distance education from a learning perspective. Specifically, this study seeks to examine the following within the context of two different distance education courses with very different learning goals. 1) The general instructional purposes for which the technologies were used; 2) the levels of learning reflected in the mediated interactions; and 3) the relationship between the use of the technology, the instructors' perceptions of its use, and the stated learning outcomes of the courses.

CHAPTER II

Literature Review

In order to be able to achieve a better understanding of distance education as it is practised today, this literature review will trace the development of communication technologies, as they have been used within distance education programs. "The field in general [of distance education] is developing from the original correspondence teaching methods through the stage of additional technical facilities towards an integrated multi-media approach in the setting of open learning" (van Seventer, 1990, p 12).

Included here are studies which attempt to investigate any of a number of variables related to the use of four distance education communication technologies: telephone tutoring, FAX , electronic mail, and computer conferencing. The selection criteria for including an article in this review were lenient because of the limited amount of research extant. Also, many of the located references lacked the necessary details to allow a critique to be made. In general, the articles which were included were those that reported a recognizable methodology and results which could be examined and critiqued. Although these selection guidelines seem very broad, the procedure used eliminated a vast majority of the pertinent material that was found. Most of

the literature is comprised of descriptive analyses of specific distance education systems which use various communication technologies. For example, there are descriptions of existing computer-mediated communication systems, such as EIES used at the New Jersey Institute of Technology, PARTICIPATE used at the Ontario Institute for the Studies in Education, CONFER used at the University of Michigan since 1977, and CoSy developed by the University of Guelph (Romiszowski & de Haas, 1989; Calvert, 1987). There is comparatively little which can be considered formal evaluation or research.

Most of the empirical research efforts have centered around instructional issues such as attrition rates, comparison of final grades in distance education courses with traditional courses, etc. As Harasim (1987, p.118), who works with computer conferencing comments: "Analysis and discussion of the specifically EDUCATIONAL value of computer-mediated communications is only beginning to emerge as a distinct area of research."

Telephone tutoring

One of the earliest technologies implemented in distance education programs was the telephone. Its use, generally in more developed countries, has been mainly as a student support component.

In a study focusing on the effectiveness of telephone tutoring in correspondence education, Flinck (1978) randomly assigned students to control

or experimental groups. The experimental group received telephone tutoring in addition to the conventional feedback, whereas the control group received only written feedback by mail. The courses included in the study were Introductory French and Basic Economics, both intended for adult learners. The results indicated that students who received telephone tutoring reacted to it favourably. Telephone tutoring was used mainly to treat subject-related problems, but at the same time, it gave students the opportunity to discuss personal or social problems. However, no significant differences were found between the two groups in achievement, amount of study time, or feelings of isolation. Telephone tutoring proved to be of a greater advantage to those students studying a foreign language than to students studying one of the social sciences.

Sweet (1982) examined both the frequency of telephone contacts between student and tutor and tutor support extended to students to determine if either was related to student persistence. His subjects were 118 students at the Open Learning Agency in British Columbia, Canada. Students who handed in all assignments were defined as "completers", as opposed to "non-completers". No significant differences were found in the frequency with which tutors telephoned students in the completing and non-completing groups. Non-completers rated tutors more highly on the measures of tutor receptiveness

and support, which suggested that tutors were attuned to the greater need of students in the non-completer group for guidance and had established a positive tone that fostered dialogue with these students. However, there were no significant differences in the amount of tutor telephone contact between the two groups. It was found that 45% of those who completed the course contacted their tutors and 32% of those not completing the course had made contact, a significant difference. No learning or achievement measures were reported.

Scales (1984), also at the Open Learning Agency, B.C., Canada, examined the relationship between telephone tutoring and persistence in course completion. "Persistence" was defined in terms of number of assignments submitted. The courses at OLA are set up in such a way that each assignment that is submitted represents a completed section of the course. Therefore, the greater the proportion of assignments submitted, the higher the relative degree of persistence. She formulated three hypotheses: (a) a positive relationship will exist between the quantity of telephone contact and student persistence; (b) a positive relationship will exist between student-initiated (as opposed to tutor-initiated) telephone contact and student persistence; and (c) there will be a relationship between type of academic program and persistence. At the time of this study, OLA provided tutors with a telephone in their home with no restrictions placed on the number or length of calls. Also, tutors were

expected to initiate a call early in the semester to reinforce the fact that the tutor is there to provide assistance, is expected to make follow-up calls throughout the semester to discuss assignments and provide support. The subjects were 57 students who were randomly selected from a larger pool of students records from one semester, and these students were followed the entire semester. The results confirmed all three hypotheses. The association between persistence and telephone contact was greatest for students enrolled in the Adult Basic Education program, where a greater number of students did not have a high school education.

Potter (1983), working at Murdoch University in Western Australia, asked participants in the external studies program to answer a questionnaire in order to ascertain two things: firstly, the extent to which external students, tutors and course-writers felt that they would derive benefit from an interactive form of external studies; and secondly, the type of telephone-based instructional processes and facilities they would find most helpful. The results indicate that 71% of external students expressed a preference for the distance teaching mode as opposed to the home study mode. In the distance teaching mode, the students are guided through the course by the tutor who supplements course material with face-to-face and/or telephone-based interaction. On the other hand, in the home study mode, the tutor simply marks the assignments

and the student works through the course alone. The results also showed that 65% of all tutors and students indicated that the discussion, by telephone, of marked assignments would be helpful. Potter reports that not all methods of using the telephone are useful for all types of courses or studies. For example, although tutor-initiated telephone discussion at the beginning of a course can be helpful to all schools of study, other methods should be limited to specific purposes (i.e., dial-access should be used primarily to discuss students' administrative queries rather than offer academic mini-lectures).

In their search for a basic distance learning paradigm, Coldeway & Spencer (1982) examined various configurations of Keller's Personalized System of Instruction (PSI). Their control group included 95 students enrolled in a distance education Introductory Accounting course which already was in use at Athabasca University, Alberta, Canada. Their experimental group subjects were 121 students enrolled in a distance education Introductory Accounting course, also at Athabasca University, but which had been modified to include four basic components of Keller's PSI. These subjects were randomly assigned to one of five experimental groups. The first experimental group was Instructional Baseline (IB), in which the students had access to their tutors by phone during regular tutor hours to discuss course-related problems. The second experimental condition (PSI-P) used a course structured according

to PSI standards and students received immediate feedback by phoning their tutor once they completed the multiple choice quiz at the end of each section of the course. The third experimental group (PSI-M) used the same PSI course as the second group, but the students mailed in their multiple choice quizzes and the tutors phoned them to give them feedback and inform them of their grade. The only difference between the second and third experimental groups was the length of time students had to wait to receive feedback on their quizzes. The students in the fourth experimental group were given the choice between PSI-P and IB conditions and 83% of students in this group chose PSI-P over IB. The students in the fifth experimental group were given a choice between PSI-M and IB conditions and all of these students chose PSI-M. In their results, Coldeway & Spencer report that a larger percentage of students in the PSI-P condition passed the credit exams throughout the course. They also report that 76% of telephone calls in the PSI-P group dealt with course content related issues, compared to 37% for the IB group and 69% for the PSI-M group. The relatively small differences which were found between the control group and the IB condition suggest that what is needed is a system that supports the instructional package and manages the student's activities on an on-going basis. The use of the telephone in the PSI-P condition seems to be a viable option by providing an effective delivery/management system.

Telefacsimili (FAX)

Telefacsimili (FAX) is a low-cost means of sending paper copies of documents using telephone lines (Schamber, 1988). A page is scanned by a FAX machine at one end, transmitted, and printed at the other end in about 45 seconds. The cost, after the initial equipment investment, is that of a telephone call. FAX machines can also interface with microcomputers and can double as copy machines.

Unfortunately, no studies were located which addressed the use of FAX, even though it seems to be quite widely used (Burpee, 1991; Schamber, 1988). The main advantages of this technology seem to be threefold. It avoids the long delays in feedback which are evident when the mail system is used and it is both less costly and less complicated to use compared to other computer communication technologies. Whether or not FAX is an efficient technology for supporting the discourse necessary for achieving various learning outcomes remains to be studied.

Electronic Mail

Electronic mail (e-mail) networks support communication among designated groups, and also permit individual two-person communication. These systems, which can be local, national, or international, usually charge a user fee, although an educational institution may pick up all or part of the cost

for faculty and students.

Quinn, Mekan, Levin & Black (1983) investigated possible context and content differences between electronic and face-to-face discussions in a college level Sociology course taught by one of the authors. The students were divided into two groups; one participated in face-to-face discussions in the regular classroom setting and the other participated in discussions via an electronic mail system for a three week period. Because of student resistance, participation in the e-mail group was voluntary which prevented the researchers from switching the groups mid-session and which may have biased certain findings.

In the content area, there was no significant difference between course grades for the two types of discussion groups. However, they did find that the instructor directed more than twice the number of questions to students in face-to-face classes than in the electronic interaction. Also, the instructor asked more process questions (requiring interpretations or opinions) in the face-to-face classes rather than more product questions (requiring a "factual response") which were required in the electronic mode. Responses were, on average, longer and more complex in the electronic mode (averaging 106 words in length) than in the face-to-face mode (averaging 12 words in length). These results support considerable content and quality differences which exist between

the two modes of instruction.

In examining context differences, they compared the process by which learning took place in the electronic discussions to the ways in which learning took place in the face-to-face discussions. The results were as follows: the amount of time spent on a specific topic was longer in the electronic mode; the time delay factor in the electronic mode was a problem for some students but an asset for others; and students' previous experience with computers did not influence their contributions to the electronic discussions.

Another difference was the structure of discussion in the two modes. Face-to-face classroom interactions have a sequential organization of initiation, response and evaluation (Mehan, 1979). That is, the instructor asks a question, a student provides an answer, and that response is evaluated by the instructor. In the electronic mail discussions, an initiation was followed by multiple student responses and little overt evaluation.

In concluding, Quinn et al. (1983) suggest that to use electronic mail systems for instructional purposes, the following guidelines would be helpful. The course outline should be structured to take advantage of multiple threads of discourse possible in "non-real" time media; the "non-real" time instructional interaction should be organized by using message headers to indicate the subject content each message relates to; and the introduction of an

electronic mail system should encourage students to use it early on in the course and to use it on a regular basis.

Gardner & Tillman (1986) described the process of introducing, maintaining, and using an electronic bulletin board with fourteen doctoral students enrolled in a research course. The use of the bulletin board was voluntary and it is not clear for what purposes the students were advised to use it.

