A CASE STUDY OF PARTICIPATION AND CRITICAL THINKING IN A UNIVERSITY-LEVEL COURSE DELIVERED BY COMPUTER CONFERENCING

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

in

THE FACULTY OF GRADUATE STUDIES

Department of Educational Studies
(Adult Education)

THE UNIVERSITY OF BRITISH COLUMBIA

October 1997

ABSTRACT

Despite the growth in the size and acceptance of distance education, there have been persistent criticisms of this form of education because it often fails to provide for interaction among students and between students and instructors. Without this, it is suggested, distance education can only be an inferior imitation of the best face-to-face education because learners are unable to clarify and challenge assumptions and to construct meaning through dialogue.

Some critics believe distance education's inability to reproduce a critical dialogue among students and between students and instructor can be addressed through the use of two-way communication technologies such as text-based, asynchronous (i.e., not in real time) computer conferencing. Appropriately-designed computer conferencing, it is argued, will facilitate interaction among students and between the instructor and students thus making distance education more appropriate for the higher-level cognitive goals of college and university education. At the same time, using this technology will retain the flexibility of time and place-independence that is characteristic of distance education.

The literature on educational computer conferencing is replete with references to its potential to create a new paradigm of education characterized by interactive group knowledge-building and critical thinking, but there are few empirical studies that have substantiated this view. Little is known about how and why learners participate and what factors may affect their participation. Similarly there has been little empirical study of the quality of computer conferencing interaction.

This case study of a university-level course delivered by computer conferencing was designed to address these issues. It was guided by two

purposes: 1) to determine whether the quantitative and qualitative dimensions of participation in this online course were consistent with key aspects of the new paradigm of networked learning as articulated in the literature, that is, if students were actively participating, building on each others contributions and thinking critically about the discussion topics; and 2) to determine what factors affected student participation and critical thinking.

The results of this study suggest that some of the claims about the potential of this technology to transform conventional and distance education may be overstated. The emergence of a dynamic and interactive educational process that facilitates critical thinking was shown to be contingent on a variety of factors. The results suggest, however, that with the appropriate course design, instructor interventions, content, and students, computer conferencing can be used for these purposes and should be given serious consideration by distance educators as a way of facilitating interaction and critical thinking in distance education.

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ACKNOWLEDGEMENTS

First and foremost I would like thank my wife, Rochelle de la Giroday, for her encouragement and support. I would never have taken the first step in this process without her unselfish prodding and I would not have completed this thesis without her continued support. I would also like to thank my children, Danielle and Alexis, who I hope one day will understand what I was doing all that time I spent upstairs at the computer.

I also extend a sincere thanks to my supervisory committee: Tom Sork, Tony Bates, Walter Uegama and Lucio Teles, for their guidance and support. A special word of thanks to the late Bill Griffiths who got me started and heading in the right direction, and to Tom Sork who took over so willingly as research supervisor and provided such excellent advice and feedback.

Finally, special thanks to my colleague, Reginald Nnazor, for his unfailing support and optimism and to my good friends Michael Armstrong and Linda Stevens for their continued interest and support and for requiring me to provide weekly Friday night updates.

CHAPTER 1 - INTRODUCTION

Distance Education

Distance education is a worldwide practice that is growing in size and importance. It is "a teaching-learning system including specially prepared study materials and regular mediated contacts between students and tutors, individually or in groups" (Holmberg, 1995, p. 1) and it has been responsible for breaking down barriers to access for millions of learners at the primary, secondary and postsecondary levels.

Until about 15 years ago distance education was usually referred to as correspondence education, a form of independent study in which most instruction and interaction is carried on by using the postal system to send course materials and assignments between tutors and students. While correspondence study still constitutes a significant part of distance education, since the early 1970s it has given way to other forms of delivery involving communication technologies such as the telephone, television, video, audio and the computer. This change was formally recognized in 1982 when the International Council for Correspondence Education changed its name to the International Council for Distance Education.

In recent decades there has been a worldwide boom in distance education. Hawkridge (1995) suggests that, in the next decade, this boom will turn into a "big bang", an exponential expansion of distance education brought on by the opening of the so-called information superhighways which will make high-speed data communications widely available. While the academic credibility of distance education is still questioned by many educators, there is evidence that distance education is shedding its marginal status and gaining wider acceptance (Smith, 1991; Black, 1992). Whether this is attributable to the

success of distance education students, the increasing use of sophisticated electronic communication technologies or economic circumstances that are causing governments to look for more cost-effective ways to deliver education remains unanswered. Nonetheless, it has been estimated that in the 1990s more than 10 million students, mostly adults, are studying at a distance (Harry, Magnus & Keegan, 1993).

In Canada there are three postsecondary distance teaching institutions: the British Columbia Open Learning Agency, Athabasca University in Alberta and the Télé-Université, part of the Université de Québec network. In addition, most conventional universities and colleges are offering an increasing number of their courses by distance education and some offer complete diploma and degree programs. Around the world there are more than 1,500 distance teaching institutions including 27 distance teaching universities (Holmberg, 1995).

Student enrollments vary considerably. In 1994/95 the Open University component of the British Columbia Open Learning Agency had 20,090 course enrollments or 1,963 full time equivalent students and the University of British Columbia had 3,840 distance education course enrollments or 511 full time equivalent students (Open University Planning Council, 1995). At the other extreme, India's Andhra Pradesh Open University had over 400,000 full time students and the Central Radio and Television University of China had nearly 2 million in the late 1980s (Reddy, 1988). Nearly half of the students in higher education in China are pursuing their studies by distance education (Moore et al, 1990). In the United States, schools accredited by the American National Home Study Council enroll about 4 million students (Verduin & Clark, 1991).

The Problem

Despite the growth in the size and acceptance of distance education, there have been persistent criticisms of this form of educational delivery because it often fails to provide for interaction among students and between students and instructors. Without this, it is suggested, distance education can only be an inferior imitation of the best face-to-face education because learners are unable to clarify and challenge assumptions and to construct meaning through dialogue (Lauzon, 1992). According to Henri & Kaye (1993),

> The difficulty distance education comes up against is that of reproducing the dialogue that enables students to be critical and personal in their learning. Students should be able to enter into exchanges in order to understand, criticize, adapt and finally use the knowledge that has been given to them and which they have made their own. (p. 28)

According to Lauzon (1992), the challenge for distance educators is to "search out means of reducing structure and increasing dialogue so that learners may move from being simply recipients of knowledge to actively embracing and working with objective knowledge to make it their own" (p. 34). In effect, the critics argue, much distance education is rooted in a transmission model of learning which inhibits the development of critical thinking. Learners passively assimilate knowledge rather than critically examine and construct it, based on their own experiences and previous knowledge (Burge, 1988; Garrison, 1993; Lauzon, 1992).

Critical Thinking

Critical thinking has been the subject of scholarly inquiry for well over 50 years but there is still disagreement over what the term means. McPeck (1981) observes that being in favour of critical thinking is like being in favour of freedom, justice or a clean environment. The concept is treated like a self-

evident slogan but "often with such matters approval diminishes in inverse proportion to the clarity with which they are perceived" (p. 1).

Garrison (1991) states that, "depending on how broadly or narrowly critical thinking is viewed, there arise two very different conceptions. In the weak sense critical thinking is a set of discrete micro-logical skills concerned with technical reasons, while in the strong sense critical thinking is a set of integrated macro-logical skills concerned with insight and the development of emancipatory reason. It is the holistic and Socratic sense of critical thinking that is of concern in an educational setting" (p. 290). This study adopts the strong sense critical thinking described by Garrison as well as Norris & Ennis' (1989) definition of critical thinking as "reasonable and reflective thinking that is focused upon deciding what to do or believe"(p. 1).

Computer Conferencing

Some critics believe distance education's inability to reproduce a critical dialogue among students and between students and instructor can be addressed through the use of two-way communication technologies. These provide opportunities for interaction which, it is suggested, lead to reflection and deeper understanding (Laurillard, 1993). Audio and video conferencing are used to achieve this, but these are time and place-bound technologies that require all learners in a course to be available at the same time and to travel to one of several meeting places. A more flexible alternative involves using text-based, asynchronous (i.e., not in real time) computer conferencing to create a more interactive form of distance education that still retains the flexibility of time and place-independence. Appropriately-designed computer conferencing, it is argued, will facilitate interaction among students and between the instructor and students thus making distance education more

appropriate for the higher-level cognitive goals of college and university education (Harasim et al, 1995; Lauzon, 1992; Tuckey, 1993).

Computer conferencing is a relatively new educational technology that has been used for higher education instruction on a small but growing scale since 1982 (Feenberg, 1987). It is a subset of computer-mediated communications involving a configuration of computer hardware and software that allows group members to share information with each other. Until recently this information was text-based only and this is still the most common type of computer conferencing, but the technology now allows for the exchange of multimedia information as well. This study examined a text-based computer conferencing system. Computer conferencing systems are "designed to facilitate collaboration among all sizes of groups, from two-person dialogues to conferences with hundreds or thousands of participants" (Harasim, 1993b). All messages to a conference are organized and stored sequentially. Depending on the software, messages can be sorted and reorganized according to different criteria such as date, author, subject, key words, or topic. Some systems provide message threading which links messages on the same topic.

The American Open University was one of the first distance education institutions to use computer conferencing, introducing it in 1983 to enhance communication between students and tutors (Harasim et al., 1995). In 1988, the British Open University became the first distance education institution to use computer conferencing on a large scale, giving access to over 1,300 students taking a course on Information Technology (Mason, 1989). With the rapid rise in popularity of the Internet and the steady diffusion of computer technology to homes, there has been an increasing interest in and use of computer conferencing technology for educational delivery. In 1992 there

were at least 200 educational institutions using computer conferencing (Wells, 1992). In British Columbia, a user's group of educators involved with computer-mediated communication was formed in 1995 with representatives from the three major universities and many of the colleges and institutes. A survey conducted in 1995 by the Standing Committee on Educational Technology found that all the major universities in British Columbia and most of the community colleges were offering some of their courses through computer-mediated communication or computer conferencing (SCOET, 1995)

The literature on educational computer conferencing is replete with references to its potential to create a new learning environment in which interaction, collaboration, knowledge building and critical thinking are the defining features. Harasim (1994) suggests that computer networking in education is a new paradigm which she calls network learning, a unique combination of place-independent and asynchronous interaction among learners connected by computer networks that will result in new educational approaches and learning outcomes (Riel & Harasim, 1994). Harasim et al. (1995) claim,

> With attention to instructional design and facilitation, these shared spaces [learning networks] can become the locus of rich and satisfying experiences in collaborative learning, an interactive group knowledge-building process in which the learners actively construct knowledge by formulating ideas into words that are shared with and built upon through the reactions and responses of others. (p. 4)

There is a growing body of literature on computer conferencing for education. Articles in distance education, communication, computing and other academic journals began appearing in the 1980s and there has been a proliferation of books on the subject. Despite this growth in the literature, there is limited empirical support for the claims made about the potential of computer conferencing to facilitate higher level thinking. In 1987 Harasim

reported, "We understand little about the new phenomenon of learning in an electronic space. There is as yet very little data describing or analysing teaching and learning within this asynchronous, text-based (screen) environment" (Harasim, 1987a, p. 119). Ten years have passed since Harasim made that observation. Certainly more data are available now, but Burge (1994) suggests there is still a scarcity of qualitative studies that enable researchers to "develop new and relevant concepts and hypotheses for consequent explorations" (p. 22). Eastmond (1994) suggests there is a need for more studies that examine online learning from the student perspective.

Little is known about how and why learners participate in computer conferencing and what factors may affect their participation. Similarly there has been little empirical study of the quality of computer conferencing interaction. Mason (1989) observes, "Many laudable studies have been carried out based on the user statistics generated from conferencing applications. . . However, one usually looks in vain for any relation between this kind of analysis and an evaluation of the actual content of messages. In fact most computer conferencing literature distinctly avoids making anything but very general statements about the content of messages" (p. 97).

A further limitation of the computer conferencing research is that much of the seminal work focused on the participation of graduate students, academics and professionals and not on undergraduate students who are not likely to be experienced at the discussion and debate that characterize college and university education in the humanities and social sciences. More recently there have been studies involving undergraduate students but these did not attempt to analyze the educational quality of student participation and what factors may be responsible for it (Hiltz, 1990; Lauzon, 1992).

There is no question that computer conferencing allows for student-to-student and student-to-instructor interaction, but if the point of the interaction is to develop higher level thinking then the effectiveness of using this technology to achieve this goal needs to be examined. Depending on the context, the use of computer conferencing may impose additional costs on students and institutions. If this is the case, there seems little point in investing in this technology if its benefits cannot be demonstrated. This study was designed to address this issue and the gaps identified in the literature by focusing on the quantitative and qualitative aspects of participation in computer conferencing in an undergraduate distance education context.

Research Purposes

This study investigated a university-level course that was delivered using computer conferencing. It was guided by two main questions: (a) to what degree were the students actively participating, building on each other's contributions and thinking critically about the discussion topics?; and (b) what factors were responsible for this, that is, what factors affected student participation in the course and how did those factors affect participation?

In the fields of adult and distance education, participation usually refers to a learner's presence in an educational activity. Studies of participation in this sense focus on what factors may prevent people from enrolling and what factors may cause them to discontinue their studies. That is not how participation was defined for this study. In this study, the learners were already participating in this initial sense. That is, they had enrolled in the course and, therefore, were participating. This study focused on the learners' degree and quality of involvement in the computer conferencing activities.

Quantity and quality of participation was examined: how frequently the students contributed to online activities and their use of critical thinking.

Research Questions

To answer the broad questions presented above, this study was guided by the following research questions:

1. How frequently and how much did students contribute to the computer conferences?

Active participation is a characteristic of Harasim's (1994) network learning paradigm. She suggests the time-independent nature of computer conferencing should facilitate active and frequent student participation. Some studies have concluded that students do contribute actively and frequently, although it is not always clear how "active" and "frequent" are defined (Harasim, 1989; Riel, 1992). Harasim (1993), for example, found students contributed an average of 5 to 10 messages in 12 courses she studied. She considered this to be active participation. Regardless of how one defines "active", research has not yet demonstrated any link between level of participation and the time-independent nature of computer conferencing.

2. To what extent did the online activity resemble a discussion in which students responded to, and built on, each other's contributions?

3. To what extent did the students appear to be thinking critically about the issues under discussion?

These two questions also relate to the characteristics of the network learning paradigm proposed by Harasim (1994). Harasim et al. (1995) suggest the text-based, asynchronous and computer-mediated characteristics of computer conferencing will facilitate and promote reflection and knowledge-

building by permitting students to reflect on each other's contributions and to think through their own contributions before posting them:

> Making comments requires the learner to pull ideas and thoughts into a coherent form; this is intellectual work. Once the statement has been made and presented in the public forum of a conference or e-mail network, it may well receive follow-up comments, such as requesting clarification and expansion or expressing disagreement for various reasons. Such exchange on an idea will require that the original author or another participant defend, refine, or acknowledge some fault in the position in a process of cognitive restructuring. The interaction activates intellectual processing and reflection on the idea (p. 29).

4. How did the quantitative and qualitative characteristics of participation change over the duration of the course?

Harasim et al. (1995) have suggested that overcoming inhibitions about communicating in a text-only, asynchronous environment can be one of the biggest barriers to participation. If this is the case, one would expect that both the quantity and quality of participation might increase as students become more comfortable with the learning environment.

5. What instructional techniques did the instructor use that may have either facilitated or inhibited participation and critical thinking?

In any formal educational activity the instructor plays a key role in structuring learning activities that guide and motivate learners. The role of the instructor in the online educational environment and the extent to which the she or he uses appropriate instructional techniques may affect student participation and critical thinking (Berge, 1995; Paulsen, 1995; Harasim et al., 1995). For example, how participation is assessed in the course and what implicit and explicit methods are used to encourage participation and critical thinking may affect participation.

6. What were student and instructor perceptions of the factors that affected participation and critical thinking in the course and how did they perceive the impact of those factors?

Harasim (1990) suggests the time-independent nature of computer conferencing may encourage participation because students will more likely be able to fit the activity into their schedules and because they will not feel competitive pressure from other students that might be evident in a classroom discussion. On the other hand, Feenberg (1987) suggests the asynchronous nature of computer conferencing may result in 'communication anxiety', the feeling of talking in a void and that some students might find this discourages them from participating. Burge (1994) also suggests that some students may be overwhelmed by the volume and fragmentation of messages and this may inhibit their participation.

The subjective reality of the learners and the instructor are considered to be as important as the measurements of participation and critical thinking and the normative comparisons. Student and instructor perceptions provide insights into how the effects of various factors are being interpreted. They may also alert us to possible inconsistencies between theory and practice.

7. Was there any apparent relationship between the level of critical thinking or participation and selected student characteristics?

Students may have predisposing attitudes towards the technology that affects their participation, and their home study environment may or may not be conducive to this form of study. Hiltz (1994), for example, found that students with more positive precourse attitudes towards computers and computer conferencing will be more likely to participate actively. Harasim (1987b) found distractions at home might have an influence on student participation. Previous computer and computer conferencing experience was

also examined for its possible impact on participation as was age and previous education. King and Kitchener (1994) suggest age and educational level are reasonable proxies for cognitive maturity and that this is related to one's ability to engage in reflective thinking.

Research Approach

This research project used a case study approach to investigate a university-level course delivered by computer conferencing. The principal difference between case studies and other types of research is not one of method but of focus and purpose (Merriam, 1988; Stake, 1988; Yin, 1994). Case studies seek to understand the complexities of a 'bounded system' which is a phenomenon such as a course, a program, an institution, a person, a process or a social group (Smith, 1978). They aim to "uncover the interaction of significant factors characteristic of the phenomenon" (Merriam, 1988, p. 10). Methods employed in case study research can vary from the purely qualitative and ethnographic approach to the highly quantitative and statistical (Merriam, 1988; Stake, 1988). Because of their focus on the particular and its uniqueness and complexity, case studies do not seek to make generalizations. Instead transferability and extrapolation are the key concerns (Guba & Lincoln, 1989; Patton, 1990). With transferability it is incumbent on the researcher to describe the case in sufficient detail to allow readers to interpret the results in order to determine the extent to which they can be transferred to other cases. According to Patton (1990), "extrapolations are modest speculations on the likely applicability of findings to other situations under similar, but not identical conditions" (p. 489). In this case study both qualitative and quantitative data were gathered in order to understand the

factors that might affect student participation and critical thinking in a computer conferencing environment.

Scope of the Study

This is a case study of one university-level distance education course delivered using asynchronous computer conferencing. It describes and analyzes quantitative and qualitative dimensions of student participation in this course, and investigates student and instructor perceptions of factors that might have facilitated or inhibited participation and critical thinking. It does not investigate how the course and specific design issues and instructor interventions may or may not have contributed to the development and growth in critical thinking. The research site and the reasons for its selection are described in chapter 3.

Definitions

In the following section key terms used in this study are defined. Some of these terms already have been discussed but they are included here for ease of reference.

Distance Education

Like other forms of adult education, distance education is a field whose boundaries are somewhat vague and whose characteristics seem to be continually in question. For the purposes of this study, however, distance education refers to a formal educational situation in which teacher and learner are separated in time and space and in which the instruction is delivered by print, computer, video, television, telephone and other technologies.

Correspondence-style Distance Education

This term refers to the form of distance education in which the instruction is delivered entirely or mostly by the printed word and in which assignments are mailed to tutors for marking. This is often supplemented with limited telephone access to tutors for discussion of the course and assignments.

Computer Conferencing

Computer conferencing is a subset of computer-mediated communications which Mason (1990) defines as "the set of possibilities which exist when computers and telecommunications networks are used as tools in the communication process; to compose, store, deliver and process communication" (p. 222).

Harasim et al. (1995) describe it as follows:

> A computer conference is a stored transcript of a discussion by a group in easily accessible format. Each conference has access privileges set by the person who opens (creates) the conference, specifying, for example, who can be a member of the conference. Each conference provides a membership list that allows participants to tell who has read what material, so one can know where everyone is in the discussion. Some systems allow people to make changes to their earlier contributions and notify members of any changes. Others are structured to allow different individuals to edit the same contributions or to enter anonymous contributions. Conferencing systems may also allow such functions as various types of voting. In more advanced computer conferencing systems, the person who opens a conference can designate the type of structures and facilities he or she wants to make available in a particular conference. Some systems provide sophisticated information management tools or retrieval capabilities, so the material can be reorganized to reflect different review requirements. (p. 19)

Online Education

Online education is a term that is used to refer to a variety of educational activities involving networked computers. In the context of this study it refers to courses that are delivered solely or primarily via computer conferencing, supplemented by textbooks and other print materials and telephone contact with the instructor. It does not include the use of computer conferencing as an adjunct to classroom-based education or other forms of distance education.

Participation

In this study, participation is not used in the way it is most commonly defined in the adult and distance education literature, as a synonym for enrollment or "as a way of describing the act of engaging in adult learning" (Selman & Dampier, 1991, p. 74). In this study, the learners have already enrolled in the course and are participating in the sense just described. Participation, for this study, refers to the frequency, quantity and quality of learner involvement in the computer-mediated learning activities.

Critical Thinking

Critical thinking is defined in this study as "reasonable and reflective thinking that is focused upon deciding what to do or believe" (Norris & Ennis, 1989, p. 1), and "a set of integrated macro-logical skills concerned with insight and the development of emancipatory reason" (Garrison, 1991, p. 290).

Overview of the Dissertation

There are seven chapters in this dissertation. Chapter 1 introduces the problem, describes the background to the problem and discusses the research

purposes and questions. Chapter 2 is a review of literature relevant to the purposes of the study. It concludes with the conceptual framework that guided the study. Chapter 3 is a detailed description of the research design and the methodology that was used to collect and analyze the data. Chapter 4 presents the findings of the study related to the context and participation. Chapter 5 presents the findings of the student and instructor interviews regarding their perceptions of the factors that affected participation and critical thinking. Chapter 6 discusses the findings, and chapter 7 summarizes the results, presents the conclusions and discusses the implications of the study for future research and practice.

Summary

This chapter has introduced and discussed the problem, presented the research purposes and questions, defined key terms, and provided an overview of the dissertation.

The study was motivated by a desire to determine whether or not computer conferencing could be used to improve the quality of distance education by providing for sustained interaction between students. The study was guided by two main questions: (a) to what degree were the students actively participating, building on each other's contributions and thinking critically about the discussion topics?; and (b) what factors affected student participation and how did those factors affect participation? Seven research questions related to these main questions were presented:

1. How frequently and how much did students contribute to the computer conferences?

2. To what extent did the online activity resemble a discussion in which students responded to and built on each other's contributions?

3. To what extent did the students think critically about the issues under discussion?

4. How did the quantitative and qualitative characteristics of participation change over the duration of the course?

5. What instructional techniques did the instructor use that may have either facilitated or inhibited participation and critical thinking?

6. What were student and instructor perceptions of the factors that affected participation and critical thinking in the course and how did they perceive the impact of those factors?

7. What was the relationship between the level of critical thinking or participation and selected student characteristics.?