The results indicate that only half of the students signed on the bulletin board, and that no files were uploaded or downloaded. The researchers state that this minimal usage of the system could be related to the following facts: not all students had access to the necessary hardware at the beginning of the course, and the system was introduced at a very stressful point in their studies. Results from the self-report inventories given during the last class indicated that 8 of the 11 respondents planned to use the bulletin board more in the following quarter, and 10 of the 11 agreed that the bulletin board should be continued. The students were also given the Stages of Concern Questionnaire developed by Hall, George, and Rutherford (1979) to measure their concerns about the bulletin board as an instructional innovation. This theory assumes that users move through seven stages of concern about the innovation, and that the intensity of concern varies from stage to stage. The results indicate that

the users did have a different profile than the non-users, but the authors do not detail these differences, perhaps because of the small number of students involved

Romiszowski & de Haas (1989) attempted to implement an international e-mail system with structured interactions that would replicate a number of face-to-face strategies of instruction. They had 47 subjects signed onto the network: 23 at Twente University in Holland, and 24 at Syracuse University in the United States. They modelled the e-mail discussions on the seminar structure by presenting a short paper to be read by all subjects. The messages of all participants were automatically routed to all other participants. The focus of this e-mail seminar was to be the discussion of the content of the seminar paper. Some 100 messages were circulated in a period of three weeks. An analysis of how the system was used indicated that only 32 messages were directly related to the seminar themes and were contributed by only 19 of the 47 seminar participants, a participation rate of 40%. Of these, 12 of the 19 who responded sent only one message. The balance was a mixture of test messages, help messages, chit-chat between individuals, and some technical messages related to using the e-mail system. The 32 theme-related messages were contributed by only 19 participants, a participation rate of only 40%. Also, the researcher found that the discussion that did take place

was quite different from the intentions defined in the initial seminar paper. A retrospective study of the dynamics of the seminar suggests that the initial respondents to the paper set the tone for the whole experience. Later respondents tended to reply to the latest messages on the system, rather than to a general framework for the discussion set up in the original seminar paper, even though the organizers input several messages indicating that they were straying from the original seminar topic.

Separate analyses of the structure of the discussion were performed by different participants at both Twente and Syracuse after the e-mail seminar was completed. Each analyst found the structure to be different. The analyst from Twente identified six main topics, whereas the analyst at Syracuse identified only four main topics and only three of these were present in the Twente analysis. These results would seem to support the view that the characteristics of e-mail communication create some difficulties for the participants to maintain a clear picture of the discussion over time. Romiszewski & de Haas (1989) conclude:

While in face-to-face discussion, several topics may be raised in sequence, their relationship is still kept in memory. The spreading of this discussion over a much longer time period introduces some extra difficulties in keeping an overview/perspective of the discussion as a

whole. This effect could well be more pronounced and have more serious consequences in larger and longer CMC [e-mail] sessions.

(p.11)

Latham, Moore, Ritchie, Rothwell, & Wilde (1990) conducted a pilot study at Mitchell College, Australia, which connected external students to the college by using a microcomputer / local area network / mainframe linkage [e-mail system] established with the help of IBM Australia. The aims of the project fell into three main categories: a) to investigate whether the use of a microcomputer would enhance the students' learning process, b) to investigate student background variables; and c) to investigate the technical and organizational aspects of establishing such a network at Mitchell College. The project was based on two groups of 15 first year undergraduate students, one group studying the Social Sciences and the other studying introductory Computer Programming.

The "student background variable" results indicate that the average time to become familiar with the equipment was 2-3 weeks; that most students used the computers from early afternoon through to 2300 hours; that Saturday, Sunday, Monday and Tuesday were heavy usage days; that the usage by the Social Science students tended to tailor off as the semester progressed; and that the Computer Science students were logged on for twice as long each day as

were the social science students.

The "student learning processes" results indicate that 6 of the 9 Social Science students responding to the questionnaire agreed that they benefited from interacting via e-mail with other students. In contrast, the Computer Science students stated that they did not use the opportunity to send or get memos from other students very much and that when they did it was not helpful. However, 8 of the 9 responses from the Computer Science students agreed that they had a definite advantage over other external computer science students who were not using the e-mail system. The final grades obtained by the students in both groups from exams were of a high standard, but the researchers state that no significant results were reported due to the project selection criteria not being completely random and the small sample size. However, the majority of students (over 95%) stated quite strongly that the use of e-mail in contacting lecturers was their greatest benefit.

Computer Conferencing

Computer conferencing systems are based on e-mail systems, but offer a much wider range of communication facilities (Mason, 1988). The main advantage computer conferencing has over e-mail systems is that it provides the possibility for group interactions, which leads to a more interactive and collaborative level of learning (Henri, 1989; Harasim, 1989). However,

Harasim (1989) also states that even if the computer conferencing system offers the potential for group interaction and communication, it does not guarantee it. She elaborates by stating that although there are reports of high participation rates and of group interaction, there are also reports of difficulties in establishing an active membership.

McCreary & van Duren's (1987) research on the influences of participation in computer conferencing have found that individual participation is determined by the personality, degree of confidence and level of interest in the subject matter of each student. They contend that this is similar to the classroom situation. They also found that students tend to make use of the system in relation to (1) accessibility - equipment must be easy to get to, familiarity with a few commands, and pre-course training in use of the system; and (2) perceived benefit - students must have some external incentive to use the system when it is their first time (i.e., portion of final grade allocated to use of the system).

Some interesting statistics have been reported on the use of computer conferencing, as compared to the conventional classroom. In face-to-face classrooms, 60-80% of verbal exchange during class time comes from the teacher (Dunkin & Biddle, 1974; McDonald & Elias, 1976). On the other hand, the instructor in on-line education typically contributes only 10-15% of

the message volume and of the number of conference messages (Harasim, 1987; Winkelmann, 1988). Also, transcript analysis shows that interaction is highly student-centered, with over 80% of messages referencing one another (Harasim, 1989).

Harasim (1987) conducted some exploratory field research in which both qualitative and quantitative data were collected from participants in two graduate level courses (n=24) which were offered entirely on-line. The researcher used a measure of "effectiveness in learning" which was defined by participation and user perception. Data indicated that students participated in an average of 4.2 hours/person/week in Course 1 and 3.6 hours/person/week in Course 2. Harasim contrasts this with the required 2-3 hours/week of classroom time generally associated with on-campus courses. Harasim adds that the measure of participation became increasingly inaccurate as students became more adept at up/downloading conferences and working off-line. One hundred percent of the students in Course 1 reported spending more time on the on-line course as compared to on-campus courses; while 50% of the students in Course 2 reported spending more time and 20% reported spending approximately the same amount of time. In Course 1, the principal instructor entered 10% of the total number of messages, while in Course 2, 12% were entered by the instructor. A breakdown of the content of the messages is not

included nor is there any reference to the learning which resulted from the conferences. In Course 2, 90% of the students reported that the amount of instructor input was "just right", there is no comparable data for Course 1. Eleven of the twelve students in Course 2 reported that they considered on-line instruction to be more effective than classroom situations for some applications, but these were not specifically reported. There was no comparable data for Course 1. Students were queried as to the advantages to learning on-line and the analysis of their comments revealed several themes: increased interaction, access to group knowledge and support, democratic environment, convenience of 24 hour access, user control over the learning interaction, motivational aspect and text-based communication.

In an attempt to understand the structure of communication within computer conferencing, Winkelmanns (1988) applied three different methods of message analysis to a computer conference which was part of an on-line graduate level course. The project attempted to answer two major questions:

- a) what message interaction patterns arise in an on-line graduate seminar; and
- b) how well do selected message analysis techniques identify interaction patterns

The subjects in his study were 30 graduate students enrolled in a course which was offered entirely on-line at the Ontario Institute for Studies in Education (OISE). The data was gathered from messages from one specific

seminar which represented the transcripts of three small group on-line discussions. The three groups posted 238 messages during the one week session in which the seminar occurred.

Intermessage Reference Analysis (IRA) was used to prepare message maps, identify thematic clusters, and locate comments which scored highly in influence (impact of a comment on later messaging activity) and confluence (extent to which an entry unites ideas). The message maps revealed a high degree of interconnection between the comments within a group. Significant themes were accurately identified by analyzing the content of messages receiving four or more references, rather than by using cluster analysis. Using referencing as the criterion, early entries were found to have greater influence on the discussion than later entries. Instructor summaries generally exhibited a high level of confluence, whereas many student summaries did not.

Message Act Analysis (MAA) revealed that many comments accomplished several Initiation, Reply, or Evaluation acts. In contrast to teacher-centered environments, nearly all of the evaluative comments were provided by the students. The Initiation-Reply-Evaluation discourse pattern common in face-to-face classrooms was embedded within more complex acts sequences: an Initiation could stimulate several parallel Replies or chains of Replies.

Message Flow Analysis (MFA) revealed that there were two waves of activity. Students posted their initial entries, which were largely based on the assigned readings, during the first three days of the session. There was a decline in activity on the fourth day, which was followed by a sharp increase over the three final days as students prepared and posted their summary comments.

As Winkelmans (1988) concludes,

"In many ways, the on-line discussions were similar to FTF [face-to-face] graduate seminars. Opening remarks were based on assigned readings, and later comments shifted in focus to previous student statements. Students who posted the earliest comments had the greatest influence on the session's choice of discussion topics." (p.123)

Mason (1989) used a descriptive case study approach to analyze the use of computer conferencing in a graduate level course at the Open University, Milton Keynes, UK. The data for this case study was collected in four different forms (1) from interviews (12 tutors, 15 students from two of the tutor groups and course team members for a total of nearly 50 interviews); (2) from observation of students, tutors and the course team, (3) from a variety of documents (the most important of which was the content of all the conferences of 1988: 65 tutor group conferences and 6 national conferences); and (4) from

statistical analysis of surveys, the student database, and computer generated usage data.

The success of the application of computer conferencing was analyzed in three ways: its effectiveness as a mass distance teaching medium, its value as a medium for tutoring, and its use as a minor component of a multi-media course. The results show that computer conferencing can be used with large numbers of students mastering the system at a distance, though not necessarily using it interactively. The medium is also very successful for specific tutoring activities, such as support, advice, and information exchange, and potentially successful for interactive discussion. However, as a minor component of a course, it is too powerful and too time consuming to be successful.

A study conducted by Henri (1989) is one of the few which has investigated the instructional design (involving a technology) and the kind of learning it supports. The primary focus of Henri's study was the use of a cognitive learning approach in the development and validation of an instructional design model incorporating computer conferencing. The goal of this research was to determine if the technological qualities of computer conferencing supported the interactive learning process deemed necessary to master the course content. The validation study was carried out in one course offered to financial consultants, all employed by the same institution (n = 11).

The course was divided into five computer conferences, each serving a different purpose (e.g., CAHIER assisted students in their use of the self-directed learning materials; PROBLEME offered support for group problem-solving; CAFE encouraged socialization, development of group solidarity and motivation). Messages were analyzed from five different perspectives in an effort to retrace the learning process that took place: general participation, general interaction among participants, social interaction among participants, evidence of cognitive and metacognitive functioning. The goal of this analysis was to discover the abilities the learner uses in order to process information while participating in a computer conference. The communications were separated into meaningful units of analysis using the content analysis objectives described by Muchielli (1984). These messages were then coded using various coding schemes elaborated for each of the five dimensions mentioned above. The results were then compared between participants and within the five dimensions listed above. Although Henri states that inter-rater reliability procedures were followed to establish these coding schemes, no statistics are reported.

The results indicate that the proposed model was useful in organizing the interaction in computer conferences and in informing the participants of their expected roles. Henri also states that this method supports the acquisition

and transfer of knowledge, as well as the development of applied capabilities. However, she does not state how she arrived at this conclusion, other than to say that participants reported so in post-experimental interviews. The message analysis method in this study presents two significant problems, that of "internal" (or construct) validity and that of reliability. Henri attempted to overcome the problem of validity by obtaining inter-rater reliability, however, the two raters were also involved in the project as conference moderators and as already noted, the level of inter-rater reliability is not reported. The problem of reliability is that the content may be different for every analysis which may change the coding categories.

Recommendations made for each of the five dimensions studied were as follows: (1) instructors should not expect even participation from all participants, (2) establishment of a conference solely for social purposes helps to polarize interactions (i.e., keeps social chit-chat out of other conferences); (3) independent (as opposed to interactive) messages are pertinent to discussion themes and should not be omitted from the analysis; (4) on the cognitive dimension, instructors should expect students to use clarification most frequently and treat information mostly at a surface level; (5) instructors should expect to find metacognitive information given freely by the students only in the conferences that are strictly for the acquisition and/or deepening of new

concepts. The researcher concludes that the model is useful in organizing the interaction in computer conferences and in informing the participants of their expected roles. The original premise of the study which states that interaction must exist to produce a significant learning experience was modified to address the large number of independent messages which led the researcher to conclude that the individual development of knowledge is also a valid objective in the use of computer conferencing.

CHAPTER III

Method

The setting for this study was the McGill University Distance Education program which offers courses, most leading to a certificate in Educational Technology. Students in these courses are primarily practicing public school teachers in Quebec and Ontario. All courses have been based on correspondence materials but most have incorporated telephone contact, e-mail and/or fax to provide instructor-student contact.

The fax, e-mail and regular mail transcripts between instructors and students, interviews with course instructors, and course syllabi composed the data set for this study. Approval to review the transcripts was received from the program director and the individual course instructors. Ethical guidelines were followed telephone contacts and contact by mail (see Appendix E for copy of letter sent to course instructors). The study was approved by the Ethics Review Committee of the Faculty of Education of McGill University (see Appendix F for Certificate of Ethical Acceptability).

Two different courses were considered, Software Applications I and Instructional Design I taught by two different instructors. In addition, two sessions of the Software Applications course were included to compare the ways in which the same instructor used the communication technology in

the same course offered at two different times. The courses are coded as follows: Course 1 is the first session of the Software Applications course (n = 9), Course 2 is the Instructional Design course (n=6), and Course 3 is the second session of the Software Applications course (n=9). These two courses were chosen because they require different types of learning and because both courses and instructors had been highly rated by students. The students in the Software Applications courses were given a study guide and reading materials prepared by the instructor. The students in the Instructional Design course were given a text ("Instructional Design" by Kemp), a video, a study guide and reading guides which structured their on-line discussions of the course content.

Design and Procedure

Both quantitative and qualitative data collection and analysis procedures were employed. Following the guidelines for establishing trustworthiness in qualitative analyses (Lincoln & Guba, 1985), procedures for triangulation were then followed. The data sources compared were e-mail and fax transcripts, instructor interviews, and course syllabi. The data collection and analysis was done in seven stages and will be described in detail below.

Stage 1

The first stage of this study was the collection and transcription of all

mediated communications between students and instructors for the three distance education courses.

All students messages were anonymously collected, transcribed and coded in order to preserve the confidentiality of students. Each message was numbered, given an instructor code and a student code. Each course was examined separately. The instructor who taught both sessions of the Software Applications I course was given two codes, one for each session.

Stage 2

Once the messages were transcribed, they were coded according to the purpose of the communication. The three major categories of the coding scheme were taken from the framework proposed by Amundsen (1988): Content messages, Student Support messages, and Administrative messages. As the transcripts were reviewed, it became evident that these three major categories were not specific enough descriptors. Therefore, more specific levels were determined following a qualitative analysis procedure of analytic induction. Borg & Gall (1989, p.404) described analytic induction as "the process of searching for propositions that apply to all cases of the problem under analysis." The more specific codes under each purpose emerged from the data itself by reviewing the transcripts a second time, postulating various sub-categories and seeing how the appropriate data fit into each sub-category.

At this point, it also became evident that one message served more than one purpose, and so the unit of analysis was broken down into units of meaning. That is, as a message progressed different themes were represented and each new theme may then become a separate unit of analysis. See Appendix A for Coding Scheme I.

In terms of the three broad coding categories, Content messages can best be described as any message related to the discussion of course content or course concepts. Messages which fell under this category were identified further as: Progress Reports, Feedback, Clarification, or Problems/Solutions. A Progress Report is a student message in which a student discusses the concepts relevant to a particular course section, or provides responses to assignments, instructor questions, and/or reading guide questions. A Feedback message is an instructor message in which the instructor provides a response to the content/concept of a student's assignment and/or reading guide responses. A Clarification message can be either a student message or an instructor message involving a discussion in which the student or instructor elaborates (or is asked to elaborate) on concepts discussed previously. A Problems/ Solutions message can also be either a student message or an instructor message but which deals with specific questions related to course content/concepts. Examples of each of these categories taken from the data set of this study can

be found in Appendix B.

Student Support messages are any messages fulfilling the role of personal support either to or from instructor or student. As defined here, Support messages do not include any content/subject matter related discussions. Messages which fell under this category were identified further as (1) Social Chit-chat such as greetings; (2) Reassurance/Encouragement such as messages that deal with asking for or providing reassurance and encouragement to both students and instructors; (3) Technological Problems/Solutions arising from the use of the communication technology itself such as finding the right sequence of commands necessary to send an e-mail message; and (4) Personal Information such as sharing personal experiences or information about each individual. Examples of each of these categories taken from the data set of this study can be found in Appendix B.

Administrative messages deal with the sort of information sharing that occurs at the beginning and the end of each class in the traditional classroom setting. Messages which fell under this category were further identified as: Due Dates and Updates (when assignments/responses are due or how they are progressing), Course Grades (often a message from the instructor telling a student that he/she has passed a certain assignment), Course Materials (questions arising from the materials students have received via regular mail),

and Communication Problems (messages dealing with problems in establishing the link in order to be able to set up a communication network, but unrelated to the use of the technologies as such). Examples of each of these categories taken from the data set of this study can be found in Appendix B.

Stage 3

Four individuals pursuing graduate studies at McGill University and not otherwise involved in this study were asked to use the coding scheme in order to establish inter-rater reliability. After two training sessions in which each category was described and explained (see Appendix B), and during which coding was practised as a group exercise, inter-rater reliability of $r = 0.83$ was achieved.

Stage 4

The third stage involved the use of The Ethnograph data analysis program. The Ethnograph is "a set of interactive, menu driven computer programs designed to assist the ethnographic/qualitative researcher in some of the mechanical aspects of data analysis" (Seidel, Kjolseth & Seymour, 1988, p.1-1). Each coded course file was entered through the program in order to separate student messages from instructor messages, and to sort all these messages according to Coding Scheme I (see Appendix A). Therefore, for example, all student messages coded as Content messages representing Progress

reports (code: S/C|P|) were separated from all other types of messages. In this way, an accurate count was obtained for each coded category in order to use quantitative descriptive statistics to make both within and between course comparisons.

Stage 5

A second level of analysis was performed on only the messages coded as Content messages using Bloom's taxonomy of the cognitive learning domain (1977). This was done in order to establish what level of learning was reflected in each communication concerning course content (see Appendix C for Bloom's taxonomy) and to examine which level/type of learning was associated with the use of which specific communication technology. That is, did one specific type of communication technology best support one specific type/level of learning? Once again the same four raters were asked to go through a coding exercise in order to establish inter-rater reliability for this step ($r = 0.77$).

Stage 6

In this stage, both instructors were interviewed using a semi-structured interview format (see Appendix D for interview questions). Each instructor was interviewed separately and a verbatim transcript was produced. The instructors were then given an opportunity to review the transcripts and were

asked to make any appropriate changes or additions. The interview transcripts were then divided into seven related categories which emerged from the interview questions: 1) Design process; 2) choice of communication technology; 3) importance of communication to learning goals; 4) strengths and weaknesses of the communication technologies used; 5) learning goals for the specific courses; 6) evaluation of learning; and 7) instructor's views of distance education.

Stage 7

Course syllabi were collected to examine the stated course outcomes and course assignments. Procedures of triangulation (Miles & Huberman, 1984) were followed to compare the learning levels reflected by the messages, the information provided by the instructors and the course objectives and assignments.

CHAPTER IV

Results

In this section, the results of the quantitative and qualitative analyses of data are presented. The first section presents the quantitative analyses in which descriptive statistics were used to investigate similarities and differences between the three courses (e.g., which technology was most used, purpose for which each communication technology was used; the level of learning reflected in the use of the communication technologies; etc). The second section presents the results of the qualitative analyses used to determine the instructional role of communication technologies in DE (e.g., did the communication technologies support the learning intended, and if so how, etc).

Quantitative Analyses

A total of 381 messages between students and instructors were collected from the three courses. The communication technology used most often was E-mail, followed by Fax and then by regular mail. Course 1 (the first session of the Software Applications course) messages were transmitted using only one of the communication technologies (E-mail), whereas both Course 3 (the second session of the Software Applications course) and Course 2 (the Instructional Design course) made use of all three technologies. However, Course 2 made use of E-mail more than Fax, whereas Course 3 used Fax

Table 1

Number of Messages by Course and Technology

	COURSE 1	COURSE 2	COURSE 3	TOTAL (for each techn.)
FAX	-	20	75	95
E-MAIL	184	71	10	265
REG. MAIL	-	9	12	21
TOTAL (for each course)	184	100	97	381

Course 1 - Software Applications I (first session)

Course 2 - Instructional Design I

Course 3 - Software Applications I (second session)

more often than E-mail. Regular mail was used the least often in both these courses (see Table 1 for exact frequencies)

An examination of the purposes for which communication took place across the three courses shows a different pattern for each course. The majority of messages for the Instructional Design course (Course 2) were Content messages, whereas this category came second in terms of use in the first session of the Software Applications course (Course 1) and third in the second session of the Software Applications course (Course 3). Support messages were the most common type of message used in both sessions of the Software Applications course (Course 1 and Course 3), but came second for the Instructional Design course (Course 2). Administrative messages were more important in the second session of the Software Applications course (Course 3) than in the first session of the Software Applications course (Course 1), and Administrative messages for the Instructional Design course (Course 2) were the least important of the three purposes of communication for this course (see Table 2)

A breakdown of instructor and student messages by purpose shows that a very different pattern of usage, in terms of different types of messages, emerged for all three courses. The pattern observed for each purpose of communication is examined separately (see Table 3 for exact values).