CHAPTER 2 - LITERATURE REVIEW

Computer conferencing is a relatively new technology that has been used for higher education instruction on a small, but growing scale, since 1982 (Feenberg, 1987). Thus, the scholarly literature on this subject is limited but growing. Initial attempts have been made to develop a theoretical base for educational computer conferencing and empirical studies have examined computer conferencing from several different perspectives. However, there is not a well-developed body of empirical and theoretical research that can inform and guide researchers and/or practitioners.

This literature review is an analysis of the empirical and theoretical research that bears directly on the purposes of this study: (a) to what degree were the students actively participating, building on each other's contributions and thinking critically about the discussion topics?; and (b) what factors affected student participation in the course and how those factors affected participation.

The review is divided into four main sections. In the first section various interpretations of the concept of critical thinking are described and strategies for facilitating critical thinking are examined. In the second section the literature on the attributes of educational computer conferencing is reviewed. In the third section the literature is used to trace the lineage of the research problem by analyzing what researchers have already discovered about the nature of participation and the factors that affect participation in college and university contexts. The fourth section is a review of the literature on appropriate instructional approaches for promoting the interactive online learning environment that is described in the literature.

Critical Thinking as an Educational Outcome

Interpretations of the Concept of Critical Thinking

The meaning of critical thinking has been a subject of scholarly inquiry and discussion for well over 50 years. While there seems to be little questioning of the value of critical thinking, there is less agreement on what the concept actually means. As Garrison (1991) points out, "at various times authors have associated critical thinking with problem solving but not creative thinking; with deductive but not inductive thinking; with ill-defined but not well-defined problems; with abstract but not concrete problems; and with relevance but not rigor" (p. 287). According to McPeck (1981) critical thinking is often approached as though it were a self-evident slogan and he suggests approval of the concept diminishes in inverse proportion to the clarity with which it is perceived. This review will examine the key interpretations of the concept of critical thinking and the various models of the critical thinking process that have been proposed.

Dewey (1933) was one of the earliest scholars to examine critical thinking. He used the term reflective thinking to refer to "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusion to which it tends" (p. 9) and he proposed a five phase model of reflective thought:

1. suggestions, in which the mind leaps forward to a possible solution;

2. an intellectualization of the difficulty or perplexity that has been felt (directly experienced) into a problem to be solved, a question for which the answer must be sought;

3. the use of one suggestion after another as a leading idea, or hypothesis, to initiate and guide observation and other operations in collection of factual material;

4. the mental elaboration of the idea or supposition (reasoning, in the sense in which reasoning is a part, not the whole, of inference); and

5. testing the hypothesis by overt or imaginative action (p. 107).

Dewey's conceptualization of reflective thinking is consistent with his emphasis on the scientific method as a way of knowing and it is clearly situated in a deductive, problem-solving perspective. However, he has not overlooked creative thinking in his model. In discussing his third phase of reflective thought he talks of an idea springing up automatically.

Passmore (1972) also signals the importance of including creativity in the critical thinking process when he suggests it "conjoins imagination and criticism in a single form of thinking" (p. 423).

In the same vein, D'Angelo (1971) highlights the importance of conceptualizing critical thinking broadly to include more than just problem-solving which he views as only a part and "contingently necessary" for critical thinking. According to D'Angelo, critical thinking also encompasses creative thinking in which evaluation and justification are not required. This broad view of critical thinking is not evident, however, in D'Angelo's definition which focuses exclusively on evaluation: "critical thinking is the process of evaluating statements, arguments, and experiences. An operational definition of critical thinking would consist of all the attitudes and skills used in the evaluation process" (p. 7).

McPeck (1981) takes issue with D'Angelo's view of critical thinking because of his "persistent attempt to remove knowledge of facts and information from the domain of critical thinking" (p. 60). This criticism is

central to McPeck's view of critical thinking as consisting of a variety of subject-specific skills rather than a set of generic skills. He argues that it makes no sense to talk about critical thinking as a subject in its own right because "to the extent that critical thinking is not about a specific subject X, it is both conceptually and practically empty. The statement, 'I teach critical thinking,' simpliciter, is vacuous because there is no generalized skill properly called critical thinking" (p. 5).

McPeck defines critical thinking as "the propensity and skill to engage in an activity with reflective scepticism" (p. 8). He suggests scepticism must be applied judiciously and that it might eventually lead to acceptance, but it does not take truth for granted. It is in defining the criteria for judging whether there has been a judicious use of scepticism that McPeck's subject-specific view of critical thinking emerges strongly. He argues these criteria should be determined by the norms and standards of the subject area in question. He is highly critical of the "analysis of arguments" view of critical thinking because it only focuses on the evaluative and not the productive dimension of critical thinking. Analyzing arguments and logic can help to eliminate hypotheses, conjectures and proposed solutions but it cannot generate them, according to McPeck. "In the most common problem-solving situations within disciplines and working fields of knowledge, the most difficult - and perhaps the most important - phase is that of producing a hypothesis, conjecture or alternative that is worth checking or trying out. As N.R. Hanson used to say, 'All cooking recipes for hare stew should begin with the prescription, First catch your hare!' In critical thinking we are, or should be, as much concerned with catching hares as we are with stewing them." (pp. 15–16).

McPeck (1981) concludes by suggesting that simply having the disposition to think critically in all areas is not sufficient to be a critical thinker. That

person is not "a critical thinker unless he has an understanding of the area or field in which he is being critical. This is because critical thinking is tied more closely to specific knowledge and understanding than to any specific set of allegedly transferable skills" (p. 156). McPeck's point that subject-specific skills are necessary for critical thinking is clear, but his criticism of D'Angelo (1971) for holding the opposite view is unfounded. D'Angelo states only that in certain cases subject knowledge may not be required for critical thinking. He states clearly, "a knowledge of the subject areas in which thinking occurs is often a necessary condition for the development of critical thinking" and then goes on to say, "however, specific knowledge in a particular area is not always necessary in order to apply critical thinking skills" (p. 5). He cites detecting the fallacious argument of appealing to the sentiments of the people in a discussion of evolution without knowing the details of the theory of evolution as an example of being able to think critically without subject knowledge.

Much of the literature on critical thinking deals with it as a formal educational issue, particularly in the context of the kindergarten to grade 12 educational sector. Brookfield (1987) is one of a few writers who have applied the concept to daily lives of adults and analyzed it in relation to the theory and practice of adult education. He claims his conceptualization of critical thinking moves it beyond the mechanical, cognitive-skill-oriented view that dominates the literature, out of the classroom and into "the context of adults' lives - in their relationships, at their workplace, in their political involvements, and in their reactions to mass media of communication" (p. 12).

Brookfield (1987) identifies two key components of critical thinking: a) identifying and challenging assumptions; and b) exploring and imagining

alternatives. The first component "involves our recognizing assumptions underlying our beliefs and behaviors. It means we can give justifications for our ideas and actions. Most important, perhaps, it means we try to judge the rationality of these justifications" (p. 13). He says it will lead to what he calls contextual thinking, "the recognition of how important it is to understand the context within which assumptions, and the actions that spring from these, are formed" (p. 16). The second component of his view of critical thinking, exploring and imagining alternatives "often entails a deliberate break with rational modes of thought in order to prompt forward leaps in creativity" (p. 13) and leads to what he calls reflective skepticism, "the development of a particularly critical cast of mind, especially where any claims for the universal truth or validity of an idea or practice are concerned" (pp. 20-21). These two components are part of a "praxis of alternating analysis and action" (p. 23) that moves through five phases: a trigger event, appraisal, exploration, developing alternative perspectives, and integration.

While Brookfield (1987) tries to set his view of critical thinking apart from the cognitive models that dominate the literature, he really only accomplishes this in how he applies it. The underlying skills and process that he identifies are essentially the same as those identified by McPeck (1981), Ennis (1987) Paul (1990) and others who have written on critical thinking. Where Brookfield parts company with these writers is in how critical thinking is developed and applied. For Brookfield the focus is clearly on adult life, life transitions, perspective change and transformational and emancipatory learning. Brookfield's conceptualization of critical thinking is similar in many respects to Mezirow's (1990) notion of critical reflection discussed later.

Ennis has been one of the most prolific and widely-cited writers on critical thinking. In a recent annotated bibliography of critical thinking literature (Cassel & Congleton, 1993) there are 16 Ennis citations. Ennis (1962) began his writing on critical thinking with a fairly narrow definition of the concept as "the correct assessing of statements" (p. 6). Later, however, he revised this in response to criticisms to "reasonable and reflective thinking about what to believe or do" (Ennis, 1987, p. 10). Based on this definition, Ennis then elaborated a model of the critical thinking process and identified a core of critical thinking skills associated with each stage of that process.

There are four key components to Ennis' (1987) definition of critical thinking: a) reasonable thinking, b) reflective thinking, c) focused thinking, and d) making decisions about what to believe or do. Reasonable thinking is the opposite of arbitrary thinking. It is thinking that relies upon good reasons. Reasonable thinking leads to the best conclusions not just any conclusions because they are supported by the best reasons. Reflective thinking involves examining the reasonableness of our own and others' thought. Reflective thinkers must consciously seek and use good reasons. Focused thinking means the thinking is purposeful. It does not happen by accident. It is not the "stream of consciousness" type of thinking we all engage in without effort, what Dewey (1933) described as "the uncontrolled coursing of ideas through our heads" (p. 4). Focused thinking is consciously-directed towards some goal — solving a problem, resolving a dilemma, making a decision. This leads to the final element of Ennis' definition of critical thinking: making a decision about what to believe or do. The key point here is that critical thinking is directed towards evaluating statements *and* actions. That is, it is not restricted to the evaluation of beliefs but also encompasses decisions about actions. This highlights the practical role of critical thinking in daily life.

The critical thinking process elaborated by Norris & Ennis (1989) begins with some form of interaction with the world and other people and is viewed broadly as part of a problem-solving process. The ultimate goal of the process is to reach a decision about what to believe or do. This depends on having adequate background knowledge which is linked to the final decision by a process of inference. Four groups of abilities are identified in this critical thinking process: a) seeking clarification b) making and evaluating inferences, c) assessing the evidence needed or used for making and judging inferences, and d) the strategies and heuristics needed that make critical thinking orderly and effective.

Ennis (1987) provides an explication of critical thinking that serves both academic and practical needs. It goes beyond many other definitions of the concept (e.g., Dewey, 1933; D'Angelo, 1971; McPeck, 1981) because it focuses on both beliefs and actions and it provides a workable set of thinking abilities that can be used for evaluation purposes. It also stands apart from many other definitions because it includes both evaluative and productive abilities. That is, critical thinking involves both evaluating and making inferences and value judgments.

Quellmalz (1987) compared philosophical and psychological models of critical thinking and the concepts of critical thinking, inquiry and problem solving and concluded there was substantial overlap. Based on her analysis she produced "a core of thinking and reasoning skills that are common to theory and research in the two disciplines" (p. 88). Quellmalz states that the goal of higher-order or critical thinking should be "for students to engage in purposeful, extended lines of thought in which they use problem-solving strategies and become skillful in monitoring, evaluating, and improving those strategies" (pp. 91-92). This goal is broken down into a set of strategies

and processes that is similar in many respects to Ennis' (1987) taxonomy of critical thinking abilities. The strategies include identifying the task; defining and clarifying essential elements and terms; gathering, judging and connecting relevant information; evaluating the adequacy of information and procedures for drawing conclusions and/or solving problems; and developing self-monitoring problem-solving strategies. The cognitive processes are analysis, comparison, inference/interpretation and evaluation. The metacognitive processes are planning, monitoring and reviewing/revising.

There is a certain amount of overlap between Quellmalz's strategies and processes but taken together they parallel closely Ennis' (1987) taxonomy of critical thinking skills. The side-by-side comparison in Table 1 reveals the similarity.

Table 1
A Comparison of Critical Thinking Skills

Quellmalz (1987)	Ennis (1987)
• Identify the task • Define and clarify essential elements and terms	• Elementary/advanced clarification
• Gather, judge and connect relevant information	• Basic support (assessing evidence)
• Evaluate the adequacy of information and procedures for drawing conclusions and/or solving problems	• Inference (making and judging)
• Planning, monitoring and reviewing/revising	• Strategies and tactics

Kurfiss (1988) offers a definition of critical thinking which, while more detailed, is similar to that of Ennis (1987): "an investigation whose purpose is to explore a situation, phenomenon, question or problem to arrive at a

hypothesis or conclusion about it that integrates all available information and that can therefore be convincingly justified" (Kurfiss, 1988, p. 2). She goes on to explain that this critical thinking process can result in a variety of outcomes: a decision, a speech, a proposal or experiment, a document such as a position paper, a new way of approaching significant issues in one's life, a deeper understanding of the basis for one's actions, and political activity. Clearly Kurfiss' (1988) view of critical thinking, like that of Ennis (1987), encompasses both beliefs and actions. One can also see similarities with Brookfield's (1987) and Mezirow's (1990) (discussed later) emancipatory and transformative dimensions of critical thinking in her inclusion of outcomes dealing with political activity and coming to a deeper understanding of personal issues and actions.

Paul (1990) takes issue with what he describes as McPeck's (1981) "placing of critical thought squarely in the center of an atomistic, information-centered model of knowledge" (p. 104). He argues that it is absurd to suggest, as McPeck does, that because one has to think about something there is no such thing as a generic critical thinking skill. If this logic were applied to writing and speaking which also must be about something, he says, we would reject all courses that taught generic skills of composition and public speaking. Furthermore, Paul argues that McPeck's conceptualization of critical thinking assumes that all thinking can be neatly sorted into separate categories or domains and that critical thinking in each domain requires an intimate knowledge of a specialized set of concepts, skills and experiences. "It follows that we must use our critical judgment mainly to suspend judgment and/or to defer to experts when we ourselves are not expert. It leaves little room for the classical concept of the liberally educated person as having skills of learning that are general and not domain-specific"(p. 108).

Paul (1993) focuses on the distinction between what he calls strong sense and weak sense critical thinking. It is a distinction that has been made by other writers on critical thinking (Ennis, 1987; Passmore, 1972) but not as explicitly as Paul. Weak sense critical thinkers have mastered all the component cognitive skills of critical thinking but they are unable to "critique their own most fundamental categories of thought and analysis" (p. 206). While weak sense critical thinkers are able to analyze, critique and evaluate the ideas of others they are unable to use those skills on their own thought. Their thinking remains egocentric and/or ethnocentric.

Strong sense critical thinking is "a) an ability to question deeply one's own framework of thought, b) an ability to reconstruct sympathetically and imaginatively the strongest versions of points of view and frameworks of thought opposed to one's own, and c) an ability to reason dialectically (multilogically) to determine when one's own point of view is weakest and when an opposing point of view is strongest" (p. 206).

Paul's (1993) notion of strong sense critical thinking is similar to Mezirow's (1990) definition of critical reflection which serves as the basis for what he calls perspective transformation and transformative learning. According to Mezirow, reflection is a procedural consideration having to do with the assessment of assumptions about how to solve problems. In this sense it is similar to Paul's (1993) weak sense critical thinking. Mezirow's notion of *critical* reflection "addresses the question of the justification for the very premises on which problems are posed or defined in the first place" (p. 12). Critical reflection "involves challenging our established and habitual patterns of expectation, the meaning perspectives with which we have made sense out of our encounters with the world, others and ourselves. To question the validity of a long-taken-for-granted meaning perspective

predicated on a presupposition about oneself can involve the negation of values that have been very close to the center of one's self-concept" (p. 12). Both Mezirow's critical reflection and Brookfield's (1987) critical thinking have a transformative and emancipatory dimension.

Garrison's (1991) conceptualization of critical thinking draws on the work of McPeck (1981), Brookfield (1987), Peters (1972), Siegel (1988) and Paul (1990). He refers specifically to Paul's (1990, 1993) notion of weak and strong sense critical thinking in his definition: "depending on how broadly or narrowly critical thinking is viewed, there arise two very different conceptions. In the weak sense critical thinking is a set of discrete micro-logical skills concerned with technical reasons, while in the strong sense critical thinking is a set of integrated macro-logical skills concerned with insight and the development of emancipatory reason. It is the holistic and Socratic sense of critical thinking that is of concern in an educational setting" (p. 290).

Garrison (1991) then builds on the work of Dewey (1933) and Brookfield (1987) to develop a five phase model of critical thinking in adult education in which critical thinking is "viewed as an over-arching concept encompassing problem solving and creative thinking" (p. 290). The five phases are problem identification, problem definition, exploration, application, and integration. The model describes a cyclical process that begins in the shared world of knowledge with the identification and definition of the problem and then moves into the private world of ideas when the problem is explored. In the application phase alternative solutions are critically analyzed and a hypothesis may be formulated. In the final, integration phase, the process moves back into the concrete world when the idea or hypothesis is tested and a new perspective may be integrated. "This integration is sometimes satisfactory while at other times it simply triggers a renewed search for a more

satisfactory resolution to the dilemma. In this situation the cyclical process of critical thinking begins anew. However, there is a real chance that an individual may proceed directly to the applicability phase, having already generated promising alternative ideas" (p. 295).

Garrison's (1991) stated purpose was to provide an integrative view of the thinking and learning process. It should not be surprising, therefore, that his analysis of critical thinking does not yield any new insights into the concept. He does contribute an original model of critical thinking but this is essentially an elaboration and synthesis of models developed by Dewey (1933) and Brookfield (1987).

Bailen et al. (1993) conceptualize critical thinking in terms of three dimensions: critical challenges, intellectual resources, and critically thoughtful responses. "To think critically is to respond thoughtfully to a particular challenge by making use of appropriate intellectual resources" (p. 5). Critical challenges are the triggering events, the tasks, questions or problems that get the critical thinking process started. "A challenge requires critical thinking only if the task, dilemma, issue, or problem requires reasoned judgment or assessment" (p. 9). Critical challenges can be categorized according to the types of judgments implied by the challenge: a) judgments about descriptive claims, b) judgments about values, c) judgments about logical/meaning relations, d) judgments about plans, and e) judgments-in-action.

Intellectual resources consist of background knowledge and critical attributes. When responding to a critical challenge a person will draw upon a variety of strategies, attitudes and knowledge required for good thinking. Critical attributes include a) knowledge of the principles of good thinking, b) knowledge of critical concepts, c) a repertoire of strategies and heuristics

and d) attitudes or habits of mind. Bailen et al. (1993) contend that promoting critical thinking is primarily a matter of developing students' intellectual resources so that "they come to understand and internalize the many generally accepted principles, concepts, strategies, and attitudes needed in good reasoning" (p. 15).

Critically thoughtful responses are the outcome of the critical thinking process. They are responses to the critical challenges that make appropriate use of the relevant intellectual resources. In judging a critically thoughtful response, the key issue is not whether or not we agree with the response but whether or not the reasoning used to support it meets the criteria of good thinking. For example, is it based on adequate evidence and reliable sources? Have distinctions been made between value and factual claims? Have appropriate strategies been used effectively? Does the response reflect an open-minded attitude?

Thayer-Bacon (1993) takes issue with the mainstream theories of critical thinking because she says they focus on developing reason and rational thinking to the exclusion of "the ability to be receptive and caring, open to others' ideas and willing to attend to them, to listen and consider their possibilities" (p. 323). However in reviewing some of the mainstream theories, Thayer-Bacon admits that this aspect is present, albeit often in a disguised form. Ennis (1987), for instance, talks about the need for critical thinkers to be open-minded. Paul's (1993) "strong sense" critical thinking emphasizes the need to understand other people's perspectives and world view and he dwells on the importance of working to shed our egocentric and ethnocentric tendencies in dealing with problematic situations.

It seems, then, that Thayer-Bacon is really taking issue with the mainstream theories of critical thinking on a matter of emphasis and over

their underlying epistemological paradigm. She wants to bring caring to the forefront of critical thinking because, she argues, that unless we do, "many voices will continue to be silenced and excluded from the conversation because their voices will not be recognized" (p. 331) She is also arguing for an understanding of critical thinking that is based on a constructivist, relational epistemology in which people work together to build knowledge by sharing insights and maintaining an open and caring attitude towards one another.

King and Kitchener (1994) also deal with the epistemological dimension of critical, or as they call it, reflective thinking. In fact they are critical of what they call "typical descriptions of critical thinking" (p. 8) because they say such descriptions fail to acknowledge the importance of epistemic assumptions in how a person deals with problematic situations. According to Kitchener and King (1990), a reflective thinker is somebody who "understands that there is real uncertainty about how a problem may best be solved, yet is still able to offer a judgment about the problem that brings some kind of closure to it. This judgment, which Dewey refers to as a 'grounded' or 'warranted' assertion, is based on criteria such as evaluation of evidence, consideration of expert opinion, adequacy of argument, and implications of the proposed solution" (p. 2). So far this sounds very similar to definitions of critical thinking offered by Ennis (1987), Kurfiss (1988) and others. However, it is the addition of the epistemological assumptions of the thinker that sets King and Kitchener's reflective thinking apart from most other definitions of critical thinking. King and Kitchener have developed the Reflective Judgment Model of intellectual development which "focuses on people's assumptions about the certainty of a knowledge claim, how knowledge is acquired, and how beliefs or knowledge claims can be justified" (King, Wood & Mines, 1990, p. 169). According to research by Kitchener & King (1990), King, Wood &

Mines (1990) and King & Kitchener (1994), individuals progress through as many as seven stages of epistemic cognition. As individuals progress through these stages "they become better able to evaluate knowledge claims and to explain and defend their points of view on controversial issues. The ability to make reflective judgments is the ultimate outcome of this progression" (King & Kitchener, 1994, p. 13).

King & Kitchener (1994) concur with Paul's (1990) view that problem structure is crucial to a proper understanding of the nature of critical thinking. They talk about well-structured and ill-structured problems. Paul uses the terms monological and multilogical. Monological problems can be solved within a single frame of reference with a specific set of logical moves. Furthermore, there is usually one correct solution to a monological problem. Multilogical problems, however, do not have a single correct solution and cannot "be described with a high degree of completeness or solved with a high degree of certainty" (King & Kitchener, 1994, p. 10). According to King & Kitchener, true critical thinking, or reflective thinking as they call it, focuses on how people deal with ill-structured or multilogical problems: "true reflective thinking is uncalled for unless real uncertainty exists about the possible solution(s) to a problem" (p. 13).

King and Kitchener's (1994) conceptualization of reflective thinking differs from most of the other work on defining critical thinking for two reasons. First, it adds an epistemological dimension which, because of its developmental nature, has educational implications. Second, it makes explicit the distinction between well- and ill-structured problems and it clearly associates critical or reflective thinking with the latter. With the exception of Paul (1993), most other discussions of critical thinking have failed to make this distinction.

In summary, the differences between the various definitions of critical thinking emerge in several areas: (a) what skills are included and which are given emphasis; (b) whether critical thinking is a generic skill or set of skills or whether it is subject-specific; (c) how the critical thinking process is conceptualized; (d) the relationships between critical thinking and other types of thinking such as creative thinking and problem solving; and (e) the epistemological nature of critical thinking. However, there seems to be general agreement that critical thinking is a purposeful mental process that involves a variety of cognitive and metacognitive skills. The range of skills and how they are defined and categorized varies somewhat from writer to writer but Ennis' (1987) definition of critical thinking as "reasonable and reflective thinking about what to believe or do" (p. 1) is broad enough to capture the essential nature of critical thinking as discussed in all the literature reviewed here. This study adopts Ennis' definition of critical thinking because it contains three key elements that find general support in the literature: critical thinking is reflective, evaluative, and reasonable. Furthermore, it is a definition that encompasses both academic and practical goals because it focuses on both beliefs and actions.