Table 2

Distribution of Course Messages by Purpose

PURPOSE & COURSE	Content (%)	Support (%)	Administrative (%)
Course 1	16.89	69.44	13.67
Course 2	59.82	23.54	16.64
Course 3	22.38	47.59	30.03

Course 1 = Software Applications 1 (first session)

Course 2 = Instructional Design I

Course 3 = Software Applications 1 (second sessions)

Content messages

The instructor and students in the first session of the Software Applications course (Course 1) sent content-related messages in relatively equal proportion. However, in the second session of the Software Applications course (Course 3), the same instructor sent twice as many content-related messages than did the students. Yet another pattern emerges from the Instructional Design course. The students in the Instructional Design course (Course 2) sent content-related messages three times as much as did the instructor for this particular course.

Student messages

Support messages also showed a different pattern for the two sessions of the Software Applications course. Support messages were relatively evenly distributed between the instructor and students in the first session of the Software Applications course (Course 1), but the instructor provided support messages $1\frac{1}{2}$ times more often than did the students in the second session of the Software Applications course (Course 3). Support messages were evenly distributed between students and instructor in the Instructional Design course (Course 2).

Administrative messages

Administrative messages also showed a different pattern for the two

Table 3

Distribution of Messages by Purpose by Students and Instructors.

PURPOSE & COURSE	Content (%)	Support (%)	Administrative (%)
Course 1 -Inst.	50.79	50.39	39.22
-Students	49.21	49.61	60.78
Course 2 -Inst.	23.80	52.20	41.38
-Students	76.20	47.80	58.62
Course 3 -Inst.	67.72	61.31	49.53
-Students	32.28	38.69	50.47

Course 1 = Software Applications 1 (first session)

Course 2 = Instructional Design I

Course 3 = Software Applications 1 (second session)

Software Applications courses. In the first session of the Software Applications course (Course 1), administrative messages were more often attributed to the instructor than to the students, whereas in the second session of the Software Applications course (Course 3) administrative messages were more evenly distributed between the instructor and the students.

Administrative messages were more often attributed to the course instructor than to the students in the Instructional Design course (Course 2).

This same process was used to examine similarities and/or differences between the three courses for each purpose (Content, Support, Administrative) for which the communication technologies were used. Content messages were further coded as Progress, Feedback, Clarification or Problem/Solution messages. More than half of the Content messages for the first session of the Software Applications course (Course 1) are Problem/Solution messages, whereas most of the Content messages for the second session of the Software Applications course (Course 3) are more evenly distributed between Feedback and Problem/Solution messages. The majority of Content messages for the Instructional Design course (Course 2) are Progress type messages (see Table 4 for exact values).

Table 4

Distribution of Content Messages by Students and Instructors

	Progress (%)	Feedback (%)	Clarification (%)	Problems & Solutions (%)
Course 1 -I	-	9.52	19.84	21.43
-S	13.49	-	3.97	31.75
Total	13.49	9.52	23.81	53.18
Course 2 -I	0.77	15.16	6.91	0.96
-S	67.75	-	7.87	0.58
Total	68.52	15.16	14.78	1.54
Course 3 -I	-	41.14	10.76	15.82
-S	10.13	1.27	1.27	19.62
Total	10.13	42.41	12.03	35.44

I = Instructor S = Students

Course 1 = Software Applications I (first session)

Course 2 = Instructional Design I

Course 3 = Software Applications I (second session)

The Student Support messages were further coded as Social Chit-Chat, Personal Information, Technical Problems, or Reassurance/Encouragement. The majority of Student Support messages for all three courses fall into the Social Chit-Chat category, followed by Reassurance/Encouragement messages (see Table 5 for exact values).

The Administrative messages were further coded as Due Dates, Course Grades, Course Materials, or Communication Problems. Once again the pattern that emerges for this type of communication is similar for all three courses. The majority of Administrative messages for all three courses concern discussion of Due Dates and reports on how the students are progressing with their course work and assignments. However, the Instructional Design course (Course 2) had more messages coded as Communication Problems than either session of the Software Applications course (Course 1 and Course 3) (see Table 6 for exact values).

All Content messages were coded again using Bloom's Taxonomy (1977) to examine the distribution of the levels of learning across courses and a different pattern of use is evident for each course. The instructor and students of the first session of the Software Applications course (Course 1) sent five times as many Knowledge level messages as did the students and the same instructor in the second session of the Software Applications course

Table 5

Distribution of Support Messages by Students and Instructors

	Social chit-chat (%)	Personal Info (%)	Tech. Problems (%)	Reassurance & Encourag. (%)
Course 1 -I	32.63	1.35	5.41	11.00
-S	37.45	3.47	5.21	3.47
Total	70.08	4.82	10.62	14.47
Course 2 -I	40.49	0.98	0.49	10.24
-S	32.68	5.37	2.93	6.83
Total	73.17	6.35	3.42	17.07
Course 3 -I	33.63	2.68	0.89	24.11
-S	27.98	4.76	2.08	3.87
Total	61.61	7.44	2.97	27.98

I = Instructor S = Students

Course 1 = Software Applications I (first session)

Course 2 = Instructional Design I

Course 3 = Software Applications I (second session)

Table 6

Distribution of Administrative Messages by Students and Instructors

	Due Dates (%)	Course Grades (%)	Course Materials (%)	Communication Problems (%)
Course 1 -I	22.55	5.88	8.82	1.96
-S	51.96	0.98	6.86	0.98
Total	74.51	6.86	15.68	2.94
Course 2 -I	29.66	0.69	3.45	7.59
-S	50.34	-	2.76	5.52
Total	80.00	0.69	6.21	13.11
Course 3 -I	19.34	24.53	3.77	1.89
-S	40.57	0.47	3.77	5.66
Total	59.91	25.00	7.54	7.55

I = Instructor S = Students

Course 1 = Software Applications I (first session)

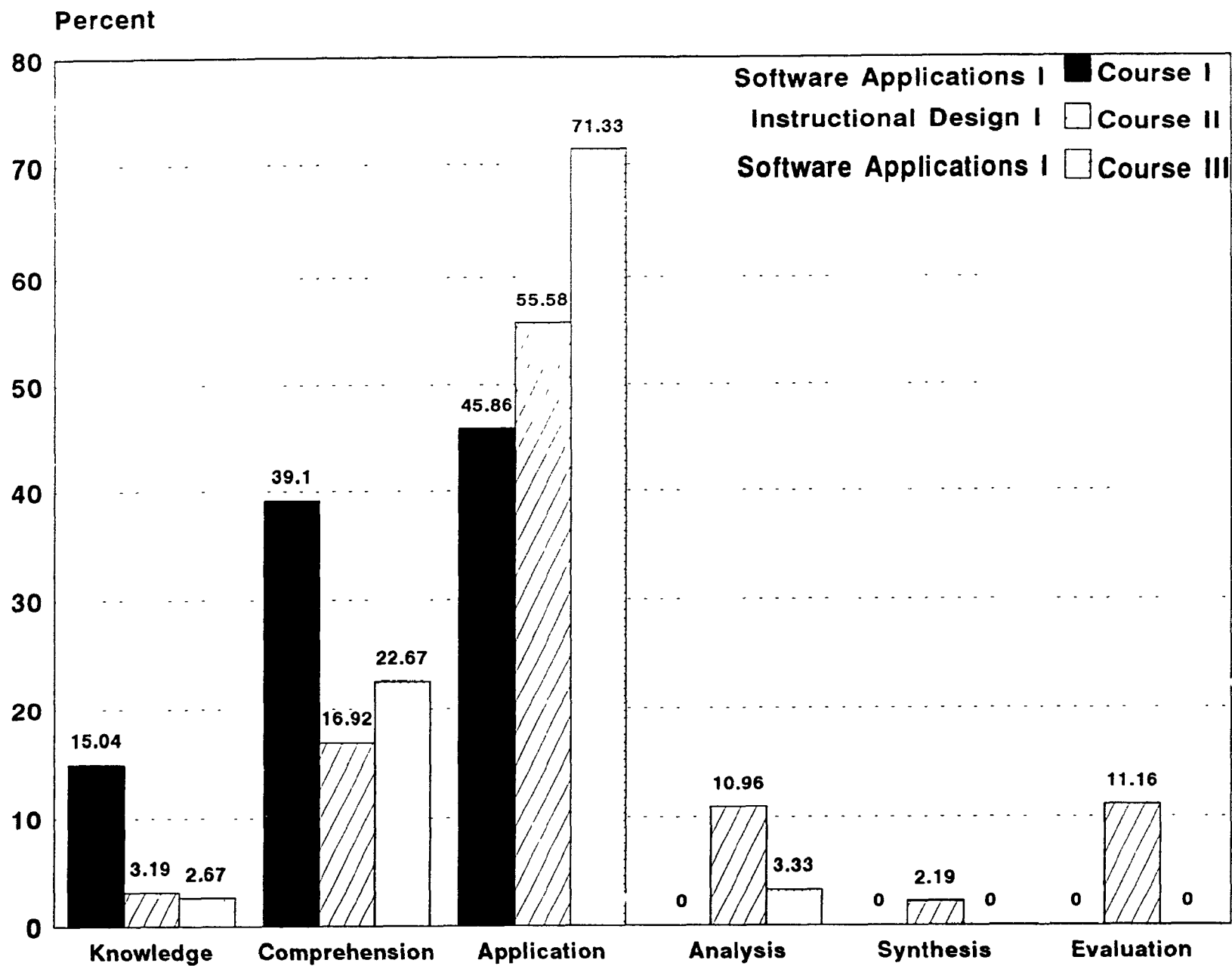
Course 2 = Instructional design I

Course 3 = Software Applications I (second session)

)Course 3), and than the students and the instructor of the Instructional Design course (Course 2) (see figure 1). Comprehension level messages are used more often in both sessions of the Software Applications course (Course 1 & 3) than in the Instructional Design course (Course 2). The level which was used most in all three courses is Application, with use gradually increasing from Course 1 to Course 2 to Course 3 (figure 1). The use of the higher levels of learning (i.e., Analysis, Synthesis, Evaluation) drops dramatically for all three courses. Approximately the same proportion of Analysis and Evaluation messages were sent in the Instructional Design course (Course 2), as well as a few Synthesis messages. In the first session of the Software Applications course (Course 1) no messages were coded at these levels. However, in the second session of the Software Applications course (Course 3), some messages were coded at the Analysis level, but there were no Synthesis or Evaluation messages (see figure 1).