Strategies for Facilitating Critical Thinking

A vast amount has been written about how to teach critical thinking skills and there is an ongoing debate about whether critical thinking is most appropriately treated as a separate subject or infused into other subjects. The literature reviewed in this section does *not* deal with this aspect of critical thinking because that was not the focus of this study. This study attempted to determine whether or not a particular set of conditions was conducive to critical thinking. The literature reviewed in this section deals with what are

considered to be the optimal conditions and strategies for facilitating critical thinking, not with how to teach students to use specific critical thinking skills.

A consistent theme in the literature dealing with strategies for facilitating critical thinking is the importance of interaction and dialogue, both between learner and instructor and between learners. In other words, discussions are favored over lecture and demonstration techniques when one of the goals of teaching is critical thinking (Clarke, 1988). As Meyers (1988) points out:

> The main problem with lecture as a primary mode of teaching is the disallowance of any time for students to interact with and process subject matter. Furious note taking may appear a form of interaction, but is no substitute for processing information by thinking out loud, restating concepts in one's own words, discussing issues with fellow students, or challenging a teacher's assumptions and conclusions" (pp. 57-58)

Sternberg (1987) and Sternberg & Martin (1988) call this the dialogical approach to teaching which is one of three main teaching styles they identify, the others being didactic and fact-based questioning. "The dialogical style is useful for encouraging class discussion, but most importantly for the present purposes, it is by far the most useful style for stimulating higher order thinking" (p. 560). Unfortunately a very small proportion of teaching at any level uses a dialogical style (Costa, 1985; Meyers, 1988). Sternberg & Martin believe there is a mutually reinforcing dynamic in place that favors didactic and fact-based questioning styles: students are used to these styles so they respond poorly to the dialogical style, teachers then get anxious about this poor response and revert to the noninteractive styles to relieve the anxiety. The students are thus positively reinforced for not responding to the dialogical style and the teacher is positively reinforced for using the noninteractive styles.

According to Sternberg & Martin (1988), the answer is not to give up too early and to adopt some strategies that might make the transition to a dialogical style easier. The instructor should not answer his or her own questions. Instead, he or she should facilitate critical thinking by providing clues, additional information, or breaking down the question into smaller, more manageable questions. "In doing so, the teacher becomes a facilitator or guide . . . of both content material and critical thinking. Not only are students forced to think about content material (hence making it more likely that they will learn the material under discussion), but they are actually forced to practice critical thinking too. Whereas Styles 1[didactic] and 2 [fact-based questioning] permit students to think, Style 3 [dialogical] demands that they think. In addition, the teacher becomes a role-model of what he she wants the students to do - to engage in critical thought" (pp. 561-562).

The view that critical thinking is facilitated by a learning environment in which discussion is favored over presentation and interaction over passivity is one that seems intuitively sensible, but it also has empirical support. A study by Smith (1977), for example, showed a positive correlation between critical thinking scores and student participation, teacher encouragement, and peer interaction. Both the Watson-Glaser Critical Thinking Appraisal Test and the Chickering Critical Thinking Behaviours Test were used to measure student critical thinking abilities in the study.

Clarke (1988) offers more specific strategies for facilitating critical thinking by focusing on the design of class discussions. He contends that treating discussions as group inquiries and planning them appropriately can lead students to "use the concepts and processes of the discipline to evaluate facts and move toward reliable conclusions", or, in other words, to think critically (p. 140). He suggests there are five necessary conditions for a discussion

organized as a group inquiry: a) the students must be aware of a problem in subject of the discussion; b) they must be motivated by their own desire to learn more about the issue; c) they must be familiar with "the conceptual tools of the discipline, the terminology, methodology, and the logical framework used to solve problems"; d) there must be agreement on the facts of the issue and their sources; and e) "they must be led to see that their own management of the issues, concepts, facts, and interpretations is the real work of learning at the college level" (p. 140).

The four phase inquiry cycle offered by Clarke (1988) addresses in detail how to organize the type of discussion that he believes will facilitate critical thinking. In the first phase (concept development) the issue is introduced along with the relevant concepts from the discipline. In the second phase (concept clarification), the issue is elaborated and procedures are introduced for exploring relationships among the concepts. In the third phase (verification), the concepts or procedures are tested against the facts gathered from readings, observations or laboratory investigations. In the fourth and final phase (analysis) interpretations are offered that clarify the issue or solve the problem. This inquiry cycle is essentially an applied version of the models of critical thinking discussed earlier. It leads students through the different phases of critical thinking by providing activities specifically related to each phase. Interestingly, however, it does not address all of the five necessary conditions for a group inquiry outlined by Clarke. For example, he does not explain how the inquiry cycle will motivate students with a need to know, nor how they will be led to see that this kind of activity is what learning at the college level is all about.

Freie (1987) offers a slightly different strategy for developing critical thinking, one that begins by suspending judgment before being critical. He

argues that "the process of critical thinking pushes us in the direction of believing only one position. The idea that multiple perspectives may contain elements of truth seems inconsistent with the doubting process" (p. 89). This point of view is based on a rather narrow interpretation of the critical thinking process, however the strategies that Freie offers to counteract this illusory defect are nonetheless useful. Basically he suggests that multiple perspectives be presented and accepted by students *before* being critiqued. In other words, one of the early steps in critical thinking should be an "attempt to suspend judgment and believe that the ideas being presented are true" (p. 90). Students are asked to "spend as much time and effort trying to believe an idea as we normally do trying to criticize it. Encourage students to make statements and ask non-hostile questions. If they have difficulty believing a particular idea, ask them to share that difficulty with others; encourage classmates to help each other believe" (p. 90).

Freie (1987) suggest there are several conditions for implementing this approach to critical thinking. They include: a) encouraging student interaction and dialogue, "student dialogue is important not because it is more logical, more rigorous, or more insightful than a lecture by a professor, but because it allows students to communicate ideas in a mode of discourse they can easily comprehend. Only by listening to how they express themselves and what they reveal about the world is it possible to explain alien perspectives" (p. 91); b) creating an open environment in which students are given the flexibility to develop methods of believing and criticizing ideas; and c) emphasizing the tentativeness of conclusions.

Much has been written about creating the appropriate classroom climate for critical thinking. Kahn & Weiss (1973), for example, suggest the quality of teacher interaction with students can have an impact on the level of

cognition, among other things. Lowery & Marshall (1980) found that teacher responses to students in the classroom had more impact on student behaviour than what the teacher actually asked or told the student to do. Flanders (1970) categorized teachers response behaviours according to their impact on students as either terminating or closing down thinking or opening up or extending thinking. He found six teacher response behaviours in these two categories as shown in table 2.

Table 2
Flanders (1970) Teacher Response Behaviours

Terminal or closed responses	Open or extending responses
• Criticism (and other put downs) • Praise	• Using silence (wait time) • Accepting—passively, actively, or emphatically • Clarifying—of both content and process • Facilitating data acquisition

The impact of most of these teacher responses seem fairly obvious. As Costa (1985) points out, "criticizing students and making them feel failure obviously does not enhance thinking" (p. 132). The impact of praise, however, is not as intuitively obvious. While many teachers see praise as a way to reinforce positive behavior and build self worth, according to Costa, the research indicates it has the opposite effect. "Praise builds conformity at a time when our goal is diversity. It tends to make students depend on *others* for their worth rather than on *themselves* for their worth" (p. 132). Research has shown that using silence, being accepting of student responses (i.e., being nonevaluative and nonjudgmental), clarifying concepts and process, and making it possible for students to acquire the data needed for dealing with the

issue under discussion all contribute to greater creativity and higher levels of thinking. It is important to note, however, that all of this research was done in kindergarten through grade 12 school contexts. None of it was conducted in college or university classrooms. Nonetheless this categorization would seem to have face validity for postsecondary contexts as there appears to be no obvious reason why the teacher response behaviours identified would not have similar effects on older students.

By contrast, Brookfield's (1987) book *Developing Critical Thinkers* contains an entire chapter on strategies for facilitating critical thinking in adult education contexts. His suggestions, however, are not particularly helpful for, or relevant to, promoting critical thinking in an academic context. They focus more on the personal development of adults as they deal with work, family, and interpersonal situations. The ten strategies he offers are: a) affirm critical thinkers' self-worth; b) listen attentively to critical thinkers; c) show that you support critical thinkers' efforts; d) reflect and mirror critical thinkers' ideas and actions; e) motivate people to think critically; f) regularly evaluate progress; g) help critical thinkers create networks; h) be critical teachers; i) make people aware of how they learn critical thinking; and j) model critical thinking. In addition to being aimed at a different context, many of these strategies overlap and lack practical specificity. For example, Brookfield does not explain how to motivate people to think critically or how to evaluate progress and his suggestion to be a critical teacher, seems to encompass all the other suggestions.

To summarize, the strategies for facilitating critical thinking fall into two broad categories: instructional style and instructor response behaviour or learning climate. An interactive, dialogical instructional style is favored over a didactic or fact-based questioning lecture style of instruction. As Meyers

(1986) puts it, "critical thinking skills develop best in an atmosphere of dialogue, interchange, and problem solving. Students do not learn much about critical thinking merely by listening to professors lecture" (p. xii). Research has shown that how instructors respond to students has a major impact on their level of thinking. Responding to students by using silence (wait time), being accepting , clarifying concepts and process and by facilitating access to necessary information is favored over responding by praising or criticizing.

The Attributes of Computer Conferencing

Underlying the notion that computer conferencing has the potential to facilitate higher level learning are the attributes of this communications technology. These attributes set computer conferencing apart from other educational technologies and, in the view of some, give it the potential to create a new and unique environment for learning that combines attributes of face-to-face and distance teaching modes (Harasim, 1990; Mason & Kaye, 1990).

The idea that educational computer conferencing should be considered a unique mode of education different from both face-to-face and distance education was first proposed by Harasim (1990). She supported her argument by pointing to five key attributes of computer conferencing which she said "both delineate its differences from existing modes of education and also characterize online education as a unique mode" (pp. 42-43). The five attributes are: many-to-many communication, place-independent group communication, time-independent group communication, the text-based nature of communication, and computer-mediated learning.

Many-to-Many Communication

Until the advent of computer conferencing, distance education was based largely on a one-to-many model of communication. In the case of correspondence-style distance education, instructional materials are distributed to a mass audience and communication is between the student and instructor via telephone or correspondence. Video and audio conferencing technologies have introduced a limited amount of group interaction into distance education but even when these technologies are used a one-to-many model is often followed by using them to transmit lectures to groups of students. The many-to-many communication potential of computer conferencing makes student to student communication as easy as student to instructor communication. According to Harasim (1990) this allows online education to be based on a learner-centered model of interactive group learning.

Place-independent Group Communication

Like other forms of distance education, computer conferencing provides access to learners regardless of their geographical location. However, when this attribute is combined with the many-to-many communication attribute, computer conferencing creates learning networks that can span the globe. "Expanded access empowers the learner and enriches her/his resource base: learners, free of geographical constraints, can access a range of input richer and more diverse than available locally" (Harasim, 1990, p. 46).

Time-independent Communication

Computer conferencing is an asynchronous form of communication. That is, communication does not occur in real time. Messages are stored in a

central computer and accessed by learners when it is convenient for them to do so. This facilitates self-pacing and allows learners more time to read and respond to messages. Unlike face-to-face situations, there is no need to listen to an irrelevant contribution, nor is there pressure to formulate a response on the spot. There is time to read, reread, reflect and respond (Harasim, 1990; Selfe & Meyer, 1991).

This absence of time constraints is also thought to reduce competition for "air time" because the system accepts and displays all messages simultaneously. A frequent and verbose contributor to a computer conference does not prevent others from contributing as he or she would do in a face-to-face discussion. This attribute is also thought to prevent the dominance of online communication by one or a few individuals as often happens in face-to-face situations (Rice, 1980).

Text-based Communication

In computer conferencing, communication is usually conducted via written (text) messages. This is changing with the advent of web-based applications that allow for the inclusion of multimedia information, but in current practice, computer conferencing is still largely a text-based technology. Like the time-independent attribute, this characteristic is also thought to promote reflective as opposed to hasty and spontaneous communication. Writing may involve thinking through one's thoughts and revising ideas and arguments. According to Harasim (1990) this can enhance metacognitive skills such as self-reflection and revision in learning. "Metacognitive skill requires the opportunity to make explicit to oneself the aspects of an activity that are usually tacit—for example, expressing the thinking processes by which a decision or conclusion is reached, or the strategy for accomplishing

some task. The text-based environment is such a narrow bandwidth of information that, to compensate, clear and explicit articulation is essential for group interaction" (p. 49).

The text-based nature of the communication is also thought to focus the attention of participants on the cognitive content of the messages rather than the presenter because physical and social cues are absent. However, empirical support for this suggestions is tenuous as some students report they miss these cues and others report they find their absence helpful in focusing attention on the content (Harasim, 1987 a,b). The text-based nature of communication is also believed to have an equalizing effect on communication because of the absence of social status and physical cues such as race, gender and physical handicap, but empirical support for this conjecture has yet to be presented. Selfe & Meyer's (1991) study reviewed later, for example, does not support this conclusion.

Computer-mediated Learning

The computer-mediated nature of computer conferencing is what distinguishes it from other forms of educational communication. It is interactive, it encourages active involvement and it gives participants control to present, receive, process and manage information (Harasim, 1990; Mason & Kaye, 1990). Computer conferencing software maintains a written transcript of the conference proceedings which can be accessed by participants for later analysis. "Users thus have more control over the nature of their interactions than they have in face-to-face environments: they may read all items, read items selectively, or merely scan. They may save particular items to disk or print them to be used in later or more intensive review" (Harasim, 1990, p. 52).

Most of these attributes are shared with other forms of educational communication. It is the computer-mediated dimension in combination with the many-to-many, time and place independent and text-based nature of communication that, according to Harasim (1990), makes online education unique. Even though empirical research has not supported many of the claims about the potential of computer conferencing, there has been no critical analysis of the theoretical framework presented by Harasim.

The Impact of the Attributes

Based on the attributes of educational computer conferencing, and with some support from empirical studies, researchers have made a number of claims about the nature of the online learning process (Harasim, 1987 a, 1987b, 1990; Mason & Kaye, 1990; Selfe & Meyer, 1991; Tuckey, 1993).

Interactive Participation

Computer conferencing should facilitate interactive participation if learning activities are used that encourage discussion, collaboration and interaction and if the instructor refrains from becoming too directive and, instead, moderates the discussions by redirecting questions and comments to the group. Interactive participation occurs when participants build on each other's contributions by making explicit or implicit references to each others' messages (Henri, 1992b).

Distributed Participation

Participation should be relatively evenly distributed among learners because all participants have equal access to the "floor". Learners can

participate simultaneously unlike face-to-face situations in which each must wait his or her turn.

Learner Control

Learners should have more control over the substance and process of interactions than in face-to-face learning environments because they can participate when it suits them. They do not have to wait for their turn and they can access the conference transcript.

Focus on Message Content

Students should be able to focus more on the content of messages than in face-to-face learning environments because potentially distracting physical characteristics such as age, gender, ethnicity and handicap are not apparent.

Negative Impacts

The defining attributes of computer conferencing are generally presented as having positive impacts on learning as just described. Harasim (1990) and others such as Feenberg (1987) have pointed out the following disadvantages of some of these attributes. The time-independent nature can result in what Feenberg calls communication anxiety, that is, the feeling of speaking into a vacuum. Participants in computer conferences often receive only delayed feedback and new users have found this aspect of the communication process disconcerting, at least initially. If there are no restrictions on the duration of a conference it is also difficult to know if a particular topic is still current. Not everybody logs on with the same frequency. A person who logs on less frequently may not have the same sense of what is current as the person who logs on every day and has followed the discussion and seen how participants

may have gradually lost interest in a particular topic. This can be alleviated through appropriate instructional design and proper facilitation, but unless a discussion is formally closed, participants may have different ideas about what is current.

The text-based nature of the communication also has its drawbacks. The lack of facial expressions, voice intonations and gestures makes more subtle aspects of communication such as humour and irony more difficult. The need to write everything and the knowledge that it will be preserved and presented for all to see may inhibit some users. There is also a danger of information overload. Unless conference size is limited, the number of messages produced in a single day can become unmanageable as they accumulate in the conference file. Furthermore, the sequential nature of the messages can fragment the content which can make information processing difficult, thus exacerbating the problem of information overload (Burge, 1994).

Despite acknowledging these limitations of computer conferencing, proponents such as Kaye (1989), Harasim (1990), Mason & Kaye (1990), and Wells (1992) maintain they are outweighed by the benefits, provided the computer conference is properly designed and moderated, that is, if learning activities that encourage discussion and interaction between students are used and the instructor moderates discussions by redirecting the discussion to the group and refrains from becoming too directive.

Summary

This section of the literature review has described the key attributes of computer conferencing and the impact of those attributes on learning in an online environment. Computer conferencing offers a mode of

communication that is "many-to-many", place-independent, time-independent, text-based and computer-mediated. It has been suggested that these attributes have the potential to facilitate interactive and distributed participation, and learner control over the educational process and that they allow learners to focus message content. On the negative side, these attributes can also result in communication anxiety and information overload. The text-based nature can make nonverbal communication difficult and problems have been reported with maintaining the currency of discussions because of the asynchronous nature of the communication.

Participation in Educational Computer Conferencing

The literature on computer conferencing in education is replete with references to the potential of this technology to promote and facilitate interaction and the consequent development of higher-order intellectual skills. Researchers such as Harasim (1990), Harasim et al. (1995), Kaye (1989) and Mason & Kaye (1990) go even further by suggesting online education is a new educational paradigm that transcends face-to-face and distance education by combining the benefits of both. Given the prevalence of this view of the defining features of this technology, it is somewhat surprising that few attempts have been made to subject these claims to empirical scrutiny. Furthermore, there appears to be a lack of clarity about the meaning of participation. Henri (1991) points out that researchers often "imply that to measure participation is to measure interaction. Thus it is presumed that any and all messages recorded in a teleconference are interactive" (as quoted in Mason, 1991, p. 169). When there is conceptual clarity regarding participation, it is often defined in narrow quantitative terms: the number, length and frequency of contributions made by a participant. Only a few empirical studies

on participation in computer conferencing deal with the nature of interaction and few attempts have been made to relate participation to other variables or to examine qualitative aspects of participation. As Mason (1991) points out:

> Very few researchers tackle the difficulties of analysing the educational quality of conference interactions. . . .The taint of subjectivity is so threatening, that most computer conferencing research stops with quantitative analyses of messages. . . . Conclusions as to the revolutionary potential of computer conferencing are, therefore, often drawn with scarcely a mention of the actual content, much less the value, of the interactions. (p. 161)

In the next section of the review, the literature on participation has been organized around two themes: the nature of participation, and factors that affect participation.

The Nature of Participation

Hiltz (1986), in a study of three computer conferencing courses offered by the New Jersey Institute of Technology: *Computers and Society, The Use of Microcomputers in Teaching,* and *Personnel Management Techniques,* found that when computer conferencing works well, the nature of the participation differs from the physical classroom: there is more communication among participants and less instructor-student communication. The qualification "when it works well" must be kept in mind when interpreting this study because the data presented on student perceptions of interaction with other students show only a moderate agreement with the statement that there is more student interaction. In addition, Hiltz comments that in one of the courses "a majority did not feel that they communicated more with other students than they would have in a face-to-face class" (p. 99).

Hiltz (1986) also used correlations between student perceptions of interaction, and their assessments of the overall value of the online

experience. She concludes there was a very strong correlation between measures of perceived greater interaction with other students and the perception of having learned more (r=.59), and measures of feeling more involved and the perception of having learned more (r=.51).

The Hiltz (1986) study is informed by theoretical work on the social psychology of computer communication and was one of the early studies in her research program to explore "the use of computer-mediated communication in both the 'adjunct' function of supplementing traditional classes and as the primary mode of course delivery for postsecondary education. . . [and] . . . to understand what types of software structures and teaching techniques may be most effective for the 'virtual classroom' (pp. 96-97).

Harasim (1987a, 1987b) builds on Hiltz's (1986) work in a study of two graduate courses offered by computer conferencing at the Ontario Institute for Studies in Education (OISE). Preliminary results of the study are reported in a journal article (1987a) and further results are contained in a conference presentation (1987b). The study uses a series of questions posed by Hiltz (1986) as a guiding framework:

> How can we utilize computer-mediated communication systems to support effective active learning? Can we provide facilities for the types of activities that usually occur outside the classroom, such as office hours, libraries, and even extra-curricular activities? Further, can the new technology-based modes of communication serve as more than an emulation of the process of face-to-face communication in the traditional classroom? Can they support a different, more active and involved style of learning on the part of the student? (p. 96)

In addition, Harasim (1987b) uses Hiltz's (1986) definition of effective learning which is "whether students take a more active part in the learning process and take advantage of the potential for more interaction with the

professor and the other students, despite the absence of nonverbal cues to facilitate this interaction" (p. 100).

The two courses she studied were designed to promote interaction and student collaboration. They were 12 weeks long and divided into three phases. In the first phase, four, one-week discussions were conducted based on prior readings. In the second phase, working groups of 4 to 9 students were formed to prepare an online presentation. In the third phase, the groups made their presentations and these were discussed by the entire class.

The purpose of Harasim's (1987a, 1987b) study was to describe and analyze computer conferencing as a support for effective and active learning. Conference transcripts and usage data were analyzed to determine rate of participation, size of messages, the degree of intermessage reference and the level of learner-learner interaction (Harasim 1987b). She found that students participated actively, averaging 4.2 hours online per week in one course and 3.6 hours per week in the other course. Student and instructor interaction in the two courses was found to be relatively equal with instructors contributing about 11% of the messages in both. Interaction was found to be relatively high with approximately 65-70% of messages making reference to previous messages.

McCreary & Van Duren (1987) made one of the few attempts to relate participation to other variables: academic level of the course and the status of the participants. Based on experiences at the University of Guelph they found participation changed from essentially "read only" for early undergraduate courses to "regularly scattered comments" in graduate courses. They attribute this to smaller class size and increased cognitive maturity. They also found that the rate of participation increased "with a feeling of security on the part of participants not only in regard to subject matter, but also in relation to the

group" (p. 113). They note that the presence of high status outside participants in a conference, that is individuals who have been invited as "guest presenters", tends to inhibit student participation.

McCreary & Van Duren (1987) make some interesting observations but they do not provide data to support their conclusions. At the time the article was published, Elaine McCreary was a faculty member at the University of Guelph so these observations were presumably based on her experiences. However, she does not provide any indication of how previous computer conferencing research may have informed her research. Only one reference is cited, Perry's (1970) *Forms of Intellectual and Ethical Development in the College Years.*

Davie (1988) studied two online graduate adult education courses offered by OISE in 1986 and 1987 that used the collaborative preparation of written assignments as a major focus. Davie's study does not build on or further previous computer conferencing research. Instead he argues that research on the effects of computer conferencing on adult learning is at an early stage and that "at this stage of development. . .we need a further base of case studies that report the structure of attempts to facilitate adult learning and that report descriptive data on the effects of those facilitative efforts" (p. 58). However, while his study may not be directly related to any previous studies, it is clearly informed by the emerging body of research in this field as he makes reference to Harasim (1987a), Hiltz (1986), Kiesler, Siegel & McGuire (1984) and other research on computer conferencing.

Davie (1988) collected descriptive data on the number of contributions made by each participant, the number of messages read by each participant, the number of participants logged on, and the number of references made to contributions by other participants. He also compared the number of

messages written by students with those written by the instructors. The results are similar to those of Harasim (1987a, 1987b). Davie found participation to be relatively high with instructors contributing about 20 percent of the messages. While interactivity was not the focus of this study and no attempt was made to determine what facilitated or hindered it, Davie did note that there was a strong tendency for students to build on each other's contributions. Of the 223 messages posted, 73.5% made reference to other messages. He also noted that students appeared to prefer a sort of pseudo-synchronous participation. That is, he found that messages tended to cluster on certain days with about twice as many of these pseudo-synchronous messages as asynchronous messages. Davie admits this is stretching the definition of synchronous but concludes that it reflects "the orientation of the students, who commented that they felt like they were working together" (p. 63).

Mason (1989) conducted a case study of the first large-scale use of computer conferencing at the British Open University in which she analyzed "its effectiveness as a mass teaching medium, its value as a medium for tutoring, and its use as a minor component of a multi-media course" (p. ii). She explains clearly how her study fits into the emerging body of computer conferencing literature and frequently draws comparisons between her results and those of previous studies, particularly those of Harasim (1987b, 1989), Hiltz (1984, 1987), Vallee et al. (1974, 1975, 1978), and Johansen et al. (1978, 1988).

Pertinent to this review is her analysis of the reasons students used or did not use computer conferencing and her conclusion that only a small minority of students contributed to interactive discussions and that "of all the course

team hopes for the exploitation of...[computer conferencing]...its potential as an active learning environment was the least actualised in 1988" (p. 135).

To determine the reasons for use and nonuse of computer conferencing Mason (1989) used student interviews, students' projects, open-ended sections of questionnaires and participant observation notes of students' log-ons. From an analysis of these data, lack of time, cost of access, the role of conferencing and the limitations of the medium emerged as the main reasons for nonuse and convenience, increased access to help, and social needs were found to be the main reasons for use. There were inequalities in the cost of accessing the computer conferencing system and technical difficulties which led to very unequal use of the system. However 57% of the students agreed that they could participate more equally in electronic than in face-to-face communication.

Henri (1989, 1992a) used the work of Harasim (1987b), Hiltz (1986) and McCreary & Van Duren (1987) as a starting point to examine interactivity and learning processes in computer conferencing used by Quebec credit union employees. Henri was specifically interested in the contention by these and other researchers that this technology facilitates an interactive learning process characterized by knowledge construction and the use of higher-order cognitive skills. The course combined correspondence-style distance education with computer conferencing. The computer conferencing was designed to encourage collaboration and the students were instructed on the importance of active participation, interaction and collaboration.

As mentioned earlier, Henri (1992a) points out that the concepts interactivity and participation are often used synonymously in the computer conferencing literature. Furthermore, she claims it is often assumed that interactivity is a guarantee of learning. She attempted to disentangle these

concepts and to operationalize the concept of interactivity by drawing on the work of Bretz (1983) who defined interactivity as a three step process involving an initial communication (A), a response (B), followed by a second communication (C) related to the first. Henri conceptualized interactivity as having two levels: true interactivity and quasi-interactivity. In true interactivity there are three actions: a message from person A to person B; a message from B to A which responds to the first message from A; and a message from A in response to the message from B. Quasi-interaction involves only two actions: a message from person A and a response from person B. This is the type of interaction most commonly associated with human-computer "dialogues". The user asks a question of the computer and the computer gives a programmed response. Noninteractive, or what she calls independent, messages are those that relate to the theme of the conference but make no implicit or explicit reference to other messages.

Analysis of the conference messages indicated that 33 percent of the students' messages were interactive and 66 percent were noninteractive. When the level of interactivity was analyzed, it was found that it was overwhelmingly quasi-interactive, that is, consisting of message chains of only two messages, or noninteractive. In two of the conferences the noninteractive chains accounted for 60% of the messages and the quasi-interactive 20%. The figures varied over the six conferences but the truly interactive chains (three or more related messages) never accounted for more than 50% of the total. Further analysis revealed that when the messages of the instructors and experts were removed, the level of interactivity dropped even lower. In effect, the interactivity was apparently due, in large part, to the intervention of the facilitators in the absence of student-to-student interaction.

Hiltz (1990, 1994) conducted a wide-ranging study involving 382 students in four postsecondary institutions: The New Jersey Institute of Technology, Upsala College, Connected Education, and the Ontario Institute for Studies in Education (OISE) at the University of Toronto. The aim was to determine if computer conferencing is as effective as classroom instruction and what variables are associated with especially good and especially poor outcomes in computer conferencing. Outcomes included mastery of the course content, writing skills, convenient access to the educational experience, participation in the course activities, ability to apply the knowledge gained in new contexts, access to the professor, interest in the subject matter, ability to synthesize the ideas presented in the course, attitudes towards, and knowledge of, the use of computers, ability to work collaboratively, and perception of the quality of the course. Like her earlier study (Hiltz, 1986), this is part of Hiltz's ongoing program of research into computer conferencing. It draws on previous work on the acceptance of computer-mediated communications systems and on teaching effectiveness for a conceptual framework. She adopts an interactionist approach to studying the acceptance and diffusion of computer technology in which system, user and organizational and group characteristics are presumed to "interact to form a complex system of determinants" (p. 143).

Three of the 10 hypotheses in this study dealt with participation. Hypothesis 3 consisted of nine parts and it posited that computer conferencing students would be more likely than face-to-face students taking the same course to report a number of benefits from their course. Among these were increased participation in the course (3.2) which was supported by the results of student self-reports.

Hypothesis 3.8 dealt with student-to-student communication. It was measured by asking students, in a postcourse questionnaire, to rate what they considered to be the extent of collaborative learning. Forty-seven percent of students in the CMC and mixed mode classes felt they had communicated more with other students than in traditional classes, but 33% disagreed. The exact question is not given, but the hypothesis on which it was based was that students taking the course by computer conferencing would report "improved ability to communicate with and cooperate with other students in doing classwork" (p. 147). Only one question appears to have been asked in a postcourse questionnaire and there does not appear to have been any attempt to observe directly collaborative behavior.

Results are unclear for the test of hypotheses 5 and 6, that high ability students (as measured by SAT scores) and those with positive precourse attitudes towards computers and computer conferencing would be more likely to participate actively and to perceive greater benefits from computer conferencing. Hiltz (1990) states the results of the quantitative analysis are inconclusive but then goes on to say "results are superior for well-motivated and well-prepared students who have adequate access to the necessary equipment and who take advantage of the opportunities for increased interaction. . . and for active participation" (p. 168).

Hypothesis 7 posited that students with a greater sphere of control on the personal and interpersonal levels would be more likely to participate in and perceive the benefits from computer conferencing. Hiltz (1990) concludes this "failed utterly to produce statistically significant relationships with use, satisfaction, or outcomes. The correlations were weak and generally not significant" (p. 165). However, she suggests "qualitative data gathered in student interviews indicate that the self-discipline to regularly set aside time

to take part in online courses is a crucial determinant of success for the student" (p. 168).

Mason (1991) built on her earlier study (Mason, 1989) by conducting an in-depth analysis of one online discussion from the UK Open University course, *Introduction to Information Technology: Social and Technological Issues.* There were over 300 students and 16 tutors involved in the course. The discussion generated 143 messages. She found that about one third of the students contributed actively and at least another third logged on regularly to read messages but did not contribute actively. She does not explain what she means by "contributing actively" and she does not say what the remaining third did, but presumably they didn't participate by either logging on and/or contributing messages.

Messages were analyzed for their degree of interactivity using the "islands, dialogues and webs" structure suggested by Fafchamps et al. (1989). According to this typology, islands are messages that do not receive a reply, dialogues are sets of two or more messages in which participants take turns, and a web develops when a message receives more than one reply and may respond to one or many messages. Mason (1991) found that most of the messages in this conference could be described as webs, "various themes explored from different perspectives and frequent interweaving of themes explicitly and implicitly" (p. 168). Only five messages were categorized as islands, and 21 as dialogues. She also used Henri's (1989) categorization of independent and interactive messages to analyze this conference and found that 15% of the messages were independent and 85% were interactive.

One of the claims made about computer conferencing is that participation will be more equally distributed than in face-to-face situations in which, it is argued, men, and those considered to be authorities, tend to dominate

discussions. The asynchronous nature of computer conferencing allows everybody equal access to the "floor" and so, it is argued, it is more difficult for it to become dominated by a few (Harasim, 1990). Selfe & Meyer (1991) attempted to test the potential of computer conferencing to achieve the goal of egalitarian communication by examining participation by gender and profession, the use of pseudonyms and the power structure of the conference discourse: "Who do people in the conference pay attention to and make reference to in their replies?" (p. 175). Their work draws on different research from that of most of the other studies reviewed here. It appears to be heavily influenced by research related specifically to computer conferencing and the teaching of English and the social-psychological aspects of computer communication. They draw specifically on work by Czajkowski & Kiesler (1984) Kiesler et al. (1984), Cooper & Selfe (1990) and Selfe (1990) which examined the effects of pseudonym use in computer conferencing.

Selfe & Meyer (1991) attempted to answer three questions: (a) Does the use of pseudonyms encourage participation? (b) Does it affect the substance of the conference discourse? and, (c) Does it affect the power structure of the conference and the conversational style of the participants? The study covered 40 days of the computer conference. In the first 20 days participants were required to use their real names. In the second 20 days pseudonyms were permitted, but were not required. Of the 189 messages sent during the pseudonym-optional period, only 24 percent were signed with pseudonyms. The number of messages contributed increased significantly compared to the first 20 day period, from 107 to 189 and the number of participants increased from 18 to 30. Selfe & Meyer suggest the use of pseudonyms may have encouraged more people to participate and to send more messages, however, given that only 24% used pseudonyms this is open to question. This

conclusion is further weakened by the fact that several participants were known to have submitted messages with pseudonyms *and* other messages with their real names. A plausible alternative explanation may be that the participation increase in the last 20 days was due to the participants becoming comfortable with each other, the technology and the discussion, and was unrelated to the use of pseudonyms.

Selfe & Meyer (1991) also conclude that the use of pseudonyms affected the substance of the conference discourse by encouraging conversation about gender and power. Support for this conclusion is based on an analysis of the messages, but no details are provided as to how this analysis was conducted.

The final question addressed was whether the use of pseudonyms affected the power structure of the conference and conversational style of the participants. Did this technique tend to negate the dominance of the conference by men and higher-profile individuals and encourage the participation of women and lower-profile participants? Also, did women and lower-status participants who used pseudonyms become more assertive linguistically? Selfe & Meyer conclude the answer is no to both questions. They found the conference, while offering fairly equal access to participants, was dominated by men and higher status members. Dominance was related to amount of discourse, verbal assertiveness and politeness. Indicators of verbal assertiveness were introduction of new topics and disagreement with other conference participants. Agreement, apology, and question asking were used as indicators of politeness. They found that the use of pseudonyms did not result in more egalitarian participation. "It did not negate male and high-status domination of the discourse, and it did not affect the personal style of participants" (p. 187). Selfe & Meyer point out several limitations to their study. The small number of subjects (33) meant that a few individuals could

have set the overall tone; and other variables external to the conference not identified such as teaching loads, committee work and conference attendance may have affected participation. The fact that only 24% of participants used pseudonyms also makes it difficult to reach any meaningful conclusions about the effects of their use.

Analyzing the Content of Computer Conference Participation

As mentioned earlier, researchers have usually restricted their analysis of computer conferencing to the quantitative dimensions of participation. There have not been many attempts to probe the qualitative nature of student communication. Mason (1991) has argued that researchers need to look more closely at the content of computer conferencing participation in order to determine whether or not this technology can support and sustain a seminar level of discussion and whether or not conference interchanges "are more than merely outpourings of lonely or loquacious students" (p. 161). Studies which attempted this are reviewed in the following section.

Henri (1989), as part of her study reviewed earlier, performed a content analysis on the conference messages to determine the types of cognitive skills that the students were using. She used a framework consisting of participative, social, interactive, cognitive and metacognitive dimensions. Henri drew on a taxonomy of aptitudes and skills related to critical reasoning activities developed by Ennis (1987) for her cognitive dimension. She focused on the skills in Ennis' taxonomy and grouped them into five categories to facilitate analysis. The five skills are elementary clarification, in-depth clarification, inference, judgment, and strategies. Henri states that in developing her model she chose to focus on skills connected to reasoning which uses critical thought. In addition to identifying the presence or absence

of these skills, Henri wanted to be able to evaluate the skills themselves. For this she drew on Schmeck (1983), Marton et al (1984) and Entwistle and Waterston (1988) whose studies indicate that the learning process "is influenced by the level at which information processing occurs" (Henri, 1992, p. 130). They distinguish between a surface and an in-depth elaborative treatment of information. So in addition to identifying presence or absence of the cognitive skills, Henri developed a further set of indicators to determine whether the skills were being used at a surface or deep level. She concludes, "The proposed analysis of the cognitive dimension makes it possible to identify the skills linked to critical reasoning and then to evaluate the level of information processing applied by learners in each of the skills" (p. 131). In the two conferences analyzed, most of the messages revealed the use of clarification skills at the surface level. However, in the conference dealing with problems the messages were more equally spread among the four levels, but still predominantly at the surface level.

According to the students in this study, studying the print material and reading the computer conference messages generated *internal* reflection and dialogue. Thus, instead of using the computer conferencing to engage in discussions, Henri (1989) concludes that the conferences were used as a way of verifying and validating knowledge and skills acquired from the students' internal reflection and dialogue. This conclusion is supported by Mason's (1989) caution that analyzing the transcript of a computer conference "must be seen as the tip of an iceberg - submerged under the transcript lies the personal questioning, relating and reorganising of thoughts, ideas and information, which is the real stuff of learning" (p. 159). This study also points out the importance of instructional design. It seems that because of the way this particular course was designed, most students did not feel the need to use the

computer conferences for discussion and, therefore, did not engage in critical thinking in the conferences. According to the students, they engaged in critical thinking individually and used the conferences to verify and validate ideas rather than to explore them. A different design may have caused students to use the computer conferencing for more exploratory, knowledge-building purposes.

Henri's (1989) framework for analyzing the cognitive dimension of student participation is a modification of Ennis' (1987) taxonomy of critical thinking skills and aptitudes. She eliminated the category called "Basic Support" which Ennis describes as judging the credibility of a source and making and judging observations. She divided Ennis' category called "inference" into two categories, "inference" and "judgment", thus separating the making of inductive and deductive inferences and value judgments from the judging of them. It is not clear why these modifications to Ennis' taxonomy were made. The elimination of the "basic support" category seems to be a major omission since judging the credibility of sources and making observations and judging other people's observations are essential components of critical thinking. The only explanation offered is that this was done to "facilitate analysis" (Henri, 1989, p.130).

Another aspect of Henri's (1989) methodology that is somewhat problematic is her addition of the surface-deep processing dimension. She argues that simply identifying the presence or absence of critical thinking skills only produces superficial results because it does not indicate at what level these skills were being used. However, critical thinking by nature has a qualitative dimension. One cannot think critically without thinking deeply or processing information deeply. It is not possible to be a superficial critical thinker. If critical thinking has been adequately defined and its component

skills properly identified then analyzing messages for evidence of these skills should provide more than enough information about the quality of student thinking.

Mason (1989) decries the lack of attention paid by researchers to the content of computer conference messages. As part of her study reviewed earlier, she made one of the first attempts to go beyond the quantification of participation by analyzing what she calls the "educational quality" of the conference messages. However she did not attempt to analyze the nature of cognition revealed by the messages. Instead her analysis concentrated on identifying and unraveling the various discussion threads and the flow of discussion throughout the various threads over the duration of the course.

A later study by Mason (1991) (also reviewed earlier) made a more substantial contribution to the analysis of the educational quality of computer conference participation. She found that students were "interacting with tutors and other students in a reflective, self-directed and active mode" (p. 167). She developed a typology of student participation that was validated by an independent expert. It identifies six key types of student contributions: use of personal experience related to course themes, reference to appropriate material outside the course package, comments on others' opinions (both students and tutors), introduction of new issues for discussion, summaries of previous messages, students posing questions for the group, and tutors acting as facilitators. She also found that the online discussion consisted of three phases: "an initial exploratory phase in which many new ideas and points of view were introduced; a second phase in which students brought in their own experience and began to build on previous messages; and final maturing phase in which ideas flowed and links were made between the disparate themes" (p. 168).

Hansen et al. (1991) used Harasim's (1987a, 1987b) work as the basis for their study of computer conferencing and collaborative learning at Indiana University. They focused on Harasim's contention that computer conferencing has the potential to facilitate collaborative learning if it is used appropriately. Part of the study examined computer conferencing that was used for an introductory computer literacy class in addition to face-to-face lectures. The rationale for this use was to allow for discussion which was unmanageable in the face-to-face situation because of the large class size. A discussion format was used for the computer conferences and students were encouraged to pursue "an issue until some resolution or consensus has occurred, i.e. to engage in a debate format that would have required them to repeatedly argue their point against other opinions" (p. 7). (Hansen et al. use the term *debate* and *discussion* interchangeably, but appear to mean discussion as opposed to a formal debate). There were 317 students in the class. In the fifth week, ten discussion topics were presented. No details are provided as to how the discussions were organized or what role the instructor played.

Investigators analyzed the conference transcripts and had students complete a questionnaire at the end of the course. The average message length was 12 lines. Students rarely contributed more than one message on a topic, or made reference to previous messages. Fifty-seven per cent of the class never contributed a message and only 35% admitted to ever reading a message. Hansen et al. (1991) conclude:

> These data seem to indicate that the students did not view the electronic classroom as a resource for discussion, but rather as a place to express their personal opinions, and if they were interested, to read the opinions of others. The element of debate is definitely missing. Very few students enter a topic more than once; the ratio of new arguments per topic entries is low; and so is the number of comments that deviate from

> the majority position; there is little evidence of controversy sparked by dissenters, few direct references to other entries; and little citing of supporting evidence for one's opinions. . . . Focusing only on the electronic classroom medium and its potential for fostering debate, the analysis suggests that students in this class did not measure up to our criteria of collaborative learning through computer conferencing. (pp. 8-9)

It is important to note that computer conferencing was not used as the sole or primary means of instruction. These students were on campus and attended regular weekly lectures. While discussion and interaction may have been limited in the face-to-face situation, it may have been enough to satisfy the needs of these students. They may have perceived the online discussions as unnecessary. Related to this is the fact that these students had regular access to the instructor for feedback. At the first-year university level it may be that many students are more concerned about instructor approval than they are about discussing ideas. In other words they may be at early stages of cognitive development according to the models of Perry (1970) and Kitchener & King (1990). This is supported by observations made by Hansen et al. (1991) who found that when students did participate in the conference it was not to discuss but to state opinions, often with little supporting evidence or reference to other opinions.

Another point to note is that the extent of student experience with computers and computer conferencing may explain the apparent lack of success with this use of computer conferencing. The postcourse questionnaire showed that few students had had any experience with either. Seventy-seven of 96 students (80%) did not own a computer; 93 of 96 (97%) had never or rarely used the computer conferencing system before; 91 of 96 (95%) had never or rarely used electronic mail; and 90 of 96 (94%) had never or rarely used their university computer accounts.

Harasim (1991a,1993a) analyzed selected contents of 12 graduate and undergraduate online courses offered by Simon Fraser University and the Ontario Institute for Studies in Education. She found that "learners formulated positions and responded to their peers with active questioning, elaboration, and/or debate" (Harasim, 1993a, p. 126). She also found that students used the conferences to build on one another's ideas by seeking clarification and through discussion..

Webb, Newman & Cochrane (1994) and Newman, Webb & Cochrane (1995) developed a content analysis method for measuring critical thinking in group learning via computer conferencing and face-to-face seminars. Their method is based on Garrison's (1991) five-stage critical thinking model and Henri's (1992b) method of content analysis described earlier. They developed a set of paired indicators of critical thinking: relevance, importance, novelty, bringing outside knowledge to bear on the problem, ambiguities, linking ideas, justification, critical assessment, practical utility, and width of understanding. Each category was further subdivided into related indicators. Each indicator was given a positive or negative value depending on whether or not it was present or absent in the transcript. The frequencies for each indicator were totaled and a critical thinking ratio calculated by converting the counts to a -1 to +1 scale.

Newman, Webb & Cochrane (1995) conducted a controlled experiment in which half the seminars in an Information Society module in the Department of Information Management at Queen's University, Belfast were conducted face-to-face and half via computer conferencing. Each seminar group used both methods to discuss ideas raised in the course lectures. The purpose of the seminars was to encourage critical thinking among the students. The preliminary results of the study indicate that critical thinking

was evident in both the computer conference and the face-to-face seminar, but more new ideas emerged in the face-to-face seminars, whereas more important ideas were raised and more ideas were linked and justified in the computer conference.

Newman, Webb & Cochrane (1995) caution their scale is in the formative stages and that as others replicate their work the indicators could be clarified. An analysis of the indicators reveals a certain amount of ambiguity and overlap. Conceptually, *relevance* and *importance* are too similar to warrant being treated as separate indicators. If a statement is relevant then it must also be important and if it is considered important, then surely it is also relevant.

In the *novelty* section *new problem-related information* and *new ideas for discussion* would be difficult to distinguish. How would one treat new problem-related information that was discussed?

There is a lack of clarity in the *bringing outside knowledge/experience to bear on problem* section. *Drawing on personal experience, use relevant outside material,* and *evidence of using previous knowledge,* would be difficult to distinguish. It is also not clear why *refer to course material* should be considered an indicator of critical thinking and how it differs from *Course-related problems brought in.*

In the *justification* section there is too much overlap between *providing proof or examples* and *justifying solutions or judgments.* These are not discrete indicators of justification but related and contingent because providing proof or examples is one way of justifying a solution or judgment.

A more substantial problem with Newman, Webb & Cochrane's (1995) methodology is that it makes no allowance for varying levels of participation and how this might affect the critical thinking ratios. For example, a student who made only one contribution but received a positive critical thinking

rating for that contribution would end up with a higher critical thinking ratio than somebody who participated frequently but received a negative rating for only one of his or her contributions. Newman, Webb & Cochrane claim their methodology deliberately produces a measure of critical thinking that is independent of the quantity of participation. Conceptually it is questionable whether this is possible, but even if it is, their method does not achieve this goal because, in effect, it penalizes a participant who participates frequently but not all of whose contributions receive positive scores, whereas it rewards a participant who may make only one or a few contributions that are positively rated.