Another interesting examination of the use of level of learning reflected in these three courses is achieved by separating instructor messages from student messages. When student messages are separated out, there no longer is the same distribution across the six levels. Student use increases as one progresses from Knowledge to Comprehension, reaching a peak with Application level messages, and falling dramatically at the higher levels of

Figure 1: Distribution of messages (instructors and students) by level of learning



Analysis, Synthesis, and Evaluation (see Figure 2 for distribution of levels of learning for student messages). However, the instructors' use of these levels of learning is different (see Figure 3 for distribution of levels of learning for instructor messages). The Software Applications course instructor used mostly messages that require Comprehension and Application in the first session of the Software Applications course (Course 1) while relying almost exclusively on Application messages to teach the second session of the Software Applications course (Course 3). The Instructional Design course instructor (Course 2) varied use of messages reflecting Comprehension and Analysis, while using Evaluation messages most frequently.

Qualitative Analyses

Analyses were conducted on two different sets of data: an examination of the learning objectives and assignments for each course, and an analysis of the semi-structured instructor interviews. Since the same instructor taught Course 1 and Course 3, and since these are essentially the same course (Software Applications), only one course syllabus was collected and one interview was conducted.

Learning objectives and course assignments

The instructor for Courses 1 and 3 (Software Applications I) stated that the main objective of the course was 'to give the student basic skills in the use

Figure 2: Distribution of student content messages by level of learning

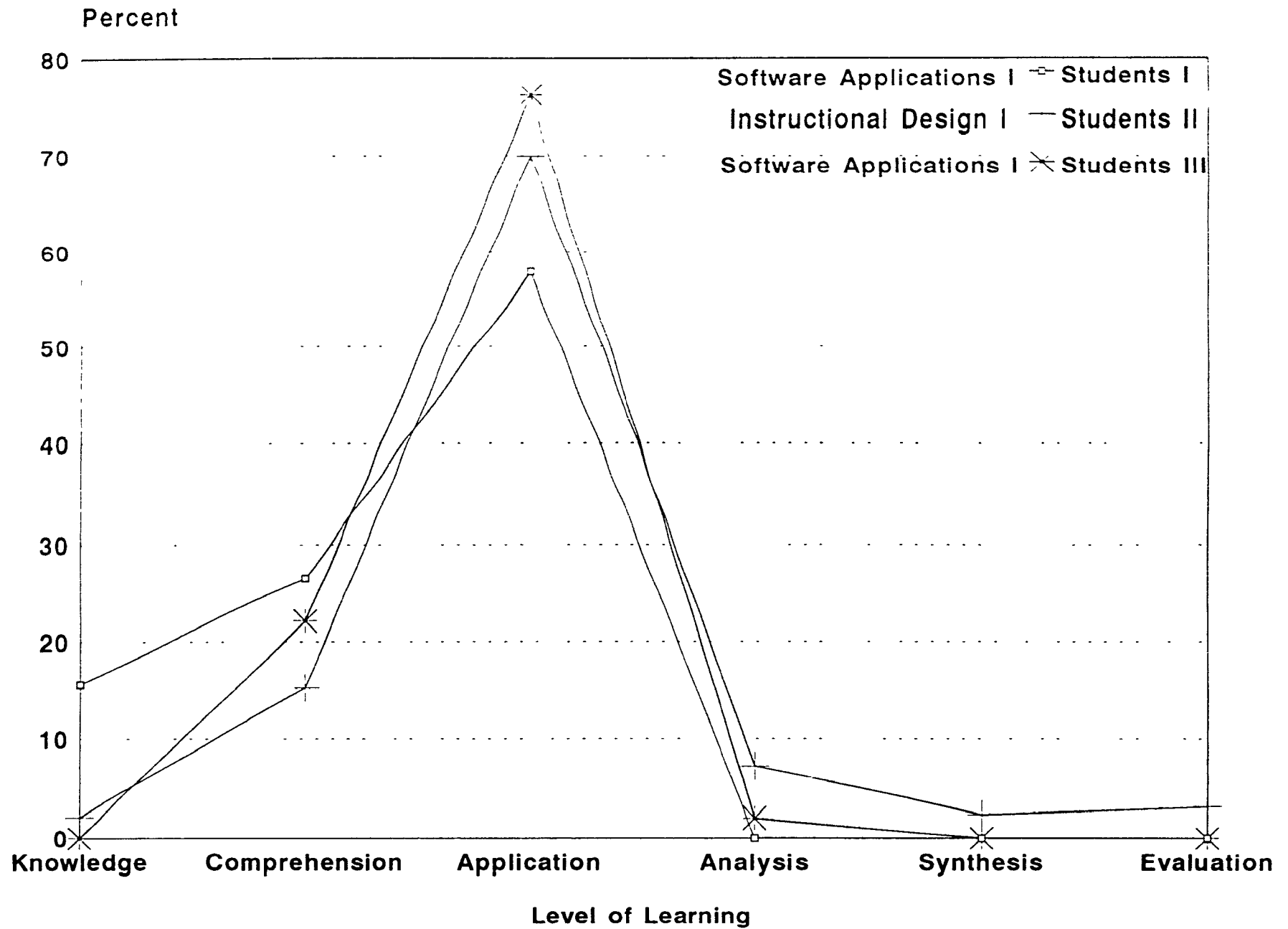
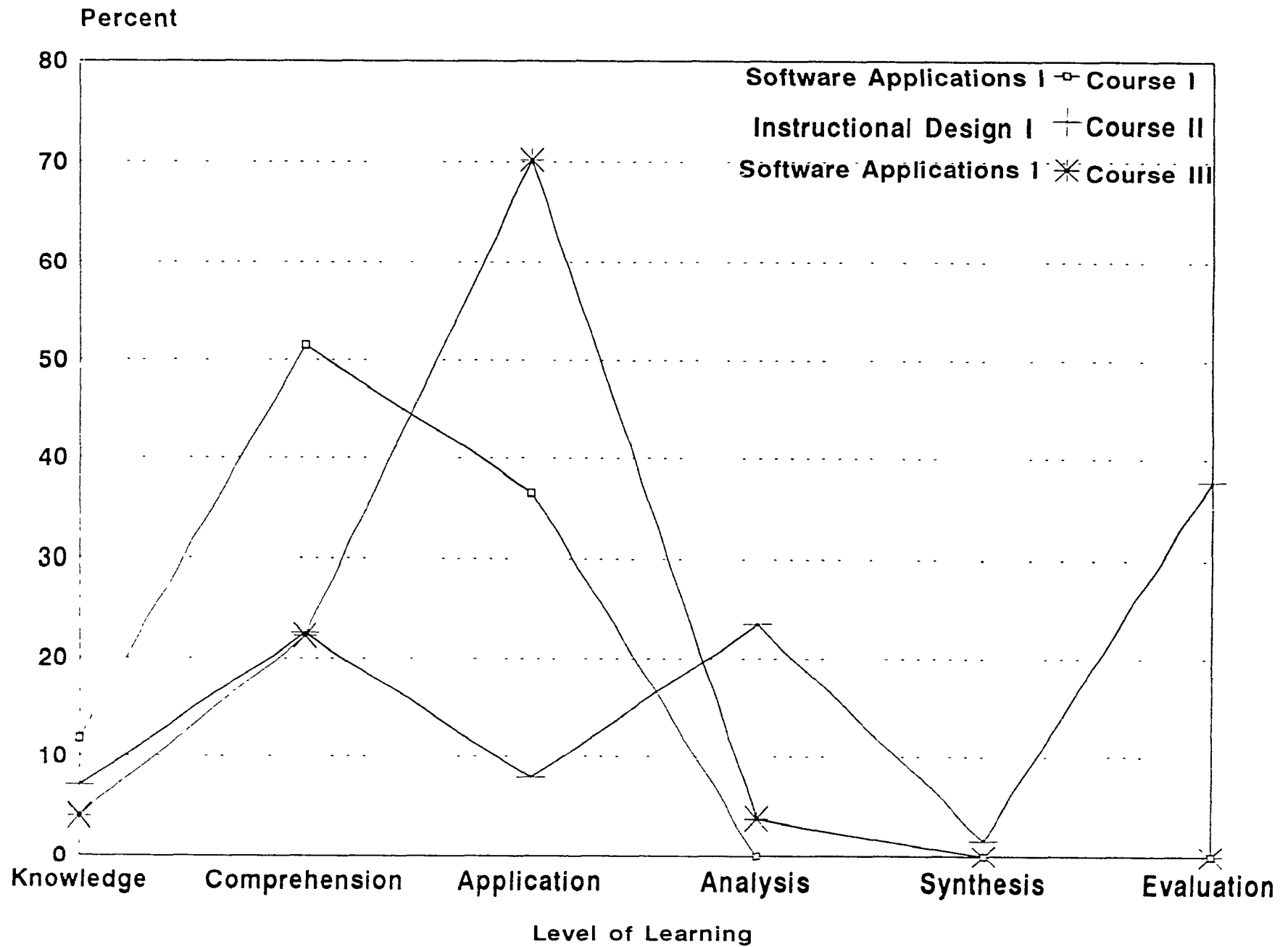


Figure 3: Distribution of instructor content messages by level of learning



of the microcomputer for personal and classroom applications " As such, this course may be said to be primarily a knowledge-based course in which students were expected to learn specific information related to developing a relevant skill (using a word processor) and to apply this new skill to different situations. In order to achieve this goal, students were given a series of assignments in which they were required to demonstrate their developing computer skills. By the end of the course, students were expected to be able to

- use the word processor for correspondence and reports,
- use the filing program to file information for later retrieval and summarization;
- understand the various functions of a computer: how to input, process,, output, and store data;
- understand how to start up a computer and how to use the various tools available: formatting diskettes, copying files, erasing files, viewing directories, etc;
- install and use the Q&A word processing program, its' features and capabilities: Q&A Write, Q&A File, and Q&A Report.

The instructor of Course 2 (Instructional Design I) described the learning in Instructional Design as "very much a mastery kind of learning. Instructional Design..is a course that has very little information or facts that

you have to learn. The learning...is a matter of how to apply the process of instructional design to lots of different kinds of learning settings." As such, this course might be described as primarily a process-based course. By completion of the course, the students were expected to be able to:

- define the commonly used terminology of instructional design and provide appropriate descriptive examples;
- describe the fundamental concepts and principles of five instructional design models;
- describe the benefits and limitations in the application of the principles of instructional design;
- describe the several possible applications of instructional design to the development and evaluation of computer assisted instruction;
- explain the concept of "domains of learning" and how it relates to Kemp's model of instructional design;
- explain the rationale for the oval format of Kemp's model of instructional design and how this may affect an instructional design process;
- design and evaluate an instructional plan following Kemp's model of instructional design

In order to be able to achieve these goals, students were given

(1) reading guides designed to promote reflective thinking and discussion (via e-mail), (2) assignments where major concepts were applied to the student's chosen instructional setting, and (3) an exam to determine the student's ability to explain and apply the process of instructional design to diverse settings

Instructor interviews

The two instructors were interviewed separately, using a semi-structured interview format (see Appendix D for the interview questions). These interviews were divided into six related categories: 1) design process, 2) choice of communication technology; 3) importance of communication to course learning goals; 4) learning goals for the specific courses, 5) evaluation of learning; and 6) instructor's views of distance education. Each of these categories will be dealt with separately.

Design process

The two instructors come from different backgrounds. The instructor of the Software Applications course (Courses 1 and 3) comes to distance education from a traditional teaching background, has taught at the high school and college level for ten years, and has given various computer training courses to business people. The instructor of the Instructional Design course (Course 2) also comes from a traditional teaching background but had already spent a number of years teaching at a distance and had taken a graduate degree

in instructional design. The following quotes were taken from the instructor interviews in order to illustrate more clearly the differences between the two instructors concerning their views of the design process (see Table 7).

Table 7

Instructors' Quotes Concerning the Design Process

INSTRUCTOR OF COURSES 1 & 3	INSTRUCTOR OF COURSE 2
I had already developed training manuals for this kind of thing which were very specific, step-by-step type of affair .so. when it came to developing stuff for distance ed...I tried to break things down ...it was just a matter of answering questions from 1000 miles away instead of 15 feet. Support is a big issue. You're giving constant feedback The revisions have generally tended to revolve around getting a new book, or a new text. But it's more a technical thing than a pedagogical orientation. Uh .I haven't changed my approach very much. One of the gaps in distance education is that there's not this dialogue, or multilogue if you like, uh... between everybody Now that...would enormously benefit the course. ...there needs to be a precursor..that just gives you a simple communication program and teaches you how to do electronic communication. Get everybody at that stage before they move on to other things.	My whole orientation was how, at a distance, to get the same kind of give and take, and growing knowledge about instructional design that you could get in a face-to-face situation pretty easily .. we were always thinking about how do you facilitate that kind of learning and support that kind of learning in a distance education.. way I guess that experience is what really forms the basis of how I designed this course. ...there had to be lots of back-and-forth. I felt that the feedback mechanism between myself and the students and among students was really important I guess if I had to redesign the course I would do a lot more in the beginning to .. to help students understand the nature of the course. Because I think it was different from others they had probably taken And I guess that's one of the things I'd change too I would have a certain time during the day where I answered messages and .and when they [students] would know that I was on-line

Choice of communication technology

Although both instructors based their choice of communication technology more or less by default (choosing the technology available to them), they have very different views of fax and e-mail (see Table 8 for instructors' quotes regarding their choice of communication technology). The instructor of the Software Applications course (Course 1 and 3) sees no essential differences between fax and e-mail, describing them as "the technology of getting information across." However, he does say that although e-mail is most difficult to set up and for people to learn to use, it is a much more convenient way to teach at a distance. The instructor of the Instructional Design course (Course 2) on the other hand, states the fax "didn't provide nearly the same interactive possibilities as e-mail..." This instructor also states that there are a lot of logistical problems in setting up an e-mail system, but that once it is set up, it provides better possibilities in terms of interaction.

Table 8

Instructors' Quotes Concerning Choice of Communication Technology

INSTRUCTOR OF COURSE 1 & 3	INSTRUCTOR OF COURSE 2
The problem [with using e-mail] is that...with teaching the Applications by that point most people aren't computer literate enough to know about modems and e-mail. Well, to me fax and e-mail are just ...pretty much equivalent. It's just the technology of getting information across. I wish e-mail was as easy as fax and people weren't afraid to use it... because it's just more convenient. ...as far as the medium of communication goes, it's pretty much the same to me. It's written words whether it's on the screen or on a piece of paper. ...I've found electronic mail has dropped off... ...I'd have everybody on electronic mail. It's just far more convenient. But that not being the case, you just employ what comes along. I didn't choose the medium, it sort of chose me!	Deciding on a communication technology was simple because... the telephone was out of the question because of the cost. Uh... fax was available but it didn't provide nearly the same interactive possibilities as e-mail... If you can get by the logistical and technological problems e-mail is better in terms of possibilities for interaction than fax. There are a lot of those problems with setting up e-mail. We actually ended up lengthening the course by a month to get everybody using the same linking software...and everybody's system working. They [students] would complete reading guides and then we'd have an on-line discussion about it. I would also ask people who I knew could communicate with each other to get together...and we would discuss it..

Importance of communication

Although both instructors agreed that communication is of utmost importance in teaching distance education courses, they had very different views on the purpose for which the specific communication technologies could be used. The instructor of the Software Applications course (Course 1 and 3) described the most important aspect of communication in distance education to be providing support to students, to let them know that they are not alone or isolated. Therefore, one of the most important roles of the communication technology according to this instructor is to provide a medium through which students' questions and problems can be responded to. On the other hand, the instructor of the Instructional Design course (Course 2) described the most important role of communication technologies as the promotion and facilitation of learning. In Course 2, electronic-mail was meant to provide the medium through which discussions could take place in order to foster a deeper understanding of the instructional design process (see Table 9 for instructor quotes concerning the importance of communication in distance education).

Table 9

Instructors' Quotes Concerning the Importance of Communication

INSTRUCTOR OF COURSE 1 & 3	INSTRUCTOR OF COURSE 2
The support issue is obviously very important if you are doing distance education. You've got to let people know that you are there... The two main types of communication (feedback) I get from students are either "I'm having a technical problem", or "I don't know what to do my project on." A lot of...the rest of the stuff that goes on in my communications is that, you know, "How are the kids?" I don't use the Tutor Reply Forms. But, uh...I find that personal correspondence is just...more personal! I try to be...more personal, and helpful and supportive You want regular feedback. Very important. "Why do you communicate with your students?" To help them with their problems, and just encourage them, feedback their results... Basically two things: problem solving and communicating results of assignments.	I think that also, the thing that happened with the e-mail...is that I created a need for them to correspond with me, to communicate with me. Well, I think anything that, where you, where discussion is going to be helpful in achieving the learning that you can use it [communication technology]. ...if it's pretty much of a straight information class then, you know...it seems to me that you could just go pretty much print-based with assignments and quizzes. It wasn't static. It was that they were engaging in a conversation. And I think that's one thing that I did stress and probably would stress more again I wanted to use the technology as a discussion mechanism. .it should be a back-and-forth kind of thing.

Learning goals

These two courses were chosen for this study for comparison purposes specifically because they provided very different learning objectives. The instructor of the Software Applications course describes the purpose of Course 1& 3 as the development of a specific skill through the acquisition of knowledge (knowledge-based course). The role of the communication technologies was the transmission of the knowledge and the practice of required skills. The purpose of the Instructional Design course (Course 2), as described by Instructor 2, is quite different and more complex. The role of the communication technologies in the Instructional Design course was to foster discussions of course content so as to develop a better understanding of the concepts of instructional design. The goal of this course was to develop an understanding of the principles of instructional design within a specific framework and the application of these principles to new learning situations (see Table 10 for instructors' quotes concerning the learning objectives).

Table 10

Instructors' Quotes Concerning the Learning Goals

INSTRUCTOR OF COURSE 1 & 3	INSTRUCTOR OF COURSE 2
...operating a computer and knowing what's going on when you do is a skill. It's not an intellectual thing... it's practice. It's repetition. It's almost a manual skill... ...it's something that requires practice and repetition. As i say, my stuff is pretty much skill-based. There's a progression and you build on things... A skill, I want them to be able to USE a computer and I want them to not be afraid of them. A skill is something direct. And that...it makes it very easy to develop this kind of thing. It's a skill that has very immediate feedback... You get into a few steps, make sure your screen looks like this... I don't expect them to be masters with it...it's an introductory course, and I let them know as much...	Instructional Design I think, is a course that has very little information or facts that you have to learn. But the learning ..to me is a matter of how to apply the process of instructional design to lots of different kinds of learning settings. So it was very much of a mastery kind of learning. I think it was a major change in the way that they looked at instruction in general. In terms of communication technology supporting the learning I think it did support it because there was a lot of negotiation going on there. In terms of, what do you think about the way I applied this.. There was a lot of back-and-forth that I don't think could have been done in print. I don't think it could have been done as successfully by the students, just by themselves, studying. It gave the possibility for active feedback.

Evaluation of learning

The evaluation for the two sessions of the Software Applications course (Course 1& 3) was structured much more along the lines of traditional course evaluations than the evaluation for the Instructional Design course (Course 2), in the sense that the students were required to submit assignments throughout the course and they received a grade on each assignment. In this way, it was easier for students enrolled in the Software Applications course to get an idea of how they were progressing through the course. The evaluation for the Instructional Design course proceeded on a pass/fail system until the end of the course. At this point students were required to submit a project and an exam, both of which contributed to the course grade. Both instructors agreed that the majority of students in their courses accomplished what they believed they should have accomplished by the end of the course (see Table 11 for instructors' quotes concerning the evaluation of learning).

Table 11

Instructors' Quotes Concerning the Evaluation of Learning

INSTRUCTOR OF COURSE 1 & 3	INSTRUCTOR OF COURSE 2
Evaluation in my course is based on: 4 assignments, the project and a mark they get for keeping in regular communication with me. If we could just do away with the marking... That's the worst part of it, is trying to evaluate... I'd be much happier if we just had a pass/fail system... ...If I had my druthers and if I knew that everybody was, uh, motivated, you know. The way I would like to run the course would be to have sort of a conference, bulletin board type system, where... Because right now, you find that uh,...you tend to answer the same question over and over again. "...did the majority of students accomplish what you think that they should?" Yeah! I do. The ones who aren't going to make attend to drop out in the beginning ...it sort of sways the marks toward the high end.	I think most of the students became pretty adept at using instructional design models that we were using. Most of the students in this course had a great deal of practical experience already. So, once they clicked into how to ..once they oriented really their look at instruction, then they just sort of ran with it. All the assessment was done. ..until the end, was done on more or less of a pass/fail basis. The exam wasn't and the final project wasn't. But until that point people were trying out the instructional process out in different ways. And they would open up the way they did it to me, for critique and so on. And I would accept it or say maybe you should look at this aspect. And, uh, I think that their projects . some of their projects were just excellent. In terms of how they applied it to situations in their own context.

Views on distance education

Although both instructors became involved in teaching distance education in very different ways, they both agreed that distance education is an interesting and stimulating way to teach. And despite all the logistical difficulties inherent in establishing a communication technology system, distance education provides many advantages to both students and instructors (see Table 12 for instructors' views of distance education).

Table 12

Instructors' Views of Distance Education

INSTRUCTOR 1	INSTRUCTOR 2
I think it's great... It's a very relaxing way of giving a course I think it's got a lot of benefits for the people who've taken courses. I think they appreciate it - more so than people who come on-campus. I gave up teaching on-campus because I enjoyed doing the distance education stuff far more I found that they [distance education students] don't base their expectations on what other people are getting I find that the people who are taking distance courses . they just want to learn something, they want to get some credits. .they want to pick something up I think in the classroom, you don't get into that kind of [personal communication]. You don't have time.	I'd say it was more fun to teach by distance education because of the students. They were more motivated to start. I didn't have to work as hard at getting them motivated. They just really appreciated the outside contact, because they were in fairly isolated communities. And they were all people who were extremely motivated and conscientious.