Factors That Affect Participation

As the research reviewed here has shown, the nature and level of participation in computer conferencing can vary considerably from situation to situation. Understanding what factors may affect participation has important theoretical and practical implications. A review of research by Hiltz (1986), Harasim (1987a), Feenberg (1987), Mason (1989) and Burge (1994) indicates the following are some of the factors that may affect participation.

Absence of Nonverbal Cues

Some students report difficulties in adjusting to a new and different form of communication that seems unnatural. In some cases, students relate this to the absence of the accustomed nonverbal cues of face-to-face interaction.

Information Overload

In particularly active conferences the number of messages can be overwhelming for some students.

Asynchronicity

This feature is often presented as a benefit of computer conferencing because it allows for participation at a time and pace convenient to the learner. However, for some students, the delay in receiving feedback is seen as a problem. This has been referred to as "speaking into a vacuum". Feenberg (1987) suggests it can result in communication anxiety which he says "may silence individuals who would speak if only they had the minimum feedback necessary to feel welcome and at home in the conversation" (p. 179).

Access

Studying online from home is also usually seen as a benefit of computer conferencing, but for some students it presents a barrier. Not all students have adequate study areas at home. For adults with children, home responsibilities can interfere with studies.

Cost is another access-related issue reported by Mason (1989). However it is not clear whether or not this actually hindered participation. Depending on their location, some students had to pay as much as eight times more than other students to access the system, but Mason found that students in high-cost areas did not log on fewer times than those in low-cost areas, although they did do less reading and composing on-line.

Keeping Track of Multiple Discussions

Students in Harasim's (1987a) study reported difficulty in keeping track of several on-going discussions and deciding when to respond: immediately or after reading all the comments. Learning online may require different organizational strategies than in face-to-face or correspondence situations. It may also require an awareness by instructors that certain capabilities of

computer conferencing, such as carrying on parallel discussions, may not be effective with some groups of students. Burge (1994) suggests that because ideas are presented in a fragmentary form in computer conferencing, some students may be unable to cope and therefore may withdraw, at least temporarily, from participating.

Cognitive Maturity

Hiltz (1988, cited in Seaton, 1993) states that students who are cognitively immature are not as likely to be active participants. Others such as Hansen et al. (1991) and McCreary and Van Duren (1987) have also alluded to this. This might be broadened to deal with epistemological barriers more generally which Garland (1993) describes as "the lack of congruence between the student's cognitive and affective characteristics and perceptions of knowledge, and the knowledge presented in the subject matter" (p. 192).

The Technology

McConnell (1990) reports that some students felt the computer conferencing technology (hardware & software) hindered their participation. This perception will vary depending on the hardware/software configurations and is likely to be less of a problem with the more current applications which are microcomputer-based and more user-friendly than earlier computer conferencing applications that were main-frame based and often difficult to use.

Lack of Time

Mason (1989) found that this was a common complaint from the students in her study at the British Open University. While it was not only directed at

the computer conferencing component of the course, because it was not perceived as an essential part of the course, it tended to be one of the first components that was set aside when time pressures became too great.

Summary

It is difficult to generalize across the studies reviewed because their contexts and purposes vary considerably. There are undergraduate students using computer conferencing as a supplement to face-to-face education, graduate education students using computer conferencing as the main medium of delivery, undergraduate students using computer conferencing as the main medium of delivery, banking professionals using computer conferencing as a supplement to correspondence-style distance education, and a conference involving academics. Table 3 summarizes the studies by listing their context and key findings.

Table 3
Summary of Research on Participation in Educational Computer Conferencing

Study	Context	Findings
Hiltz (1986)	undergraduate college	- greater student to student interaction than face to face
Harasim (1987a,b)	graduate university	-active participation - not dominated by instructor - high level of intermessage reference
McCreary & Van Duren (1987)	undergraduate/graduate university	- nature of participation changes depending on nature of students, course and familiarity
Davie (1988)	graduate university	- high level of participation - not dominated by instructor - high level of intermessage reference

Study	Context	Findings
Mason (1989)	undergraduate, distance education, open university	- low level of participation - low level of interaction - reasons for participation and nonparticipation investigated
Henri (1989, 1992a)	professional	- low level of interaction - CC used to verify knowledge gained in correspondence material, not for discussion - use of clarification skills - surface-level information processing
Hiltz (1990)(1994)	undergraduate, graduate college, university	- greater participation in CC than face-to-face - greater student-to-student communication than in face-to-face - no relationship between sphere of control and participation
Harasim (1991a)(1993a)	undergraduate, graduate university	-use of active questioning, elaboration and debate
Mason (1991)	undergraduate, distance education, open university	- one third of students contributed actively - reflective, self-directed, active participation - "dialogues" and "webs" dominate
Selfe & Meyer (1991)	academic	- dominated by men and higher status members - pseudonyms increase participation but do not affect its nature
Hansen et al. (1991)	undergraduate college	- low level of participation - low level of interaction and collaboration - students tend to state unsupported opinions
Newman, Webb & Cochrane (1995)	undergraduate college	-evidence of critical thinking

One feature that all these studies share is that they sought to examine computer conferencing that was used in a way that attempted to promote or facilitate discussion. Despite the variation in purpose and context of these studies, some general conclusions can be drawn. With the exception of the Mason (1989) and Hansen et al. (1991) studies, it appears that participation in quantitative terms was relatively high and there was a moderate level of

interaction as measured in terms of the intermessage references with inter-student communication as frequent or more frequent than student-to-instructor communication.

One factor that might account for the extent of high level interaction may be the degree to which the computer conferencing was perceived by the student to be an integral part of the learning environment. If computer conferencing is used as an adjunct to other modes of delivery and students do not perceive it as valuable, it is possible that it may not get used in the manner in which it was intended. Perhaps discussion must be tied directly in both time and space to the presentation of the course content. In the case of the undergraduate students in which the computer conference was used to supplement the on-campus lectures (Hansen et al., 1991), one could speculate that because of the spatio-temporal separation of the computer conference from the lectures the students felt less motivated to use it as it was intended by the instructor. Other factors may have played a part such as previous experience with computers and computer conferencing, the cognitive maturity of the students, and assessment incentives for participation. This notion of separation as a factor is supported by Henri (1992a). In this case the conferences were designed explicitly to encourage discussion between students and the students were relatively mature professionals employed in the credit union system. However, the course content was delivered via correspondence material. There was, therefore, a clear separation in time and place between the course content and the computer conference discussions.

Another finding that is common to most of these studies is that computer conferencing used for discussion results in communication patterns that differ from the face-to-face context. There was more student-to-student communication and the instructor's contributions were less prominent than

in comparable face-to-face situations. Whether this was caused by the technology, the design of the learning activities, or the nature of the students and their previous experience with computer conferencing, is not addressed in the studies. It seems plausible that the three factors interact. That is, the attributes of the technology combined with the way in which it is used and some student characteristics such as cognitive maturity and computer conferencing experience result in a distributed communication pattern.

Analysis of the content of conference participation was not as prevalent in the literature as the more quantitative studies. Henri (1989) found students were using some critical thinking skills but these were predominantly clarification skills at the surface level. Mason (1991) found students were reflective, active and self-directed, Harasim (1991b, 1993b) found that students used active questioning, elaboration and debate, but Hansen et al. (1991) found this was largely absent. Newman, Webb & Cochrane (1995) found students used critical thinking skills in a course offered by computer conferencing.

While the studies reviewed describe and analyze participation in computer conferencing in varying contexts, most fail to address the question of what might account for differential rates and types of participation. Only McCreary & Van Duren (1987) made some suggestions in this area as to the most important factors: cognitive maturity of the learners, and individual sense of security within the group. However, it is not clear how they reached these conclusions. Other factors that may affect participation that are mentioned in the literature are the absence of nonverbal cues, information overload, asynchronicity, student access to a computer, the ability to keep track of multiple discussions, comfort with the technology and lack of time to take part in the computer conferencing activities.

Few studies dealt specifically with factors that affect participation. In several cases the factors have been inferred from findings dealing with "difficulties" with computer conferencing. Yet eliciting sustained interaction by students is clearly a problematic issue as the studies by Henri (1992a) and Hansen et al. (1991) reveal. In both cases learning activities that encouraged student interaction were employed and instructors took on the facilitative role the literature suggests is appropriate. In both cases these measures failed to produce sustained interaction. It would appear, then, that factors other than course design have an impact on the quality of student participation.

Appropriate Designs for Promoting Interaction

One point comes through clearly in the computer conferencing literature: interactive participation will not occur just because computer conferencing is used to teach. The unique attributes of the technology must be exploited by using creative course designs (Harasim et al., 1995). At the heart of all of the suggested designs is the idea that traditional instructor and learner roles have to change. Learners become active by engaging in discussions and collaborative group activities. The instructor, rather than being a dispenser of knowledge and an authority figure, takes on a facilitative role. Redirection and abstention from participation are as important as direct contributions for the instructor. In this section of the literature review, the notion of appropriate designs is explored. This is divided into three categories: the role of the instructor, the role of the learner, and learning activities.

The Role of the Instructor

In computer conferencing designed for interactive learning the instructor becomes more of a facilitator and less of a lecturer. It is an active and

important role and perhaps in some ways more difficult to master than conventional teaching. The computer conference instructor must know when to refrain from participating in order to permit the development of student-to-student discussions. He or she must pose questions instead of only supplying answers, deflect student questions to the group, and know when to intervene to get a discussion back on track, to stimulate discussion or to bring closure to a discussion (Davie & Wells, 1991). Harasim et al. (1995) offer the following specific recommendations for online teaching: Do not lecture; be clear about expectations; be flexible and patient; be responsive; do not overload; monitor and prompt for participation; use small groups; be a process facilitator; write weaving comments every week or two; organize the interaction; set rules and standards for good netiquette; establish clear norms for participation and grading of online participation; allow students to moderate some discussions (p. 192). Davie (1988) sums up the role of the instructor, "Not only does she or he structure the experience, but the instructor also provides an important role model with his or her own contributions to the conversation. The instructor encourages participation, demonstrates appropriate responses, summarizes the discussion from time to time, and redirects the attention of the group when it gets off track" (p. 62).

The difficulty in playing this role successfully is evident from the results of the Henri (1992) study discussed earlier. Despite having properly trained facilitators and using interactive learning designs, the communication was largely noninteractive and the students tended to direct most of their communication to the instructor. The computer conference facilitator must know how to counter this seemingly inherent tendency yet avoid becoming so directive that he or she ends up dominating the discussions.

Contextualizing and Monitoring

Feenberg (1987) stresses the importance of what he calls contextualizing and monitoring in computer conference facilitation. These, he says, are "explicit substitutes for the massive flows of tacit information concerning appropriate and relevant communication that can guide talk in everyday face-to-face settings" (p. 178). Contextualizing, as it implies, is the explicit statement of the context of the conference. More specifically, the facilitator chooses and states the "communication model" for the conference. Is it a formal debate, an informal discussion, a meeting, a class? Feenberg argues that unless the moderator states at the outset what type of conference it is, participants will not know what kinds of contributions are "relevant and appropriate to the essentially imaginary 'situation' in which they find themselves" (p. 179). Once the contextualizing has been done, the facilitator must model appropriate communication by playing the appropriate role—chairperson, host, teacher, or facilitator. Whatever role is chosen, he or she must monitor closely the conference to ensure that contributions are relevant and appropriate and he or she must reassure participants that their contributions fit the model.

Creating a Group Learning Environment

Related to Feenberg's (1987) notions of contextualizing and monitoring is the importance of creating the appropriate conditions for a group learning environment. According to Harasim et al. (1995), "the instructor must make a computer conference feel and function like a classroom, turning the computer screen into a window on the world, so that students exchanging asynchronous messages feel and behave as if they are working together with a group of peers" (p. 139). This is accomplished through the use of some of the

facilitation approaches already described and by using appropriate group activities described later.

A study by Tagg & Dickinson (1995) also indicates that the development this group learning environment may depend on how the instructor responds to student messages. Much of the literature stresses the importance of avoiding instructor domination of the discussions, however the results of the Tagg & Dickinson study indicate that "a pattern of frequent, prompt tutor responses that address individuals and offer guidance in a succinct and predictable manner seems, therefore, to be most effective in encouraging student activity" (p. 52). However, the Tagg & Dickinson study did not distinguish between independent and interactive messages, as defined in this study. It focused solely on the quantity of student messages and did not attempt to determine whether or not the instructor's participation style had an effect on the level of interaction as defined in this study.

The Role of the Learner

For interaction to flourish in an online environment learners must behave in much the same way they would in a face-to-face group activity. They must be active participants in the conferencing activities by contributing to discussions and building on previous contributions (Hiltz, 1986). There are specific suggestions depending on the particular learning activities that are being employed. For debates and discussions, Hansen et al. (1991) suggest students pursue an issue until some resolution or consensus has been reached, support their positions with evidence, and build on the contributions of other participants. To a large degree the change in the role of the learner will be facilitated by the use of appropriate course designs that

specifically require student initiative, student discussion, student reflection or iterative attempts to improve one's work (Davie & Wells, 1991).

Learning Activities

Appropriate learning activities are probably the key to developing the often-mentioned interactive learning online environment. Harasim (1987a, 1987b, 1990), Wells (1992) and others stress that interaction in computer conferencing will not emerge unless appropriate activities are used. Computer conferencing can be quite effective for noninteractive applications such as delivering content. Written lessons, which students download to their computers and then read, can be distributed quickly and cheaply using this medium. However, using computer conferencing in this way is unlikely to result in much interaction. Many specific suggestions have been made for what constitutes an appropriate activity. One characteristic these activities share is they require active student participation, they encourage interaction and they use of some or all of the attributes of computer conferencing.

Feenberg (1987) suggests the essay genre is most appropriate for humanities courses. This is essentially a guided discussion that begins with a specific example which participants are encouraged to comment on and draw conclusions from. The moderator also participates by offering his or her own interpretations and perhaps introducing other examples to enlarge the discussion. "The essay conference invites many-faceted and open-ended discussion because the occasion on which it is based can be approached from as many different angles as there are participants...the fragmentary form of the essay is enhanced by interactive uses of the medium. There is room here for both suspense and surprise, the two sources of intrinsic motivation to participate" (p. 184).

Davie (1988) reports on the successful use of two different types of joint writing activities in a graduate adult education course. In the first case, students were paired and asked to prepare a joint paper via computer "outlining their values and beliefs about community development and indicating where their ideas converged or diverged from each other's" (p. 60). In the second case small groups of four or five students were formed to analyze a case study online and present their findings online to the full group. While interaction was not the focus of this study, in analyzing the conference transcripts, Davie found a strong tendency for students to build upon each other's contributions. Seventy three and half percent of the 223 messages referred explicitly to other messages.

Harasim (1987a) used a variety of techniques to promote interaction online in offering two graduate courses dealing with women and computers: plenary discussions, debates, small-group discussions, working groups, class presentations, and group feedback and critiques. She found high rates of student participation and interaction and positive student assessment of the effectiveness of the learning experience.

Harasim (1993a) and Harasim et al. (1995) suggest a variety of group activities in which students take on a number of different roles such as presenting and moderating a seminar, participating in a debate, conducting and presenting a group research project, or working in a dyad as means of stimulating learner interaction.

Summary

In this section of the literature review, appropriate designs for promoting interaction in computer conferencing have been examined. This was divided

into three categories: the role of the instructor, the role of the learner and learning activities.

Learners must participate actively by contributing to discussions and building on each other's contributions. It is important to note, however, that while active participation is a necessary condition for interaction, it is not a sufficient condition. One can be actively participating in the sense of logging on, following discussions and even making contributions. However if those contributions do not directly or indirectly relate to previous contributions, they will not help build the interactive learning environment that this type of computer conferencing is believed to facilitate.

The most difficult adjustment to make in computer conferencing designed for group interaction is probably in the role of the instructor. The literature suggests this is a delicate balancing act between too much involvement and too little. It is a shift away from the role of authority figure and dispenser of knowledge to that of the facilitator who intervenes just enough to keep the discussion active.

The literature indicates that, at the simplest level, an appropriate learning activity for computer conferencing that is designed to promote interaction must involve two or more participants working together. This may only involve a group discussion in which contributions build on each other or it may involve students working together on projects and assignments in small and large groups.

In a sense learner and instructor roles and appropriate learning activities are interdependent. Without appropriate instructor and learner behavior, computer conferences may turn into a series of monologues. By the same token, without appropriate learning activities, interaction will probably not flourish. It makes little sense to argue which comes first. They all must be

dealt with simultaneously. Learning activities that encourage interaction must be designed, learners must be apprised of their responsibility to participate interactively and instructors must be sensitive to the need to be involved in a less directive manner if interactive participation is the desired outcome.

Summary of the Literature Review

This review of the literature has examined the empirical and theoretical research that bears directly on the purpose of this study. Following are the key conclusions that can be drawn from each body of work.

Critical Thinking

The literature on critical thinking indicates there has been considerable discussion about the meaning of this concept. The current consensus seems to be that critical thinking is more than a technical process of constructing logically sound arguments. Rather, it is seen as thinking which is purposeful and reflective in which assumptions are challenged and supporting evidence scrutinized. To be sure, logic is a necessary part of critical thinking but one can be a logical thinker without necessarily being a critical thinker. It is possible to make logically sound arguments in which valid inferences are made which lead to logical conclusions without thinking critically about the subject under discussion. The key to critical thinking is reflection, active consideration, and rational decision-making about knowledge, beliefs and actions. Dewey (1933) used the term *reflective thought* to denote "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusion to which it tends" (p. 9). Norris & Ennis (1989) provide a similar definition which adds the element of

decision-making: "Critical thinking is reasonable and reflective thinking that is focused upon deciding what to believe or do" (p. 1). Understanding and knowing how to use logic in arguments is part of this, but logical thinking that is not also reasonable and reflective is not critical thinking.

Critical thinking can be conceived of as consisting of three interrelated dimensions:

1. critical challenges which are the tasks, questions or problematic situations which provide the impetus for critical thought. A challenge is only considered a *critical challenge* if it requires reasoned judgment or assessment;
2. intellectual resources which consist of the background knowledge and critical attributes that are used in responding to a critical challenge; and
3. critically thoughtful responses "which embody the appropriate use of intellectual resources in response to critical challenges" (Bailin et al, 1993, p. 5). Critical thinking, then, involves responding thoughtfully through the use of reasoned judgment and assessment to a task, question or other problematic situation using the appropriate intellectual resources.

Ennis (1987) and Norris & Ennis (1989) provide a more detailed model of critical thinking in which the intellectual resources category is broken down into four skill areas: clarity, basis, inference and interaction. "We want to be clear about what is going on. We want to have a reasonable basis for judgment. We want the resultant inferring to be reasonable. We want the interaction with other people to be sensible." (Ennis, 1987, p. 17).

Quellmalz (1987) analyzed philosophical and psychological conceptualizations of critical thinking and found the two approaches had much in common. Based on this analysis, she developed a set of thinking and reasoning skills that are common to the two disciplines: analysis, comparison, inference/interpretation and evaluation.

Attributes of Computer Conferencing

The five attributes of online education that are thought to make it unique are: many-to-many communication, place-independent group communication, time-independent group communication, the text-based nature of communication, and computer-mediated learning.

Participation

Empirical research on the nature of participation reveals relatively high but widely varying levels of participation with moderate levels of interaction as measured by the number of intermessage references. In most cases there was a high degree of student-to-student communication and students tended to make more contributions than instructors. However, most of the studies failed to address the question of what might account for differential rates of participation and levels of interactivity. Analysis of the content of computer conference messages for indications of educational value or cognitive activity produced a variety of findings. Henri (1989) and Newman, Webb & Cochrane (1995) found evidence of the student use of critical thinking. Harasim (1991a, 1993a) and Mason (1991) found students to be actively involved in ongoing discussions while Hansen et al (1991) found the opposite: students messages were predominantly unsupported opinions that made no reference to other messages.

The literature dealing with factors that hinder or facilitate participation suggested the following possibilities:

- Absence of nonverbal cues;
- Information overload;
- Asynchronicity;
- Access problems;

- Difficulty in following multiple discussions and the fragmented nature of communication;
- Cognitive maturity of learners;
- Technology getting in the way;
- Lack of time;
- Cost of access.

Course Design

The review of appropriate designs for promoting interaction revealed a strong consensus on the importance of changing traditional instructor and learner roles. The literature suggests learners become more active and collaborative and take on greater responsibility for their learning, and the instructor become more of a facilitator or guide rather than the source of all knowledge.

A Conceptual Framework

Based on the review of the literature a conceptual framework can be constructed that presents the main dimensions of this study and their relationships. Three categories of factors combine to affect learner participation: the attributes of communication via computer conferencing, the design and facilitation of computer conferencing activities, and student situational and dispositional factors. Figure 1 depicts the conceptual framework and some of the possible interactions between factors.

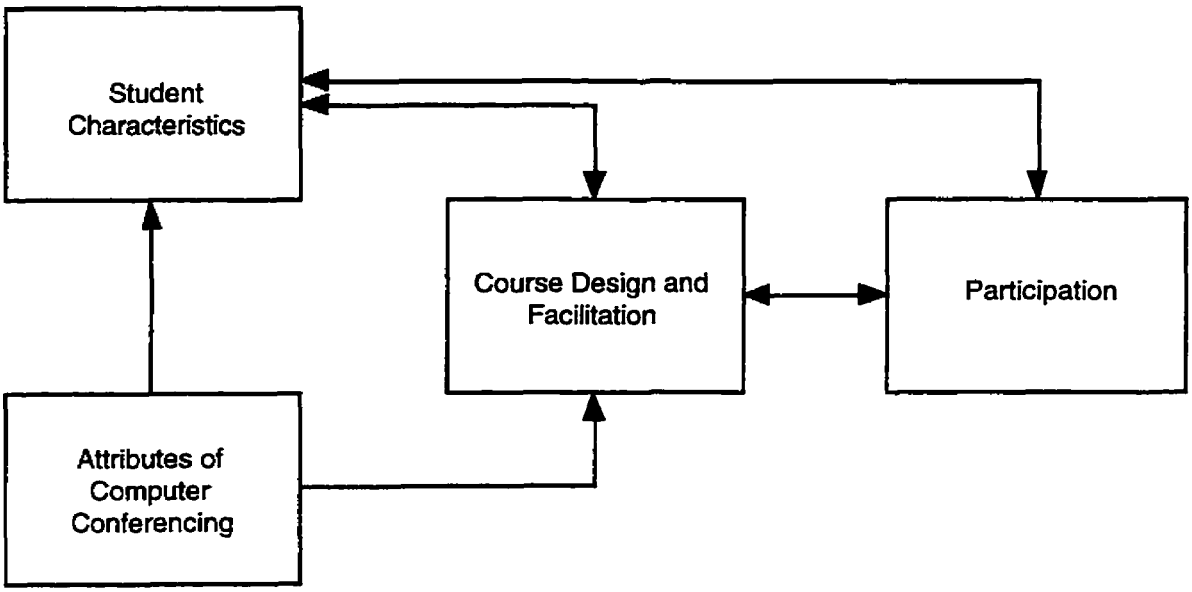

Figure 1: A conceptual framework for participation in computer conferencing.