CHAPTER V

Discussion

The lack of a direct, continuous link between distance education "teachers" and learners is often the primary variable used to characterize distance education. Much of the distance education literature has focused on ways in which communication can be made possible in distance education courses by incorporating various communication technologies into the course design. One assumption has been that interpersonal communication between "teachers" and learners, and among learners, would create a less passive learning context thereby improving the quality of learning by making possible the kinds of interactions that take place in face-to-face instruction.

An ideological shift from simply using the communication technologies to understanding how they might support the desired learning is needed. The question must change from "What technology should we use in this course?" to "What kind of learning should result from this course and how can the technology be used to support this learning?" The present study attempted to provide the first step toward realizing this shift by proposing a framework for investigating the instructional role of communication technologies in distance education.

Although the current literature in distance education reflects a move

toward a more systematic investigation of teaching and learning within the distance education context, most of the existing literature is comprised of descriptive analyses of specific distance education systems which use various communication technologies. There has been comparatively little effort placed on formal evaluation or research of the possible support these communication technologies might contribute to the desired learning. In order to investigate the instructional role of various communication technologies in this study, the content rather than the structure of mediated communications was examined. The mediated communications between students and instructors from two distance education courses with very different learning goals were first investigated as to the general ways in which the specific communication technologies were used. Next the course content-related messages were coded using Bloom's Taxonomy of the Cognitive Learning Domain (1977) to determine if the messages reflected the types and levels of learning described in the course objectives and in the statements made by the instructors.

General Use of Communication Technologies

The instructors' choice of communication technology was dictated by which technology was available to them and to most of their students. The findings indicated that the different communication technologies were generally used in a consistent way across both courses. That is, the major purposes

(Content, Student Support, and Administrative) were evident in both courses. However, important differences existed in terms of the reason why communication was to take place in each course. The instructor of the Instructional Design course used the communication technology "...as a discussion mechanism", whereas the instructor of the Software Applications courses used the communication technology for "...two things: problem solving and communicating results of assignments." These differences are related to the different course learning objectives, to the different characteristics of each communication technology and to the instructors' views of the interaction capabilities of each technology and were directly reflected in the instructors' actual use of the technologies.

Levels of Content

The content messages were further coded as Progress, Feedback, Clarification, or Problem/Solution messages. Major differences existed at this level between the two types of courses (knowledge-based vs process-based). The majority of content-related messages for the Software Applications courses (Course 1 and Course 3), the knowledge-based course, are Problem/Solution type messages. Problem/Solution messages deal with specific questions related to the course assignments. This finding is directly related to the main course objectives which stated that students were required to develop a specific skill

(learning how to use the Q&A word processing program) that would require repetition and practice. For example, in learning how to retrieve a document, a student would tell the instructor that they were unable to find the document and ask for a possible solution to this problem. The instructor would respond to the problem with the solution that an extension to the filename (e.g., .EXT) was required for the computer to find the proper document.

The majority of content related messages for the Instructional Design course (Course 2), the process-based course, are Progress type messages in which students discuss the concepts relevant to a particular assignment. This finding is related once again to the specific course objectives of developing an understanding of the process of instructional design. In order to develop such an understanding, students had to participate in on-going discussions of the instructional design process.

Comparison of Levels of Learning, Learning Objectives, and Instructor Interviews

The investigation of how the instructors and students used the different communication technologies showed important differences related to course content, desired learning outcomes, and purpose of communication.

Triangulation, as described by Miles & Huberman (1984, p 234), "is supposed to support a finding by showing that independent measures of it agree with it

or, at least, don't contradict it." It is the process through which a finding can be validated by comparing results from different independent sources and using different methods which represent different levels of the same phenomenon. In the present study, the process of triangulation was used to compare the learning categories evident in the mediated communications with the stated learning objectives and the interview statements of instructors.

The stated learning objectives for the Software Applications courses fall into the following categories: application, comprehension, and knowledge. The main goal of the course was for students to learn (knowledge) a specific computer program, understand its' various features (comprehension), and apply them to create specific documents (application). The analysis conducted on the mediated communications for both sessions of this course revealed that the messages sent did reflect these same levels of learning, i.e., knowledge, comprehension, application. These findings are further corroborated by the instructor's comments regarding the learning required in this course (i.e., learning a new skill) and his view of the technology itself as a means of simply getting information to students. Since the learning levels obtained from the communications match so well with the desired learning and with the instructor's comments, it can be argued that the communication technologies (i.e., fax and e-mail) did provide support for the desired learning. These

findings echo Weston & Cranton's (1986) work which suggests that less interactive learning tends to be more effective with behaviorally explicit learning outcomes such as skill development.

The stated learning objectives for the Instructional Design course reflected all six levels of learning: knowledge, comprehension, application, analysis, synthesis, and evaluation. This course is a process-based course in which a new theoretical framework had to be learned (knowledge), incorporated into the existing knowledge base (comprehension and analysis), used in new instructional settings (application and synthesis), and the end product of this new design had to be evaluated (evaluation). All of these categories are represented in the content messages sent by the instructor. However, the most sophisticated levels of learning (i.e., analysis, synthesis, evaluation) are not reflected to any great degree in the messages sent by the students. In other words, the students in the Instructional Design course responded in the same manner as the students in the Software Applications course even though the instructor messages for the Instructional Design course clearly reflected the higher learning levels and she used the technology as a mechanism for discussion. This is consistent with the findings of Henri (1989) that student communications were most often for clarification and that they treated course content mostly at a surface level. A possible explanation for this

is that students may need much more support in functioning at higher levels of learning. In this case, the students in the Instructional Design course sent three times as many content messages as did the instructor. Perhaps more modelling was required by the instructor

The purpose for examining two sessions of the same course given by the same instructor but at different times, was to examine if the way in which an instructor used communication technologies differed over time. There were some differences found. These included sending twice as many content-related messages as did students in the second session of the course, whereas the distribution of content-related messages was much more even in the first session. A similar trend is evident in the student support messages and the administrative messages for the two sessions. Perhaps these differences were simply due to the differences in the needs of the two student groups and the frequency with which they encountered technical problems. However, most important here is the finding that the two sessions of the Software Applications course produced messages at the same levels of learning which was consistent with the stated learning outcomes of the course. First, in both sessions the majority of content-related messages were Problem/ Solution messages. This finding is directly related to the main goal of the Software Applications course (learning how to use a computer) which did not change for either session.

Second, Application was the primary level of learning reflected in both sessions of this course, followed by Comprehension. The students in both of the Software Applications sessions learned a new skill, which required the development of a new knowledge base. Based on these findings, it can be argued that differences in the instructors' use of the technologies was primarily a reflection of their instructional planning and not due to random variance.

Implications for Practice and Research

These findings represent a departure from the existing literature on communication technologies in distance education by examining the use of these communication technologies from an instructional perspective, rather than from a structural perspective. This study indicates that there are two instructional aspects related to the choice of communication technology which must be taken into consideration when designing future distance education courses. Course designers and course instructors must consider (1) the purpose for which the communication is going to take place (will it be simply the transmission of information or will it require more interaction), and (2) the course content or desired learning objectives of the course in question (will they be simply the acquisition of new knowledge or will they require discussion and assimilation of knowledge). In order to achieve the higher levels of learning in distance education courses, it is essential not only that

these two aspects be taken into account, but that they also have a complementary relationship as integral elements of course design. However, as indicated here, how to encourage/enable students to operate at the higher levels of cognitive functioning, if appropriate to the learning task, will require further investigation.

In this researcher's opinion, research in distance higher education should continue to focus on the learning process and on how to establish the interpersonal communication needed in order to foster more meaningful learning with respect to various instructional tasks. The key to improving distance education is to develop a better understanding of the instructional role of communication technologies within the distance education framework.

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Appendix A

Coding Scheme I - Coding for Purpose

CODING I

Content

- | | | |
|----------------------|-------|---------|
| - Progress Report | - S | 2/20/00 |
| - Feedback | - I | 2/20/00 |
| - Clarification | - S/I | 2/20/00 |
| - Problems/Solutions | - S/I | 2/20/00 |

Student Support

- Social Chit-Chat
- Reassurance/Encouragement
- Technological Problems/Solutions
- Personal Information

Administrative

- Due Dates and Updates
- Course Grades
- Course Materials
- Communication Problems

Appendix B

Description and Examples of Coding I Categories

DESCRIPTION OF CODING CATEGORIES

a) CONTENT

Any messages dealing with discussion of course content or course concepts.

1) Progress Report

- a STUDENT message in which the student discusses the concepts relevant to a particular assignment or provides responses to assignments, to instructor questions, or reading guide questions.

e.g. "I've been thinking about a diskette I have here.

Unfortunately, I don't have a proper name for this diskette. It is a diskette for learning French. There are four different activities. One is to practice the 'present', another is to practice 'imparfait', one is 'bonhomme pendu', finally the last one is to practice the possessive pronouns. Is it correct to work on a homemade diskette or should I pick a more commercial type diskette?"

e.g. "Reading Guide: Chapter 1, #2. Education is the learning of general knowledge. Training is the learning of exact, specific skills. BOTH ARE A LEARNING PROCESS."

2) Feedback

- an INSTRUCTOR message in which the instructor provides a response to the content / concepts of a student's assignment, reading guide responses, etc

e.g. "Not clear what you want here."

e.g. "As for your work on XYWrite, it's pretty clear that you're not going to have much trouble with that part of the course. I could probably learn a thing or two about the program from you! I liked your idea for the Valentine's Day competition. It must have taken a while to organize the teams."

3) Clarification

- discussion in which the student or instructor elaborates (or are asked to elaborate) on concepts discussed in a previous message

e.g. "With regard to the contents of your outline for Assignment 2, I'll leave it pretty much up to you. What I'm after is to see if you know how to create a proper outline with headings, subheadings and associated text, with whatever other enhancements you feel appropriate. What you create should, of course, lend itself to a structured outline, but there's lots of things which fall into that category. So what you're doing is probably just fine. As long as it uses the features of the PC-Outline well, and is at least three pages long, you're meeting the basic requirements of the assignment."

e.g. "Are all the outcomes for this module covered in the questions on checklist. What happens to the checklist - do students (participants) discuss it with the instructor/facilitator. How do both the checklist and the questions become evaluation of progress in considering the issues you address."

4) Problems / Solutions

- can be either a student message or an instructor message
- deals with specific questions related to course concepts / course content.

e.g. "Well I have been trying to make the copy as you suggested in your letter. I reached the point after "Format" Y/N and then the term Invalid Parameter came up. I am getting to know this word but what to do. I tried to follow your letter from point 1. I went back and put TEST when the name file came up. Still nothing happened. I then tried all kinds of ways to type in AC. So are there any other suggestions. I must be doing something wrong. Rodrique is our computer teacher for the APPLE machines. He tried to help. I am going to study the IBM disk again."

e.g. "...but I am still uncomfortable with the cause of the problem itself you describe and the problem itself is not well defined - further instruction in a

school setting may not be the answer - but let's go ahead. Defining the problem better should emerge through the objectives "

b) STUDENT SUPPORT

Any messages fulfilling the role of support; either to or from instructor or student.