The Attributes of Computer Conferencing

As discussed in the literature review, the attributes of communication via computer conferencing are:

1. many-to-many communication;
2. place-independent group communication;
3. time-independent group communication;
4. text-based nature of communication; and
5. computer-mediated learning (Harasim, 1990).

The review of the literature suggested these attributes can either promote or discourage participation and this study attempted to determine under what conditions these attributes might facilitate or encourage participation and their relationship to the other factors in the conceptual framework.

Figure 1 suggests that the attributes of computer conferencing do not have a direct impact on participation but interact with student characteristics and/or the course design and facilitation before affecting participation. For

example, the time independent attribute may interact with different learning styles (student characteristics) to either facilitate or inhibit participation.

The Design and Facilitation of Computer Conferencing

The second category of factors that can affect participation is the design of the conference activities. The literature suggests that the interactive potential of computer conferencing will not be realized unless designs are employed that require responses from learners and that encourage discussion, and that instructors should play a facilitative rather than a directive role. That is, the activities should be designed to elicit inter-student communication and collaboration as well as student-instructor interaction. This study examined how the conference activities were designed and facilitated and how students responded to these factors in an attempt to understand the impact of these factors on student participation.

Figure 1 shows that course design and facilitation can have a direct impact on participation, independent of the other factors, but may also interact with the attributes and student characteristics to affect participation. In the latter case, the instructor may tailor the design and facilitation of the online activities to the different learning styles of the students. In doing so she or he may emphasize or de-emphasize certain attributes depending on the characteristics of the students. For instance, if the students are not used to independent study, the instructor may downplay the time-independent attribute by having deadlines for participation and strict guidelines for frequency of participation.

Student Dispositional and Situational Factors

The literature is less clear about learner factors that may hinder or facilitate participation. Dispositional factors include such things as the predisposing attitudes of the learner towards computer conferencing, distance education, education or the subject matter; computer skills in general and the more specific skills required to use the computer conferencing system; comfort with the medium of communication; the degree to which the learner is comfortable with the epistemological orientation of the course and the learning activities; and the motivational orientation of the student. For example, if the student is relatively immature cognitively and the course requires the discussion and synthesis of multiple perspectives on issues, he or she may find participation difficult or unsatisfying.

Situational factors include student access to the necessary computer hardware and software, their home situation in general (i.e., is it supportive of home study) and amount of time available for study.

Figure 1 shows that student characteristics may have a direct impact on participation, independent of the attributes or the course design and facilitation. For example, a student who has limited access to the necessary computer equipment is likely to have trouble participating regardless of the attributes or the design of the course.

In some cases the interaction between factors works in both directions. As an example, course design and facilitation may be informed by the student characteristics but some student characteristics such as motivation and attitude may in turn be affected by the course design and facilitation. There is also a two-way relationship between participation and course design and between participation and student characteristics. The course design and facilitation may be modified depending on the quantity and quality of

participation that results from it initially, and certain student characteristics such as motivation and attitude may change depending on the student's participation experience.

Participation has a quantitative and a qualitative dimension. The quantitative dimension is reflected in the number and length of messages and the frequency of intermessage references. The qualitative dimension is reflected in the use of critical thinking in the conferences discussions.

Each category in the conceptual framework consists of an objective and a subjective dimension. The attributes of the medium, the course design and facilitation, and learner characteristics exist in an objective sense. However, they are also *perceived* by the learners. Different learners interpret the impact of these factors differently. Furthermore, while some factors may have a direct impact on student participation, others may interact to affect participation. It is argued that the quantity and quality of participation will depend on how these factors interact and how they are interpreted by the learners.

To summarize, all the components in the conceptual framework contribute to participation and can be considered either facilitators or barriers. The conceptual framework, then, provided a set of categories with which to begin the investigation into factors that affected participation. These can be classified as related to the attributes of the technology; the design of the learning activities; and student situational and dispositional factors.

Conclusions

Several points that have a bearing on this study emerge from this review of literature. First, researchers have tended to focus on the quantitative dimensions of participation; few studies have examined the quality of

conference participation or analyzed the content of conference discussions. In 1991 Mason observed that if the growing use of educational computer conferencing was to be "based on realistic expectations and not on unresearched hyperbole, it is timely to look more closely at the nature of conferencing interactions to determine their educational value" (p. 161). Since then, only a few researchers have heeded Mason's plea. The focus of participation research in computer conferencing has remained largely on the quantitative dimensions. Research that has focused on more qualitative aspects of participation has still tended to avoid the content of the communication. Instead it has investigated such issues as intermessage references, interactivity, equality of participation and phases of participation.

In studies that have looked specifically at the content of messages, there have been some methodological problems. Henri's (1989) framework for analyzing the cognitive dimension did not include the skills of judging the credibility of sources and making observations and judging other people's observations which the critical thinking literature indicates are key. Newman, Webb & Cochrane's (1995) framework of indicators of critical thinking contains overlap and ambiguity. In addition, their scheme for scoring critical thinking does not make allowance for varying levels of participation.

Second, few attempts have been made to explain differential levels of participation. Why do some students take to this new way of learning immediately while others find the adjustment difficult and frustrating?

Finally, while many suggestions have been made about what may hinder or facilitate participation, empirical research in this area is not well-developed. Factors that affect participation that have been identified in the literature can be grouped into three categories: the attributes of the

technology, course design, and student situational and dispositional characteristics. However, much of the literature on the impact of these factors is speculative and there have been few attempts to gain a comprehensive understanding of how these factors may affect quantitative and qualitative dimensions of student participation.

CHAPTER 3 - RESEARCH DESIGN

The Context

The study was carried out at the University College of the Fraser Valley in Abbotsford, British Columbia using one section of the course, Computer Information Systems 360 (*Information Systems in Organizations and Society*) which ran from January to April 1996. The official catalogue description of the course is as follows:

> Issues related to the uses of information systems within organizations and society will be discussed from several technical points of view. Topics will include legal, ethical and privacy issues as well as the impact of automation on organizations and society. Students will be expected to research and present topics. (Instructor, 1996)

The course objectives as stated in the course outline were as follows:

> The successful student will be able to critically discuss the current issues and controversies surrounding our evolving electronic technology. She or he will be able to make informed decisions on the current legal issues related to data and information transfer. Through the use of scenarios, students will apply critical thinking to resolve ethical dilemmas in information technology. (Instructor, 1996)

This was a required course in the Bachelor of Computer Information Systems degree program offered by University College of the Fraser Valley. The program "blends computing science theory with information systems theory and managerial skill training, rather than emphasizing science-based problems" (UCFV, 1996a). Graduates of the program pursue careers in the software development industry and in software-related positions in other businesses and industry. The program aims to provide students with knowledge in the following areas: computer programming, application/software support, operating systems/operations, and hardware/data communications. Some of the abilities that the program aims

to develop include the ability to maintain, create and design computer programs, to use spreadsheets, word processors and micro-based data management systems, to learn any operating system and provide some systems programming support. The program also seeks to develop business management, analytic and communication skills (UCFV, 1996b).

Eighteen students registered for the course and 13 completed it by writing the final examination. Two students dropped out before logging on. This was the only course in the Computer Information Systems degree program that was offered online or through other distance education modes at this time. All the students were taking the rest of their courses on campus.

The instructor used computer conferencing for two main purposes: to deliver a "lecture" which supplemented the course textbook and readings by providing the instructor's interpretations and elaborations on the reading material; and to conduct seminar discussions on key course issues. Each discussion was organized around one or more key questions based on the readings. The discussions had a fixed duration of two weeks, except for the final two discussions which were only active for one week each. The instructor's purpose in using seminars was to encourage students to interact with each other in order to think critically about the issues and to relate them to their own experiences. To encourage students to contribute, 15% of the final course grade was based on their participation in the computer conference seminars.

The computer conference discussion topics included Skills for the Information Society, Ethical Issues in Business, Ethical Issues in Information Systems, Privacy and Accuracy, Property and Access, Artificial Intelligence and Ethics, and Health and Safety. The course materials included a package of readings from journals and books and the textbook, *Ethical Issues in*

Information Systems (1991) by R. Dejoie, G. Fowler, and D. Paradice.First Class ®(version 3.1) computer conferencing software was used in this course. It has both asynchronous and synchronous modes. The synchronous mode is a "chat" capability that allows participants to engage in real-time "conversations" using the computer keyboard, however the instructor chose not to incorporate this into his course design. The "chat" function was only active for the first few weeks and was then disabled for technical reasons. The computer conference discussions were all delivered asynchronously which meant students were not required to be online at any particular time.

Selection of the Case

This course was selected for three reasons. First, it used asynchronous computer conferencing as the primary medium of delivery. Only one face to face meeting was held for orientation purposes at the beginning of the course. Second, the computer conferencing component was designed to promote interaction between students and to encourage the students to think critically about the issues in the course. Third, this was the second time the instructor had taught this course using asynchronous computer conferencing and it had been revised and refined based on his first experience.

A number of difficulties were encountered in trying to find an appropriate case for this study. At the time the study was conducted there was not a large number of distance education courses being offered in British Columbia that were delivered using computer conferencing, that were discussion-based, and that used computer conferencing to facilitate interaction and critical thinking. Several months were spent investigating a Psychology course offered by the Open Learning Agency and plans were made to use this course for the study but the course was cancelled due to low enrollments. A Nursing Ethics course

offered by the British Columbia Institute of Technology was then considered but rejected because fewer than 10 students were expected to enroll and because it was a pilot offering of the course.

Methodology

A case study approach that involved the collection and analysis of both quantitative and qualitative data was used to investigate participation and critical thinking in this course. As discussed in chapter 1, case studies are distinguished by their focus and purpose and not their methods. Case studies attempt to present a holistic understanding of the complexities and interrelationhips of the factors in a bounded system, whether that is a course, a program, an institution, an event, or a person (Merriam, 1988; Stake, 1988).

There has been considerable discussion in the literature about qualitative versus quantitative research methods and the compatibility of of the two approaches. Some suggest that the two are epistemologically incompatible and that it is inappropriate to mix qantitative and qualitative research methodologies (Guba & Lincoln, 1989). However, many contend that qualitative and quantitative research methods are complementary and when appropriately used can strengthen research in education and the social sciences (Borg & Gall, 1996; Bryman, 1988; Firestone, 1987; Howe, 1985; Patton, 1990; Soltis, 1984).

A variety of methods were used in this study. This complementary approach was chosen because of the nature of the research purposes and questions which Shulman (1988) suggests is an appropriate basis for the selection of research methods. As discussed in chapter 1, this study seeks to describe and analyze both the quantitative and qualitative characteristics of participation in computer conference discussions and to understand learner

and instructor perceptions of the factors that affected their participation, therefore both quantitative and qualitative methods were deployed.

Regardless of the approach taken to data collection and analysis, case studies seek to understand a phenomenon in its natural setting without separating the phenomenon from the context and without manipulating either the context or the phenomenon (Yin, 1994).

The quantitative data collected for this study consisted of the number of messages posted by each student, the frequency of participation, the number of intermessge references, and the degree to which students appeared to be thinking critically while participating. The qualitative data consisted of the perceptions of the learners about their participation and use of critical thinking.. Thus, this is a case study that examined quantitative and qualitative data in an attempt to begin the process of theory construction in this relatively new field of educational inquiry.

In the first part of this study the case and its context are described in detail and in the second part an attempt is made to determine whether or not there were any relationships between the various factors in the conceptual framework and different levels of participation and critical thinking. Both parts of the study were guided by the overall research purposes and the seven related research questions presented in chapter 1. Using the conceptual framework as a guide, the seven research questions were translated into a series of operational questions that were used to describe and analyze the dimensions of each category of that framework and subsequently to examine the relationships between the various factors. Table 4 shows the relationship between the research purposes, research questions and operational questions. The related conceptual categories of the operational questions are indicated in parentheses.

Table 4
Research Purposes, Research Questions and Operational Questions

Purpose 1

To determine to what degree the students were participating actively, building on each other's contributions and thinking critically about the discussion topics.

Research Question 1

How frequently and how much did students contribute to the computer conferences?

Operational Questions

(Participation)

1. Over the duration of the course, how often did students contribute to the computer conferences?
2. Over the duration of the course, how much did students contribute to the computer conferences?

Research Question 2

To what extent did the online activity resemble a discussion in which students responded to, and built on, each other's contributions?

Operational Questions

(Participation)

3. Over the duration of the course, to what degree were the contributions linked to each other?

Research Question 3

To what extent did the students think critically about the issues under discussion?

Operational Questions

(Participation)

4. Over the duration of the course, to what degree did students' contributions to the computer conferences appear to reflect the use of critical thinking?

Research Question 4

How did the quantitative and qualitative characteristics of participation change over the duration of the course?

Operational Questions

(Participation)

5. How did the frequency and quantity of student contributions change over the duration of the course?
6. How did the degree to which student contributions were linked and built on each other change over the duration of the course?
7. How did the degree to which students used critical thinking change over the duration of the course?

Purpose 2

To determine what factors affected student participation in the course and how those factors

affected participation.

Research Question 5

What instructional techniques did the instructor use that may have either facilitated or inhibited participation and critical thinking?

Operational Questions

(Course Design & Facilitation)

1. How frequently did the instructor respond to student comments
2. What types of comments did the instructor use to respond to student comments?
3. What style of teaching did the instructor use?
4. How did the instructor encourage participation?

Research Question 6

What were student and instructor perceptions of the factors that affected participation and critical thinking in this course and how did they perceive the impact of those factors?

Operational Questions

(Participation)

8. What did students perceive to be the factors that affected their participation in the computer conference discussions?
9. What did students perceive to be the factors that affected their use of critical thinking in computer conferencing?
10. What were the students' understandings of the meaning of thinking critically?
11. What was the instructor's perception of student participation and his role in promoting it?
12. What did the instructor perceive to be the factors that affected student participation in the computer conference discussions?
13. What did the instructor perceive to be the factors that affected the students' use of critical thinking in the computer conference discussions?

(Attributes of the Technology)

1. What are the student and instructor perceptions of how these attributes affected participation?

(Course Design and Facilitation))

4. What were the student and instructor perceptions of how the design and facilitation affected participation?

(Student Characteristics)

1. What were the student/instructor perceptions of how the situational characteristics affected participation?
2. What were the student and instructor perceptions of how the dispositional characteristics affected participation?

Research Question 7

Was there any apparent relationship between the level of critical thinking or participation and the student characteristics?

Operational Questions

(Participation)

14. What was the relationship between the level of participation and the student characteristics?
15. What was the relationship between the level of critical thinking and the student characteristics?

Operational Questions

What follows is a discussion of the operational questions grouped according to their related conceptual categories.

Participation

1. Over the duration of the course, how often did students contribute to the computer conferences?

Participation has a quantitative and a qualitative dimension. This question addresses one of the most basic quantitative dimensions: their frequency of contributions.

2. Over the duration of the course, how much did students contribute to the computer conferences?

This question also addresses one of the most basic quantitative dimensions: the size of their contributions.

3. Over the duration of the course, to what degree were the contributions linked to each other?

This question starts to move into the qualitative dimension. Intermessage references are quantifiable but they help shed some light on the quality of the communication. In other words, by knowing the number of intermessage references we know if the students are responding to each other's contributions and the extent to which they are doing this. This information, alone, does not say much about the quality of student participation, but when

considered in relation to their use of critical thinking, it can help us to understand the quality of their participation..

4. Over the duration of the course, to what degree did students' contributions to the computer conferences appear to reflect the use of critical thinking?

This deals with the quality of the communication. The other questions have dealt with the amount and frequency of communication and the intermessage references but they tell us nothing about the actual content of the communication. This question addresses one key aspect of the content issue.

5. How did the frequency and quantity of student contributions change over the duration of the course?

6. How did the degree to which student contributions were linked and built on each other change over the duration of the course?

7. How did the degree to which students used critical thinking change over the duration of the course?

If comfort and familiarity with the online environment have an impact on participation it is reasonable to assume that students will become more comfortable with the environment as the course progresses and that the quantity and quality of their participation might improve as a result.

8. What did students perceive to be the factors that affected their participation in the computer conference discussions?

9. What did students perceive to be the factors that affected their use of critical thinking in computer conferencing?

10. What were the students' understandings of what it means to think critically?

11. What was the instructor's perception of student participation and his role in promoting it?

12. What did the instructor perceive to be the factors that affected student participation in the computer conference discussions?

13. What did the instructor perceive to be the factors that affected the students' use of critical thinking in the computer conference discussions?

These questions seek to understand how the the students and the instructor interpreted the impact of the various factors and how the students understood the meaning of critical thinking. It is assumed that how students understand critical thinking will affect their ability to use it.

14. What was the relationship between the level of participation and the student characteristics?

15. What was the relationship between the level of critical thinking and the student characteristics?

Specific dispositional factors that were examined included the student's age, previous education, motivational orientation, previous computer experience and previous computer conferencing experience. The small sample size and the narrow range in the independent variable scores precluded the use of Pearson Product-Moment correlation coefficients or other statistical tests. Therefore, the apparent relationships are described, but no statistical tests were performed.

The Attributes of the Technology

1. What are the student and instructor perceptions of how these attributes affected participation?

Some or all of the attributes may be relevant to this situation, but their impact on participation may be viewed differently by different students and by the instructor.

Course Design and Facilitation

1. How frequently did the instructor respond to student comments?

2. What types of comments did the instructor use to respond to student comments?

3. What style of teaching did the instructor use?

4. How did the instructor encourage participation?

The instructor plays a key role in any formal educational activity but an online educational environment requires different approaches to stimulate and maintain ongoing and active participation. These questions attempt to determine whether the instructor used appropriate techniques as recommended in the literature.

5. What were the student and instructor perceptions of how the design and facilitation affected participation?

Steps may have been taken by the instructor in the design and facilitation to encourage participation and more specifically, inter-student communication and critical thinking, but the impact of these steps may have been perceived differently by different students and by the instructor.

Student Characteristics

1. What were the student/instructor perceptions of how the situational characteristics affected participation?

2. What were the student and instructor perceptions of how the dispositional characteristics affected participation?

Data Collection and Analysis

The following data collection procedures were used: observation of the computer conference discussions and the face-to-face orientation session, the collection of quantitative measures of student participation using the computer conferencing software, a questionnaire, analysis of the content of the computer conference discussions, and the use of in-depth, semi-structured interviews with students and instructor. In addition, all course materials were read thoroughly so that the author gained an understanding of the content of the course.

Observation

The face-to-face orientation session held at the beginning of the course and the computer conferences were monitored to gather data about the design of the computer conferencing activities and the possible impact of the instructor on student participation. The observations were also used to determine which attributes of the technology of computer mediated communication were relevant to this study. That is, which attributes appeared to be having an impact on participation.

Quantitative Measures of Participation

The computer conferencing software (First Class, version 3.1) maintained a record of all computer conference messages. This was used to collect the following data on the frequency and quantity of student participation:

- the total number of messages posted by each student per week;
- the mean and median number of messages posted by all students per week;
- the total number of messages posted by each student in each conference;

- the total number of messages posted by each student for the whole course;
- the mean and median number of messages posted by all students in each conference and in the whole course

Analysis of message flows conducted by Winkelmans (cited in Harasim, 1993a) has shown a high correlation between individual daily totals of messages and the length of messages as measured by the number of characters typed (r=.94) so this study used the number of messages as the measure of the volume of writing activity. The total number of messages posted by each student and the mean and median number of messages posted by all students provides an indication of the level of participation of the group and of individual students relative to the group. The variability of individual participation is depicted with frequency distributions for the number and length of messages posted.

In addition, the degree to which messages are linked to one another is described using Levin, Kim & Riel's (1990) technique of intermessage reference analysis. In intermessage analysis each individual message is analyzed to determine whether it refers to any other messages. Sometimes these references are explicit such as when the author states "In reference to John Doe's message about..." or when the subject heading refers to a previous message. Other times it may be implicit, when the content of the message relates to previous messages, but no explicit statement about those messages is made. Then there are the cases when the message makes no reference, either explicit or implicit. Recall that Henri (1992b) identified two types of participation: independent, in which participants make no references to other messages, and interactive, in which participants refer to and build on each other's contributions.

The degree of interactive participation was described with the aid of the following statistics:

- the total number of independent and interactive messages posted by each student;
- the total number of independent and interactive messages posted by all students
- the mean and median number of independent and interactive messages posted by all students and percentage of each type.

Questionnaire

A brief questionnaire was sent to each student at the beginning of the course to determine their previous computer experience, previous computer conferencing experience, their reasons for taking the course, their age and previous education.

Content Analysis

Content analysis was used to determine the degree to which students appeared to be using critical thinking when they participated in the computer conference discussions. Based on the definition and model of critical thinking used in this study (Norris & Ennis, 1989), four categories of critical thinking skills were identified. The content of the computer conferences was analyzed for evidence of the use of these skills (positive indicators), and also for evidence of uncritical thinking (negative indicators). Looking for evidence of uncritical thinking provided a balanced picture of each student's level of critical thinking because it is assumed that the ratio of uncritical to critical thinking will vary from student to student. The ratio of critical to uncritical thinking is one of the factors that was used to determine each student's level

of critical thinking. Table 5 is based primarily on Ennis's (1987) taxonomy of critical thinking abilities and Quellmalz's (1987) Higher Order Thinking Strategies and Processes, and to a lesser extent on Bailin et al's (1993) explication of critical thinking.

Table 5
Critical Thinking Skills and Associated Descriptions and Indicators

Skill	Description	Positive Indicators	Negative Indicators
Clarification	The attempt to appraise and understand the exact nature of the problem, issue or dilemma. This includes attempting to understand different points of view on an issue.	1. Focusing on a question. a) Identifying or formulating a question b) Identifying or formulating criteria for judging possible answers 2. Analyzing arguments. a) Identifying assumptions - unstated, needed. a) Identifying conclusions b) Identifying reasons - stated, unstated c) Identifying similarities and differences d) Identifying irrelevance e) Summarizing 3. Asking and answering questions of clarification. 4. Defining terms and judging definitions.	1. Focusing on a question unrelated to the problem. a) Incorrectly identifying or formulating a question b) Identifying or formulating inappropriate criteria for judging possible answers 2. Analyzing arguments inappropriately. a) Incorrectly identifying assumptions b) Incorrectly identifying conclusions c) Incorrectly identifying reasons d) Incorrectly identifying irrelevance e) Incomplete or inaccurate summarizing 3. Asking inappropriate or irrelevant questions of clarification. Incorrectly answering questions of clarification. 4. Incorrectly defining terms and inappropriately judging definitions.

Skill	Description	Positive Indicators	Negative Indicators
Assessing evidence	In order to establish a sound basis for inferences the evidence used to support those inferences must be assessed. This involves judging the credibility of sources of information and making and judging the credibility of observations.	1. Judging the credibility of a source. Criteria to consider: a) Expertise b) Conflict of interest c) Agreement with other sources d) Reputation e) Use of established procedures f) Risk to reputation g) Ability to give reasons 2. Making and judging observations. Criteria to consider: a) Characteristics of the observer, e.g., alertness, emotional state. b) Characteristics of the observation conditions, e.g., quality of access, time to observe, opportunity to observe more than once, instrumentation. c) Characteristics of the observation statement, e.g., closeness to time of observing, made by observer, based on reliable records. d) All topics listed under "Judging the credibility of a source"	1. Judging the credibility of a source based on inappropriate criteria. 2. Making and judging observations based on inappropriate criteria.

Skill	Description	Positive Indicators	Negative Indicators
Making and judging inferences	Inductive and deductive inferences and value judgments are involved in making a decision about what to believe or do. Critical thinking involves the ability to judge the soundness of inferences and to make good inferences. Using evidence to support arguments is included in this category.	1. Making and judging deductions a) Class logic b) Conditional logic c) Interpretation of statements, including: i) Double negation ii) Necessary and sufficient conditions iii) Other logical words; for example, "only", "if", "if and only if", "or", "some", "unless", "not", "not both" 2. Making and judging inductions a) Generalizing—concerns in: i) Typicality of instances ii) Limitations of coverage iii) Sampling iv) Tables and graphs b) Explaining and hypothesizing—criteria to consider: i) Explaining the evidence ii) Consistency with known facts iii) Alternative conclusions eliminated iv) Plausibility c) Investigating i) Designing experiments, including planning that controls variables effectively ii) Seeking evidence and counterevidence iii) Seeking other possible conclusions 3. Making and judging value judgments—considerations: a) Relevance of background facts b) Consequences of proposed action c) Dependence on acceptable higher order value principles d) Consideration and weighing of alternatives	1. Making and judging deductions inappropriately by using faulty logic or by incorrectly interpreting statements. 2. Making and judging inductions inappropriately. a) Generalizing without consideration for the concerns listed under "positive indicators" b) Hypothesizing without consideration of the criteria listed under "positive indicators" c) Investigating without controlling variables effectively, and seeking evidence and counterevidence or other possible conclusions. 3. Making and judging value judgments without taking into account the considerations listed under "positive indicators" or by using inappropriate considerations.

Skill	Description	Positive Indicators	Negative Indicators
Using appropriate strategies and tactics	Critical thinking is not a matter of following steps or procedures but some strategies or heuristics can be useful in guiding thinking.	1. Making lists of reasons for and against a position. 2. Use of mathematical algorithms. 3. When struggling with an idea, standing back from a situation to get the total picture. 4. Talking through a confusing issue with another person. 5. Double-checking responses before deciding that the task is completed. 6. Using models, metaphors, drawings and symbols to simplify problems. 7. Asking others how they might feel or act in a situation as a "reality check".	1. Using strategies and tactics inappropriately. For example, making lists of reasons for and against a position before the problem has been sufficiently clarified or using an incorrect mathematical algorithm, model, or metaphor.

Transcripts of each conference were read and marked up for positive and negative indicators of the critical thinking skills detailed above. The following questions were used to guide this analysis procedure:

Clarification.

1. Does the student appear to have a correct understanding of the question, issue, dilemma, or problem?

2. If not, does he or she seek clarification?

3. Is appropriate and sufficient clarification sought?

Assessing evidence.

1. Does the student assess properly the evidence on which to base decisions, opinions, conclusions ?

Making and judging inferences.

1. Does the student make valid inferences?

2. Does the student judge correctly the inferences made by others?

Strategies.

1. Does the student appear to be using appropriate strategies and/or heuristics in order to solve the problem, resolve the dilemma, or reach a decision in an effective and orderly manner?

Once the transcripts were marked, the students were sorted into one of three categories: high (extensive use of critical thinking skills, minimal use of uncritical thinking), medium (moderate use of critical thinking skills, some uncritical thinking) and low (minimal use of critical thinking skills, frequent use of uncritical thinking). Categorizing the contributions in this way was a subjective process but the following definitions of the three categories helped to guide the process:

High. Students in this category received mostly positive scores and did some or all of the following where necessary on a consistent basis:

- demonstrated a clear understanding of the issue or problem;
- sought adequate and appropriate clarification if confused;
- appropriately assessed the credibility of information sources and observations before rejecting them or using them to make inferences;
- made valid inductive and/or deductive inferences;
- appropriately assessed the value of inferences and value judgments before accepting or rejecting them;
- made valid value judgments; and
- used appropriate strategies and/or heuristics.

Medium. Students in this category received more negative scores than students in the high category and used some or all of the skills listed in the high category, but they did not do so consistently. Lack of consistency is the key discriminating feature of the medium category. While both high and

medium level students used the critical thinking skills listed above, students in the medium level did not do so consistently. In addition to their failure to use critical thinking skills consistently, students in this category occasionally demonstrated uncritical thought by making some or all of the errors listed in the low category. Again, consistency is the key factor here. Medium level students differed from low level students in that they did not make these errors consistently.

Low. Students in this category received more negative than positive scores and rarely used any of the skills identified in the high category. Instead they did some or all of the following:

- demonstrated a misunderstanding of the issue or problem;
- failed to seek clarification when confused;
- accepted information and observations without assessing their credibility;
- assessed evidence inappropriately;
- made no inductive and/or deductive inferences;
- made inductive and/or deductive inferences that are logically unsound or are not based on valid criteria;
- made value judgments without considering the relevance of background facts, the consequences of the proposed action and without weighing the alternatives;
- attacked the problem in an arbitrary manner without considering the use of appropriate strategies or heuristics;
- used inappropriate strategies.

In addition to these operational definitions of the various critical thinking skills and levels, the content analysis was guided by the overall definition of critical thinking adopted for this study: thinking that is reasonable and

reflective and focused on what to believe or do (Norris & Ennis, 1989). In analyzing student contributions, then, the criteria of reasonableness, reflection and focus on beliefs or actions were always applied regardless of the individual critical thinking skills identified.

Course Materials

All the course materials sent to the students were read by the researcher before the content analysis was conducted. The materials consist of a textbook, a collection of readings, "lectures" delivered by computer, computer conference discussion questions, and assignments.

Interviews

In-depth, semi-structured interviews with students and the instructor were conducted to provide an understanding of what the students and the instructor perceived to be the factors that affected participation and the use of critical thinking.

The conceptual framework for the study provided the initial structure for the interviews. A set of initial questions dealing with learner and instructor perceptions of the impact of each of the factors identified in the conceptual framework was developed (See appendix 1). The interview questions were reviewed by the dissertation committee for clarity and consistency with the purposes of the study and the conceptual framework.

The subjects selected for the interviews were contacted initially by electronic mail. Only 5 of the 16 students responded to the electronic mail request and consented to the interview. Follow-up telephone calls resulted in a further eight students agreeing to participate for a total of 13 interviews.

The subjects were interviewed in person, either at home or at the college depending on their preference. The interviews were tape-recorded as a safeguard against incomplete or misinterpreted researcher notes. Tape recording also allowed the researcher to engage in a more natural conversation with the student than if he had to concentrate on taking complete notes of the interview. The interviews began with a brief explanation of the purpose and a review of confidentiality measures. Once underway, the interview schedule was used as a guide, but responses were explored by probing for elaboration. Probes involved seeking clarification of initial responses, definition of terms or providing examples to illustrate or support a particular response. At the end of the interview, subjects were asked if there were any other issues not discussed that they felt affected their participation. To check that the responses of the subject were correctly understood, the researcher periodically paraphrased the responses and asked the subject if this was a correct interpretation. The tape recordings were transcribed and a copy was mailed to the subjects for review and change if they felt it did not accurately represent their views. None of the transcriptions were returned with any changes or corrections.

Analysis of the interviews involved classifying data into a scheme that allowed themes, concepts and hypotheses to emerge. Researchers use different methods to accomplish this, however Lazarsfeld & Barton (1971) argue that any scheme should have the following attributes: it should be articulated (i.e., moves from the general to the specific); logically correct (i.e., the categories are exhaustive and mutually exclusive); and it should be adapted to the structure of the situation. Whether or not to use predetermined categories depends on the extent to which research questions have been detailed in advance. Therefore the analysis in this study began

with categories based on the conceptual framework and the definition of critical thinking. The conceptual framework categories were the factors affecting participation: the attributes of the technology, the design of the learning activities, and student situational and dispositional factors. This framework provided the initial structure for the interviews. Initial questions dealt with learner perceptions of how factors in these categories affected their participation. The definition of critical thinking was used as a basis for analyzing student responses to the question dealing with their understanding of the concept.

In analyzing qualitative interview data there is not a clear line separating data collection from data analysis. In a sense, data analysis in this study began during the interviews. As the interviews progressed, themes began to emerge and notes were kept of these. This informal data analysis continued during the transcription of the interviews which was done by the researcher. In listening to the tape recordings of the interviews during the transcription process, more themes and hypotheses emerged and were noted. The formal data analysis process began with the first reading of the transcribed interviews. At this stage, the transcribed interviews were highlighted whenever a student's comments appeared to refer to a category in the conceptual framework. Following this initial analysis a coding scheme was developed that corresponded to the operational questions. The transcribed interviews were analyzed again and coded using this scheme. This was an iterative procedure whereby the initial coding and sorting of quotes into appropriate categories from the first interviews was sometimes modified by the coding and sorting of later interviews. Sorting the responses into these categories involved reducing the unimportant dissimilarities such as terminology, examples and other superficial characteristics, and integrating

and generalizing the important similarities such as "the specification of the core elements which make up the content and structure of a given category. This means that the protocols have to be studied with the intention of understanding what the students are expressing irrespective of what words or examples they may use, which may show considerable variation even between answers belonging to the same category. " (Dahlgren, 1984, pp. 24-26). The final step in the analysis procedure was to extract the coded quotes and transfer them to a database to allow for later sorting and retrieval.

Criteria for Qualitative Data

Guba & Lincoln (1989) suggest four criteria for judging the trustworthiness of qualitative research: credibility, dependability, confirmability and transferability.

Credibility

This refers to the accuracy with which the researcher has represented the views of the subjects in his or her conclusions. Credibility was addressed in this study by providing subjects with transcripts of their interviews for verification or amendment.

Dependability

This describes the extent to which people not involved in the study can track the research process and determine which raw data was used to reach what conclusions. Dependability was addressed in this study by keeping detailed records of data collection and analysis procedures and by making data files on each interview, audiotapes of the interviews, and analysis notes available for inspection.

Confirmability

In qualitative research it is important that others can check to see that the interpretations and conclusions reached are based on the data collected and are not a reflection of researcher bias. This criterion is called confirmability. Confirmability was addressed in this study by including appropriate excerpts from the raw data which support the interpretations and conclusions and by making complete transcripts of the interviews available for inspection. Complete transcripts of the interviews were made available to committee members in a password-protected World Wide Web site. Excerpts from the interviews that were included in this dissertation were highlighted and indexed on the web site

Transferability

As mentioned earlier, because of the nature of this study, there was no attempt to generalize statistically the results to some population. However, case study research is concerned with transferability. This refers to the applicability of the results to similar settings. This criterion is achieve by providing enough descriptive detail to allow others to decide if the findings are applicable to other cases. Transferability was addressed by providing a detailed description of the case and by providing the raw data upon which the conclusions were based. The students' situational and dispositional characteristics are described in terms of their age, educational background, reasons for taking the course, current program of studies . The course content, course design and the learning objectives are outlined, and the program, of which this course is a part, is described. A detailed description of the computer conferencing software and how the instructor organized and

moderated the discussions is provided, and student situational and dispositional characteristics are described.

Table 6 summarizes the operational research questions along with an indication of the type of data that was collected for each.

Table 6
Operational Questions and Related Data

Operational Questions	Data
Participation	
1. Over the duration of the course, how often did students contribute to the computer conferences?	• Total number of messages per student per week • Mean and median number of messages per week
2. Over the duration of the course, how much did students contribute to the computer conferences?	• Total number of messages per student per conference • Total number of messages per student for the course • Mean and median number of messages per conference and course
3. Over the duration of the course, to what degree were the contributions linked to each other?	• Total number of independent and interactive messages per student • Total number of independent and interactive messages for all students • Mean and median number of independent and interactive messages
4. Over the duration of the course, to what degree did students' contributions to the computer conferences appear to reflect the use of critical thinking?	• Student level of critical thinking in each conference • Frequency distribution of levels of critical thinking in each conference
5. Did the frequency and quantity of student contributions change over the duration of the course?	• Time-series graphs of the data for questions 1 and 2.
6. Did the degree to which student contributions were linked and built on each other change over the duration of the course?	• Time-series graphs of the data for question 3.

7. Did the degree to which students used critical thinking change over the duration of the course?	• Time-series graphs of the data for question 4.
8. What did students perceive to be the factors that affected their participation in the computer conference discussions?	• Interview transcripts
9. What did students perceive to be the factors that affected their use of critical thinking in computer conferencing?	• Interview transcripts
10. What were the students' understandings of what it means to think critically?	• Interview transcripts
11. What was the instructor's perception of student participation and his role in promoting it?	• Interview transcripts
12. What did the instructor perceive to be the factors that affected student participation in the computer conference discussions?	• Interview transcripts
13. What did the instructor perceive to be the factors that affected the students' use of critical thinking in the computer conference discussions?	• Interview transcripts
14. What was the relationship between the level of participation and the student characteristics?	• Comparison of data from questions 1, 2 and 3 with data from questionnaires and interviews.
15. What was the relationship between the level of critical thinking and the student characteristics?	• Comparison of data from question 4 with data from questionnaires and interviews.
The Attributes of the Technology	
1. What are the student and instructor perceptions of how the attributes affected participation?	• Interview transcripts

Course Design and Facilitation	•
1. How frequently did the instructor respond to student comments?	• Total number of messages posted and number of days between messages.
	• Conference discussion transcripts
2. What types of comments did the instructor use to respond to student comments?	• Conference discussion transcripts
3. What style of teaching did the instructor use?	• Conference discussion transcripts
4. How did the instructor encourage participation?	• Interview transcripts, course outline
5. What were the student and instructor perceptions of how the design and facilitation affected participation?	• Interview transcripts
Student Characteristics.	
1. What were the student/instructor perceptions of how the situational characteristics affected participation?	• Interview transcripts
2. What were the student and instructor perceptions of how the dispositional characteristics affected participation?	• Interview transcripts

Permissions and Clearances

The proposal for this study was approved by the University of British Columbia Behavioural Sciences Screening Committee for Research and Other Studies Involving Human Subjects. In addition, written approval was granted by the University College of the Fraser Valley. Student and instructor consent forms were signed giving the researcher permission to use transcripts of the computer conferences.

CHAPTER 4 - FINDINGS: THE CONTEXT AND PARTICIPATION

Case study research demands that careful attention be paid to the context in which the research is conducted. This chapter, therefore, begins with a detailed description of the context of this study: the situational and dispositional characteristics of the students, the design and facilitation of the course, and the relevant attributes of the technology used to deliver the course. The institutional context and the course content were described in detail in chapter 3. Following the presentation of findings related to the context, the findings related to student participation are presented. In chapter 5 the perceptions of the students and the instructor about the impact of the various factors on participation are presented.

The Students

Most of the data on student situational and dispositional characteristics were gathered using a questionnaire which was mailed to each student about two weeks before the start of the course. Those who failed to return the questionnaires were given another copy, in person, at the orientation session held at the beginning of the course. In the end, all 18 registered students returned completed questionnaires.

Data on students precourse attitudes towards online learning were gathered in the face-to-face interviews conducted after the course was completed. Eleven of the 13 completing students and 2 of the 5 noncompleting students agreed to be interviewed.

Completion

Of the 18 students who registered for this course, 13 completed it by writing the final examination. Two dropped out before logging on; one dropped out after the first week and two dropped out after the first month.

Age and Gender

The students ranged in age from 20 to 56 years with an average age of 26.27 years. Fifteen of the 18 students were in the 20 to 28 year-old range. When the 56 year-old student is removed, the average age drops to 24.5 years. The average age of the 13 completing students is slightly lower at 25.3 years and it drops to 22.75 years without the 56 year-old student.

Table 7
Age Distribution of Enrolling Students

Age	20-25	26-31	32-37	38 and older
n=	13	2	1	1

Fifteen of the 18 registered students were male. All five dropouts were male, leaving 10 males and 3 females who completed the course.

Previous Education

A majority of the registered students (10 of 18) had some postsecondary undergraduate education, and 7 of 18 only had a high school education. One of the students had completed a Master's degree. The educational profile of the completers is slightly different with equal numbers (6) having high school and postsecondary undergraduate education and one student with a Master's degree.

Table 8
Educational Level of Enrolling Students

Level				
n=	7	10	0	1

Computer Experience

As would be expected in a computer course, most of the registered students considered themselves frequent computer users. Sixteen of the 18 registered students said they used computers frequently and two responded that they used them occasionally. All 13 completers considered themselves frequent computer users.

Computer Access

All except two of the students accessed the course from their home computers. The two students who did not access the course from home did so from the college. In one case the student did not have a computer and in the other he had a computer but did not have a modem.

Previous Online Experience

Despite the fact that most of these students were frequent computer users and had their own computers at home, only 2 of the 18 registered students and 1 of the 13 completing students had had any previous experience with online courses.

Motivation

The fact that this course was offered online had little impact on the students' decision to enroll in the course. Fourteen of the 18 registered students stated their main reason for taking the course was because it was required. Only three were motivated primarily because the course was offered online and one student said the main reason he took the course was because its time-independence allowed him to fit it into his schedule. The breakdown for completers is much the same: 10 stated that their main reason for taking the course was that it was required, two because it was online, and one because of the scheduling flexibility.

Eleven of the 18 registered students and 8 of 13 completing students said one of the reasons they took the course was because it was offered online.

All 18 registered students were taking the course for credit and it was a required course for 17 of the 18 registered students and 12 of the 13 completers. Nearly all of these students, then, had no choice but to take this course online. It was required in their program and it was only offered in this format.

Fifteen of the 18 registered students and 10 of the 13 completing students said one of the reasons they took the course was because the subject matter interested them.

The Program of Studies

For most of these students, going to school was a fulltime activity. All of the students were in the Bachelor of Computer Information Systems degree program. Seventeen of the 18 registered students and all 13 completing students were taking four or more courses. One of the students who dropped out was only taking three courses.

For all of these students, this was the only online or distance education course in their program of studies. The rest of their courses were face-to-face courses offered on campus. Many of the students knew each other from previous or current face-to-face classes and several said they met on a regular basis. These meetings were usually social in nature, but often the conversation dealt with the course discussion topics.

Attitude

The attitudes of the students towards this course, and more particularly towards the fact that it was offered online, varied from outright enthusiasm to jaded cynicism with most having apparently neutral or noncommittal feelings about it. Most also confessed they did not really know what to expect.

Student #6 is representative of those in the middle of the spectrum:

> *I had no real, just a neutral. It's just another course that I have to take. It was sort of interesting because it was . . . ethics, it wasn't programming, it wasn't learning a specific field or programming, it was ethics which was different than anything I'd done before. . . it was sort of interesting, you know mildly interesting, "oh wow this is online, oh that's kind of neat", in that way, but as far as making me want to take it more or less, it was just another aspect of the course.* (6:5:1)

Student #16 displays one of the more negative attitudes:

> *Everyone thinks online is a waste of time, that's the attitude. I'm not saying I actually have that.*(16:12:1)

> *You don't learn as much. You can fake by. You can BS half your way. I mean I did and I passed. I didn't get a great mark but if I put a bit more time into BSing it would have worked.* (16:12:2)

Flaky joke but I'll do it because you have to pass the degree. I mean I wouldn't have taken this course. Online courses personally I still wouldn't take another one. I don't like them. They're not necessarily a joke but they're flaky. You don't get as much out of them. It's nobody's fault, it's just the nature of the course. (16:13:1)

Students #8 was one of a few students who began the course with a positive attitude towards online learning:

I was very positively predisposed. I said it's about time because I had been waiting. I had heard there was an online course and I had just been waiting for it to come up again to that I could take it. (8:14:1)

The Course

A general description of the course content, the course design, and the instructor's role was presented in chapter 3. What follows is a more detailed description of the course design and how the instructor attempted to promote online discussion. Data on these aspects were gathered through observations of the face-to-face orientation session held at the beginning of the course, and the online activities, and from a face-to-face interview and casual discussions with the instructor.

The Role of the Instructor

The course was organized around a series of readings and 12 related online discussions. Every two weeks, for the first 10 weeks of the course, there were two concurrent online conferences related to articles or textbook chapters the students were to have read. One of the two concurrent conferences presented an ethical scenario that students had to consider and then decide whether the activity in question was ethical, unethical or not an ethics issue. Students were instructed to support their position with reasons. In the other

concurrent conference, the instructor presented one or more discussion questions that were related to that week's readings and that had ethical implications. Students were instructed to answer the questions by thinking critically about the issues involved and then presenting a well-reasoned and supported argument on one side of the issue. The instructor used the same definition of critical thinking adopted by this study that was discussed in chapters 1 and 2. For the last three weeks of the course, the format changed slightly. Instead of concurrent conferences, there were two consecutive discussions that overlapped slightly.

Participation in the online conferences counted for 15% of the final grade. In addition there were mid-term and final examinations worth 20% each, an essay worth 15% and a term paper worth 30%. The instructor tried several approaches to promote and encourage online discussion. He began by posing the questions and asking students to present well-supported and well-argued responses. In subsequent discussions the instructions became more specific. For example, in conference 2A (Ethics-Business) he tried to promote greater inter-student discussion as evidenced by the following instructions:

```
Message #2
Monday, January 29, 1996 11:00:17 PM
Ethics - Business Item
From:        Instructor
Subject:      Discussion Format
To:          Ethics - Business (2A)

We are going to take the level of discussion up a notch. For the
first week, respond to two of the three discussion questions
posted from the readings. For the second week, respond to at least
two of the responses posted by your fellow students. Either agree
or disagree and offer an example from your experience or reading
that supports your stance.
```

Later, in conference 3A (Ethics-Information Systems) he tried a collaborative learning activity. He broke the class up into dyads and then gave them the following instructions:

```
Message #2
Monday, February 12, 1996 11:05:13 PM
Ethics - Info Systems Item
From:         Instructor
Subject:       Assignment(s)
To:           Ethics - Info Systems (3A)

For this session you will have two separate tasks:
1. Investigate & report on the issue you and your partner have
chosen.

2. Choose ONE aspect of the article "Why I Never Met a Programmer
I Could Trust" and upload a discussion question for the rest of
the class. Do this BEFORE next Monday Feb. 19. In the second week
of this session, answer TWO of the questions uploaded by your
fellow students.
```

In order to stimulate their critical thinking, in conference 4A (Privacy/Accuracy) he asked to students to first present arguments that were *not* examples of critical thinking and then follow this with arguments that *were* examples of critical thinking. In subsequent conferences, he reverted to an open discussion format.

```
Message #40
Tuesday, January 30, 1996 9:19:27 AM
Start Up Item
From:         Instructor
Subject:       Ros Wrap up
To:           Start Up (1A)

Thank you all for some very good contributions. I am VERY
impressed with the thought you've all put into it. This is going
to be a GREAT class!
While you've covered virtually every point I could care to
mention, here's my attempt to summarize the discussion. If I've
left out any points you feel are important, please add them.
```

```
Message #20
Monday, February 19, 1996 11:06:45 AM
Ethics - Info Systems Item
From:           Instructor
Subject:        Progress
To:             Ethics - Info Systems

Thank you for the questions you've raised about Shore's article.
They are excellent. Please offer your responses this week. Choose
any two of them.

Thanks as well to Student #1 & Student #3 for their report on the
V-Chip. Hopefully the rest of the partnerships will post their
reports VERY soon so that we can spend the rest of this week
reacting to them.

If you are having a problem reaching your partner please notify me
via a private message through your mailbox.
```

In general the instructor used a dialogical style of teaching, as opposed to a didactic or fact-based questioning style, which is recommended for facilitating critical thinking (Sternberg & Martin, 1988). While he did present electronic lectures or "electures" in which he discussed the readings relevant to the week's discussion topic, these were brief and made up only 10% of his messages (7 of 72). Instead his style was to monitor the discussions and respond selectively to student comments, with encouraging comments, clarification, redirection and summaries.