Must NOT be content-related.

can be messages either providing or asking for support.

1) Social Chit-Chat

- messages that include such things as greetings, etc.

e.g. "Hello Ins.1! I finally made it back to Salluit, a little tired but feeling good. The place hasn't changed, except for the weather which has gotten noticeably better what with longer daylight hours and the blazing sun. Watch out for melanomas!"

e.g. "Hi INST 2, it took a bit of time to find my feet, after the holiday. It sort of seems like a dream now. The weather is much warmer now 0 to -20...yes, that is warmer! The sun has some strength and we have about 17 hours of daylight now."

2) Reassurance / Encouragement

- messages that deal with providing support specifically in the form of asking for or providing reassurance and encouragement to both students and instructors

e.g. "P.S. Your messages are neither overly verbose nor vague in any way. It's nice to see someone who obviously enjoys the use of language and is not afraid to correspond in more than monosyllabic words and brief sentences. Keep it up!"

e.g. "OK, AA - I'll go with this."

3) Technological Problems / Solutions (in general)

- messages dealing with problems / solutions arising from the use of the technology (i.e., problems finding the right sequence of commands in order to send an e-mail message; or problems using the computer)

e.g. "No, it ain't possible to send oneself a message and have it stay in the mailbox. I've already tried, although I can't remember why! There's probably a way of doing it, but not through the Express program. You could likely use a "normal" telecommunications program, and find out how to talk directly to Immedia, without the automation inherent in Express. I'm sure it's possible, but at the moment, I can't say how. If I ever do find out, I'll let you know."

4) Personal Information

- messages that deal with the sharing of personal experiences or information about each individual

e.g. "I had to take a course in University titled Education Psychology 100. Anyhow, it was actually an instructional design course. However -- we had a totally incompetent, replacement instructor. The regular prof was away on sabbatical or something. The course content was scrambled and there were real personality conflicts with the instructor and the entire class of students. The end result was that the instructor was told by the department that no one was to fail the course -- which was lucky for me. I finished the course with a bad feeling about instructional design and a knowledge of how to write reasonable learning objectives, but hating to write them because that would be admitting that the prof might actually have known something."

c) ADMINISTRATIVE

Messages that deal with the sort of information sharing that occurs at the beginning and the end of each class in the traditional classroom

1) Due Dates & Updates

- messages dealing with when assignments / responses are due and / or how assignment / responses are progressing

e.g. "Assignment #7 - I will submit 1 module plus parts of 2nd module just to give you an idea of how the modules progress "

e.g. "Don't worry too much about the fourth assignment - you've already handed it in! It was the AskSam file & questions about famous people - I haven't printed it all out yet, but I took a quick glance and it looks fine "

2) Course Grades

- messages discussing the grade a student received on a particular assignment
 - often the messages are simply a response from the instructor that the student has passed a certain assignment.

e.g. "Sorry to lose you J - What I can do is give you a mark of "K" (incomplete) until you finish the requirements for the course - Otherwise I have to give you a failing mark which would appear on your student record - I'm not sure how long McGill will allow a "K" to remain until they change it to an "F". I'll check and let you know "

3) Course Materials

- messages dealing with questions arising from the course materials the students have received via regular mail.

- can also be related to missing sections in the course materials
e.g. "Re: Assignment 1 I guess I'll have to find out exactly what they sent you up there. The notes from the last session included an introductory letter at the very beginning, followed by Assignment 1. I guess they left that part out of the package they sent this time around "

4) Communication Problems

messages dealing with problems in establishing the link in order to be able to set up a communication network (i.e., messages dealing with problems: with INET, communication software, etc).

e.g. "I got in touch with student C by phone. He's been sending messages out (I've received 2) but not getting any replies (I've replied to his messages). So we can only assume that his e-mail transmits but does not receive "

Appendix C

Bloom's Taxonomy of the Cognitive Domain Coding II

BLOOM'S TAXONOMY
COGNITIVE DOMAIN

1. **KNOWLEDGE:** the recall of specifics and universals, the recall of methods and processes, or the recall of a pattern, structure, or setting.
2. **COMPREHENSION:** refers to a type of understanding or apprehension such that the individual knows what is being communicated and can make use of the material or idea being communicated without necessarily relating it to other material or seeing its fullest implications.
3. **APPLICATION:** the use of abstractions in particular and concrete situations (i.e., general ideas, rules of procedures, generalized methods, technical principles, ideas, theories)
4. **ANALYSIS:** breakdown of a communication into its constituent elements or parts such that the relative hierarchy of ideas is made clear and/or the relations between the ideas expressed are made explicit.
5. **SYNTHESIS:** the putting together of elements and parts so as to form a whole.
6. **EVALUATION:** judgements about the value of material and methods for given purposes. Quantitative and qualitative judgements about the extent to which material and methods satisfy criteria.

Appendix D

Instructor Interview Questions

INSTRUCTOR QUESTIONS:

- How did you become involved in the area of distance education?
- Can you go back to when you first designed the course (Applications Software I / Course Design I) and share your thoughts at that time ? (probe: What were your major considerations during the design process?)

Were there any guidelines given to you for the course design?

- How did you decide on the communication technology you chose to use? How were you using the communication technology?

In your course, how important was it for you to have regular contact with your students?

- Why did you communicate with your students?
- Why do you think they communicated with you?
- Would you consider the communication technologies to be effective?

Why or why not? (Weaknesses/ strengths in using the communication technologies in distance education.)

- If you were redesigning the course, what would you do the same or differently? Why?
- What should students have learned by the end of this course?
- How did the communication technology support the learning goals of the course (content)?
- How was student learning evaluated in your course?
- What influenced your decision to evaluate learning in this way?
- In general, do you think the majority of the students have accomplished the learning goals of the course? Why or why not?

Appendix E
Letter to Instructors

Centre for University Teaching and Learning
McGill University
3700 McTavish Street
Montreal, Quebec H3A 1Y2

Centre d'enseignement supérieur
Université McGill
3700, rue McTavish
Montréal, Québec H3A 1Y2

(514) 392 6649

October 24, 1990

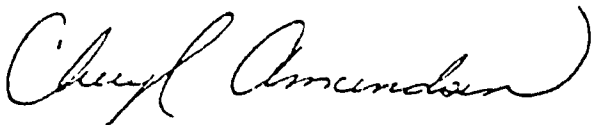
Dear Distance Education Instructor,

Many of you already have some information about the research project we are conducting concerning the instructional role of communication technologies in distance education. This project is funded by FCAR (Fonds pour la formation de chercheurs et l'aide à la recherche) for a three year period which began September 1990. In this first year, the project has employed two M.A. students from the Dept. of Educational Psychology and Counselling, who will be doing their theses in conjunction with the project (Helene Rogerson and Nancy Price). We are lucky indeed to have this funding and we would like to take this opportunity to further inform you about how you may aid us in carrying out this research. The attached sheet provides you with some background information concerning the research study and a brief outline of the procedures we will follow for each of the three years.

As you will see, one of the procedures we will be carrying out involves the analysis of both E-mail and FAX communications. Peter Burpee has told me that he has asked all of you to save these communications from the courses you are presently teaching - we are interested in both sides of the transmission (i.e., both instructor and student messages). If you choose to allow us to analyze the communications you save, please be assured they will be treated completely anonymously. In fact, we would appreciate your help in removing student names from communications before we look at them. Neither will your name be used at any point in the analysis, we will only need to separate instructor from student transmissions. We are also interested in taking a look at communications which have been saved from courses taught previously.

This letter is meant to provide initial information, we will be personally contacting each of you in the near future to ascertain your permission and to discuss any questions you may have. Thank you very much.

Sincerely,



Cheryl Amundsen

Appendix F

Certificate of Ethical Acceptability

Statement of Ethics

1. Informed Consent of Subjects

Informed consent was given by the course instructors in response to a letter explaining the nature and purpose of this study and requesting their participation (see Appendix A). Permission to contact course instructors was given by the Distance Education Program Director Peter Burpee, who provided the list of instructors. This first contact by letter was followed by a telephone contact by the author in which the purpose of the study was explained again. The need for confidentiality was expressed and instructors were asked to remove all instructor and student identification (i.e., names, ID numbers, addresses, etc.) from the documents prior to forwarding them. Course materials were given instructor and student codes as they were received. This coding was done by an individual hired as a transcriber who was not involved in the research project.

2. Subject Recruitment

2.1 The subjects in this study are the instructors and students of three Distance Education classes. The nature of this study is such that the area of investigation is not the students and instructors themselves, but rather the content of the course communications.

2.2 No pressures to participate in this study were applied. When instructors were contacted and asked to participate in this study, they were given a free choice and were assured that there would be no repercussions for not participating.

2.3 No inducements to participate were presented to prospective subjects other than asking them to provide their help for a thesis project.

2.4 The instructors were free to contact the author at any time in order to answer any

questions they might have regarding this study, which included questions of participation and termination of participation.

3. Subject Risk and Wellbeing

The risks inherent in this study are minimal and centre around reading the communications that took place between students and instructors. The interest in these communications is from a purely content-related perspective. Since course materials were given instructor and student codes prior to being examined, both students and instructors could be assured of confidentiality. In addition, the data was analyzed and collated well after the end of each course.

4. Deception of Subjects

4.1 The research design does not necessitate any deception of the subjects. The instructors were made fully aware of the nature and purpose of the study, and they were assured confidentiality by the instructor and students codes assigned prior to examination of the communications.

4.2 Not applicable.

4.3 Not applicable.

5. Privacy of Subjects

The subjects' right to privacy was respected by the fact that it was the instructors themselves who selected the course materials made available for this study. Also they were the ones who were asked to remove all personal identifications from the materials prior to forwarding it. They were left free to remove any information they thought might be better left out of the materials they wished to make available in order to protect students' and their privacy. It is important at this point to emphasize again that the interest in these communications was strictly at a content level. Messages relating to information from the private domain were not included in the research transcripts that were examined.

6. Confidentiality/Anonymity

6.1 The identity of the subjects was concealed by the instructor and student codes which were assigned by the individual who transcribed the course materials forwarded by the instructors. This individual was hired specifically as a transcriber and was not involved in the examination process in this study. This procedure ensured that the subjects' confidentiality of information was safeguarded.

6.2 The data collected for this study were aggregated in several ways that ensured that no inferences could be made regarding the performance, competence, or character of any one participant. Since the instructor and student codes were assigned by someone independent to the study itself, there was no way to discover the identity of any of the participants. Also, the data were processed using the Ethnograph which is a qualitative data analysis program. This program separated the messages according to purpose of communication and in this process all student and instructor codes were removed. Therefore