In total the instructor contributed 72 messages to the 12 discussions ranging from a high of 19 messages posted in conference 2A to a low of one message posted in conference 5B and 6 but, as can be seen from Figure 2, it tended to follow the participation pattern of the students.

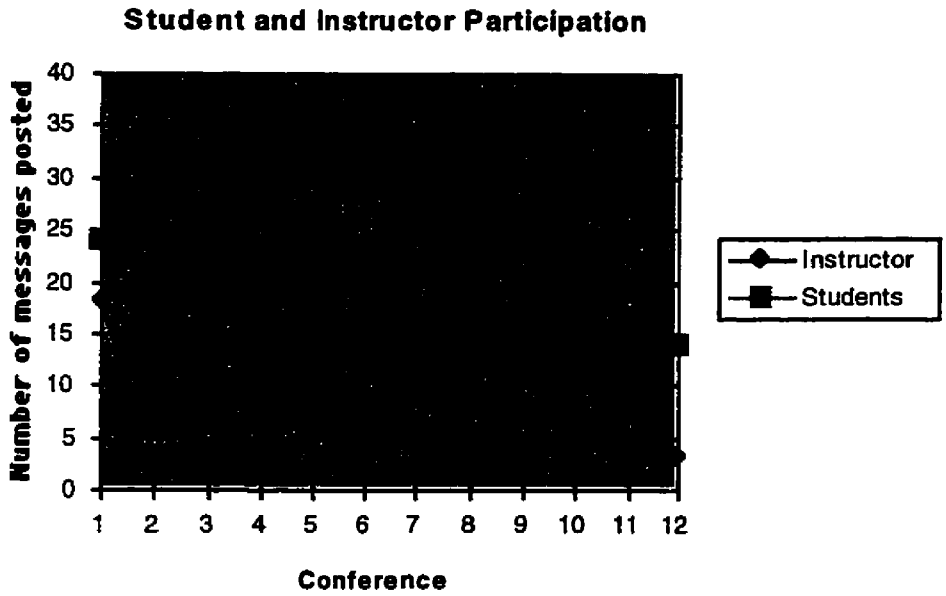

Figure 2: The total number of messages posted by students and instructors in each conference.

The instructor's participation also tended to be clustered on a few days in each conference instead of evenly distributed throughout the conferences. Of the 86 days between January 15 and April 9 the instructor posted messages on 20 of them for an average contribution rate of once every 3.47 days. However, his frequency of posting ranged from daily, on eight occasions, to a gap of 13 days on two occasions. There was also one gap of 10 days, one of eight days, one of five, two of four, two of three days and one of two days.

Despite his experimentation with several different ways of organizing the online activities, in general the instructor played a relatively passive role in the course. Once he initiated the discussions with the opening question or issue, metaphorically speaking, he left the classroom and only returned occasionally.

Conference 5A - Property/Access is used to illustrate this. (The complete transcript is reproduced in appendix 3). The instructor begins with two brief "electures" (messages #1 and #2) in which he discusses the relevant readings

and then ends each with a discussion question. In general, lectures are not recommended in online courses, especially if they are long, because they tend to suppress student interaction (Harasim et al., 1995). However, students often need to be properly oriented to the relevant information that forms the basis of the discussion so a short presentation by the instructor may be useful, particularly when it invites student responses. In both of these electronic lectures the instructor ends with a discussion question and asks students to respond. However, the question in message #1 is somewhat vague, "How do you feel ethics can be applied to your situation?" and in message #2 it is completely open-ended, "Comment on whatever peaks your interest." While asking students to link the course material to their own personal or professional experience is a recommended practice in adult education, neither of these questions seem pointed enough to stimulate discussion. Judging from the lengthy delay until the first student response, they do not appear to have done so. The instructor posted his messages on Monday March 11 and the first student message is not posted until late on Saturday March 16, five days later. Harasim et al. (1995) recommend waiting a day or two before responding to student comments or encouraging responses. By Thursday the instructor probably should have posted another message seeking student responses. He could have rephrased, and sharpened the question or asked students if they were having trouble understanding what was expected.

Finally, on Saturday March 16, student #8 responds.

Message #3
Saturday, March 16, 1996 10:57:16 PM
Property/Access Item
From: Student #8
Subject: Property Discussion
To: Property/Access

DISCUSSION QUESTION:
Earlier in the course I stated something to the extent that when ethics fail, laws are made. From the above one may gather that the LAWS have failed to protect the ownership of software. How do you feel ethics can be applied to the situation? Go back in the readings to gather ideas. Try to build a case for your solution.

I think the way to apply ethics to solve this problem (if indeed it is solvable) is for educational facilities to instantiate an ethics policy dealing with the matter. However it would need to be accepted by the instructors to be effective.

A point made in the e-lecture was that

"... the academic respondents admitted copying software 73% of the time while the IS managers admitted to copying only 9% of the time." The instructor stated that maybe it was because the faculty were more honest but I would like to submit that maybe it was the software policing done in corporations like BC Hydro that kept the IS managers "clean"..

I worked as a co-op student with BC Hydro last year. They have a good system that deals with illegal software. Being a large organization under constant public scrutiny they cannot afford to have illegal software on machines. They have a strict policy against illegal software which they send reminders out to their departments about frequently. They also have auditing software which checks computers for illegal software. "Surprise" audits are done on random departments. The fear of these "surprise" audits are enough to keep "most" computers clean. The results of the audits are also published in memos to the departments which gives a sense of legitimacy to the threat of being caught.

I have a copy of the Canadian Information Processing Society's Standards of Conduct which also deals with this matter.
P4) I will not seek to acquire, through my position or special knowledge, for my own or others' use, information that is not rightly mine to possess.
P5) I will obey the laws of the country, and will not COUNSEL, aid, or assist any one person to act in any way contrary to these laws.

This organization has standards relating directly to educators as well but nothing that deals directly with this problem. However P5 would seem to relate here. Perhaps if computer instructors had a code of ethics that they agreed to follow they would be more careful with how they advise students to act in this matter. This then would filter positively down to the computer students. It may not work but the alternative (instructors being agreeable to student copying software definitely won't work, so it's worth a try).

The instructor does not respond to student #8 and there is another day of "silence" until student #9 posts a message on Monday March 18 (message #4) and again on Tuesday March 19 (message #5). In both these messages, student #9 makes comments that invite an intervention from the instructor. In message #4 the student does not seem to be focusing on the question ("How do you feel ethics can be applied to the situation").

Message #4
Monday, March 18, 1996 4:56:21 PM
Property/Access Item
From: Student #9
Subject: Misc. Concerns
To: Property/Access

...
From the readings to a large extent the attitudes and behaviour re: piracy have come about due to a lack of education in the following areas:

- increase student and professional user awareness of software development costs required to develop/upgrade new programs
- impact of lost revenues due to piracy resulting in increased retail prices -
- although personally I have allot of trouble with this rationale namely:
    - the software industry punishes the people who abide by the copyright law by charging them higher prices - ah! some thing wrong with the logic here ?? Note: Some mechanism for charging software users less e.g. based on their track record of copywritten software purchases, in other words an incentive to buy copywritten software rather than a punishment.
    - the industry usually sets retail prices on the basis of " what the traffic will bear" if this is not above their costs + profit they get out.
- discussion of piracy scenarios and consequences thereof from the software developers point of view.

In message #5 she/he makes a comment about encryption software that needs elaboration and then his message ends abruptly. However, again there is no response from the instructor.

Message #5
Tuesday, March 19, 1996 5:01:08 PM
Property/Access Item
From: Student #9
Subject: Piracy & Such
To: Property/Access

Re: Demographic Factors:
I find it more than coincidence that while 52.8% admitted to piracy the following prerequisites for piracy to occur were approximately 50% higher:

- 67% of the respondents were offered copies to pirate (conversely the 67% who offered would have no problem copying others software given the opportunity)
- 70.4% were confident that there was little chance of being caught (if no negative consequences are perceived why not)
- 70% believed that software piracy occurs a lot (Maybe this is a better approximation than the actual study itself)

Coincidence I don't think so. The wide spread availability and use of encryption software such as Pretty Good Privacy(PAP) will make the enforcement of the copyright laws all but impossible as a pirate will be able to sell software with out revealing his/her identity or physical location. While there isn't any cause and effect relationship intend here

On Thursday March 21, student #12 responds to the discussion questions, but instead of discussing how ethics can be applied he explains why laws have failed. There is, again, no response from the instructor, nor from any students.

Student #9 returns to the discussion on Thursday and makes a statement and talks about "avoiding the devastating social costs of relegating trades and craftpersons worthless with the coming of the industry revolution." This would have been an ideal opportunity for the instructor to point out that a key aspect of critical thinking is to support one's position with evidence and well-reasoned argument.

Finally on Tuesday March 26, in three messages, the instructor responds to all the student messages at once. The first message is shown below. See appendix 3 for the complete transcript.

Message #11
Tuesday, March 26, 1996 11:06:44 AM
Property/Access Item
From: Instructor
Subject: Re: Property Discussion
To: Property/Access

Student #8 said:

"... the academic respondents admitted copying software 73% of the time while the IS managers admitted to copying only 9% of the time." The instructor stated that maybe it was because the faculty were more honest but I would like to submit that maybe it was the software policing done in corporations like BC Hydro that kept the IS managers "clean"..

I can't disagree with that. Earlier on in the course we read that enforcement was an important tool in maintaining ethical practice. This goes well too with the idea that most people operate at level 2 ethics.

"Perhaps if computer instructors had a code of ethics that they agreed to follow they would be more careful with how they advise students to act in this matter. "

Well we do & I think we do. The article is rather dated. When I went to computer school (talk about dated) the instructors has a very casual attitude towards software copyright. I don't think that that is the case any longer.

This organization has standards relating directly to educators as well but nothing that deals directly with this problem. However P5 would seem to relate here. Perhaps if computer instructors had a code of ethics that they agreed to follow they would be more careful with how they advise students to act in this matter. This then would filter positively down to the computer students. It may not work but the alternative (instructors being agreeable to student copying software definitely won't work, so it's worth a try).

However, coming as these do at the end of the conference, these responses from the instructor are not likely to encourage participation in this

conference because there is no time left for follow-up comments. Furthermore, the instructor's comments are so brief and uncritical they seem unlikely to force the students to think any more about the questions addressed in the discussion. At best the instructor's comments serve to acknowledge the student contributions and may provide some psychological comfort, but they seem unlikely to help to achieve the critical thinking and participation goals of the course.

In his interview the instructor acknowledged that he was probably too passive in this course. He attributed this, in part, to the fact that this was the second time he had taught the course online and so the material was not "fresh" and he felt somewhat distant from it. He said he would have liked to have taken a more active role in the discussions but found it difficult because there was no disagreement or controversy to work with:

> *I struggled with it because I didn't have enough dissonance to work with. Everybody agreed with everybody so a way to do that is to say "well Charlie said this but you said that, it seems that your blah, blah, blah so could both of you explain this a little bit further" or "examine what he says and you examine what he says" and that kind of thing or switch sides and play each other's role and that kind of thing. There weren't enough differences in people to do that but I should have.*(I:8:1)

> *I should have been probing more, I should have been digging more.* (I:9:3)

The Computer Conferencing Software

First Class ® is a client-server based computer conferencing application that works on both Windows® and Macintosh® platforms. Client-server means that each user (client) must install a copy of the application on her or his

computer which then connects to the host computer where the server application is installed. All messages are stored on the host computer and accessed online from the individual user's computer. The application has a graphical user interface that makes use of the standard Windows ® and Macintosh ® features such as folders, menus and "point and click" mouse operations. In other words, it presents an interface that is familar to Windows® and Macintosh® users.

To access messages students must launch the application on their computer which then connects them to the host computer. Once a login identification and password are entered, the student is online and is presented with a graphical desktop with a number of folders. In this course there were separate folders for each discussion topic as well as folders for social messages, and assignments. When a folder is opened a list of messages is presented which can be sorted by date, sender, or topic. Double clicking on a message opens it up to be read. Unopened messages have a red flag beside them. Once a message is opened, the flag disappears. A folder with unopened messages also displays a red flag which only disappears when all messages have been opened.

In version 3.1 of this software there was no offline capability which meant that reading and composing messages had to be done while connected to the host computer. It was not possible to download messages, go offline to read and compose, and then online to post. In addition, unless the application is launched, users receive no notification that there are new messages.

In addition to the conferencing feature, the software has an e-mail feature that allows users to send private messages to any member of the conference. There is also a synchronous "chat" feature which allows for real-time text-

based communication, however this feature was disabled for technical reasons.

The Attributes of Computer Conferencing

This course used asynchronous computer conferencing as the main method of delivery. As discussed in earlier chapters, this technology has five defining attributes. In observing the implementation of this course it was clear that all five attributes came into play.

Most of the communication could be classified as "many-to-many" because all students were participating to some degree by posting messages that were received by all other students and the instructor. However, as we will see later, most of the messages tended to be responses to the instructor's initial question and there was little inter-student communication.

The communication was "place-independent" in that students were not required to assemble in one place to participate. However, in practice, most students were forced, by circumstance, to participate either from home or by using computers at the college. Two of the students had no choice but to participate using the college computers because one did not have a modem and the other did not have a computer at home.

Participation was also "time-independent" in that the instructor did not require students to log on at a particular time. Again, in practice this flexibility was not as evident as most students tended to attend to all their other courses first because they were time-dependent and then deal with this one. That meant they usually ended up participating after the regular school day in the evenings or on weekends. Instead of providing flexibility, for many students time-independence resulted in procrastination. Student #16 sums up the feelings of these students:

It's like e-mail, you get around to it when you can. You don't look at it as a priority. You have a set time for class, I mean everyone will make it to class. You either make it or you don't. If you miss it, you skip and you lose information. And on this one there's more of well you can come in whenever you wanted so there's not really any pressure, so you put it off, you procrastinate and I'm that kind of person anyway so that didn't really help to get me in there. (16:9:1)

The communication was text-based because the software used did not allow for anything else and it was computer-mediated, although the computer mediation was not fully exploited. Students used it to access the messages of other students but there were no activities that required the manipulation or analysis of the record of the conference discussions. Once a discussion was closed, students had no need to return to it.

Participation

As detailed in chapter 3, several measures of student participation in the computer conferences were taken, varying from pure quantitative counts of numbers of messages posted and frequency of posting, to more qualitative assessments of the messages such as their interactive nature (the degree to which they were linked to other messages) and the degree to which the messages appeared to reflect the use of critical thinking. In addition, these quantitative and qualitative measures were tracked over time to see if they changed over the duration of the course.

Quantitative Measures of Participation

In total, the 13 completing students posted 207 messages during the 14 weeks of online activity for an average of 15.92 messages per student. The total number of messages posted per week by the 13 completing students

ranged from a low of 4 to a high of 40. The average number of messages posted per week, per student, ranged from a low of .15 to a high of 2.5. This means that, on average, each student posted just over one (1.14) message per week..

The amount of student participation varied over the 14 weeks of the course. As can be seen in figure 3, it began climbing after week 1 and peaked about half-way through the course when the total number of student messages reached 40. From that point it tended to decline quite quickly, bottoming out in week 11 at two messages, then climbing for two weeks before declining again.

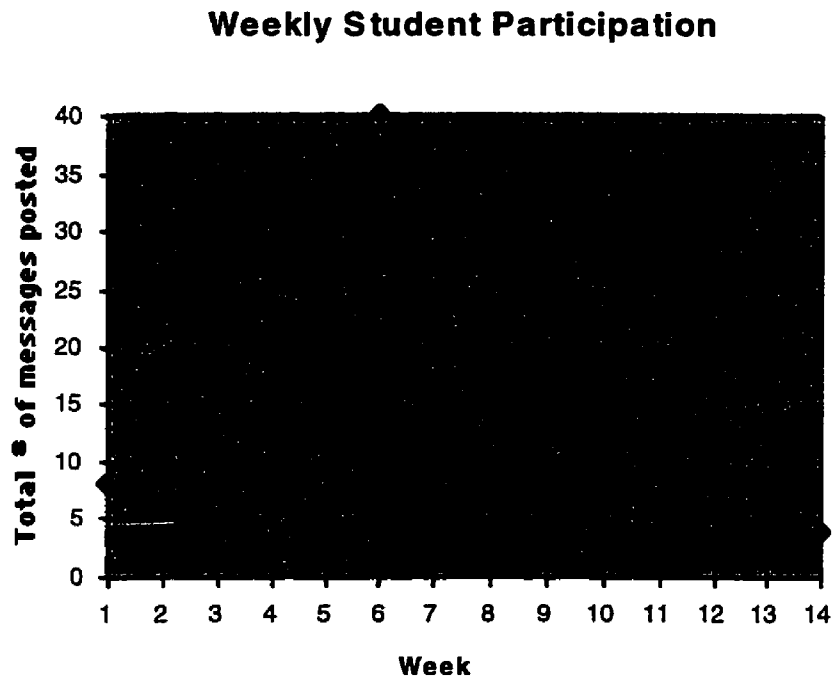

Figure 3: Total number of messages posted by students each week.

The frequency with which students participated varied widely with some students contributing only in two of the 14 weeks and others in 10 of the 14 weeks. None of the students made contributions in all 14 weeks. It should be noted that this is only an indication of the students' frequency of *contribution*

not an indication of their frequency of logging in. No records were kept of student log-ins so it is possible that students logged in and read messages more frequently than they logged in and posted messages.

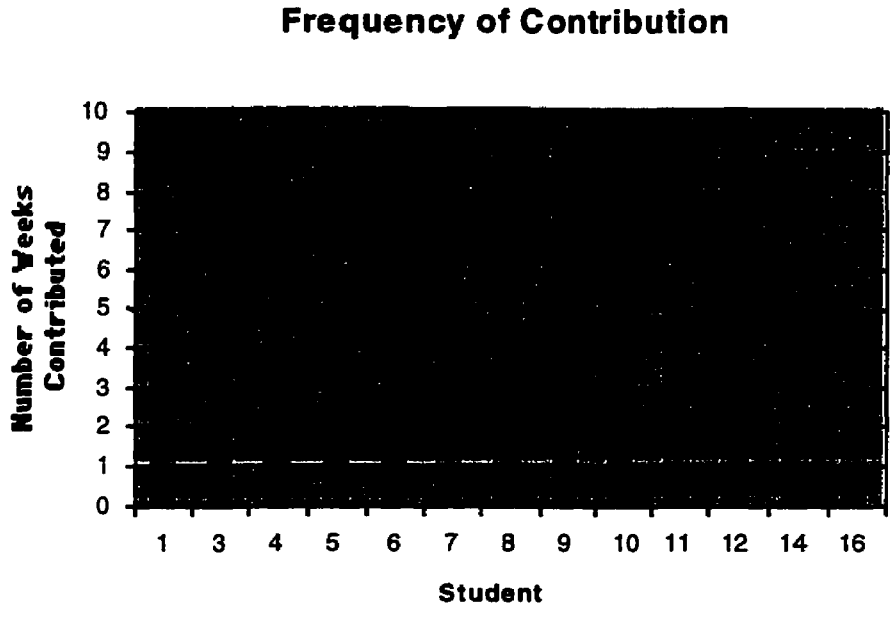

Figure 4: The total number of weeks in which contributions were made by each student.

Qualitative Measures of Participation

Two qualitative measures of participation were taken: the interactivity of the messages and the degree to which the messages appeared to reflect the use of critical thinking.

Interactivity

In chapter 3 two types of messages were defined: independent and interactive. Independent messages are those that deal with the topic of discussion but make no implicit or explicit reference to any other messages. Interactive messages are those that, while dealing with the topic of discussion,

do refer to other messages by responding to them, elaborating on them or building on them in some fashion.

Student messages in this course were overwhelmingly independent in nature. In total, 48 of the 207 (23%) of the messages were classified as interactive. As figure 5 indicates the number of interactive messages posted varied over the duration of the course but it tended to follow the same pattern as the total number messages posted, peaking in week 6 and then declining.

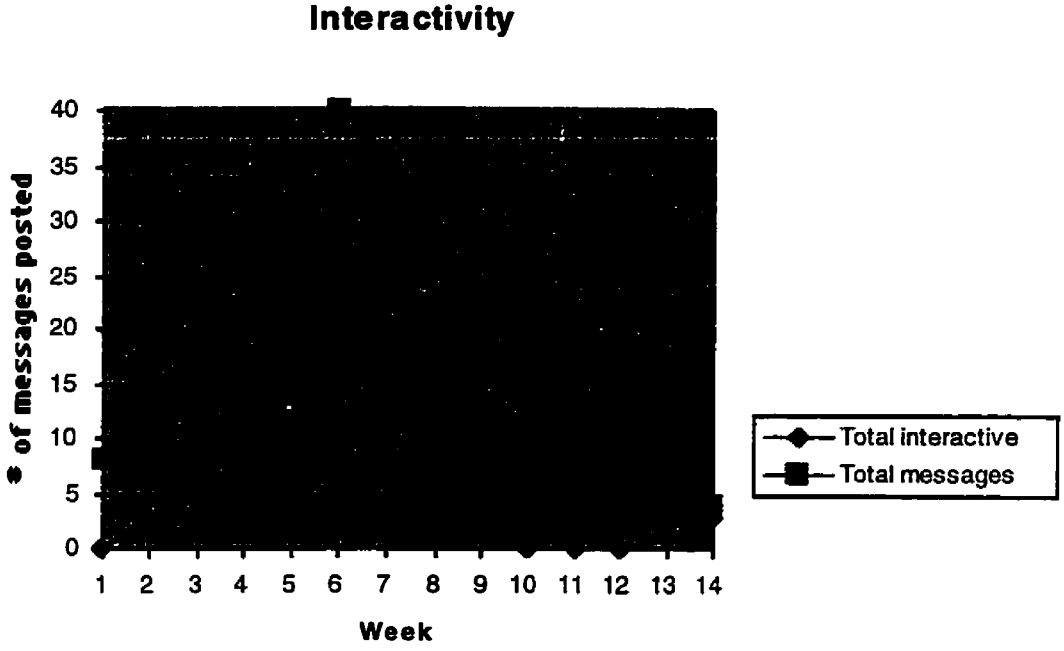

Figure 5: Weekly totals of interactive messages and all messages posted by students

The number and proportion of interactive messages posted by each student also varied considerably from a low of 0 to a high of 12. On average, each student posted four interactive messages over the duration of the course which works out to .26 interactive messages per week.

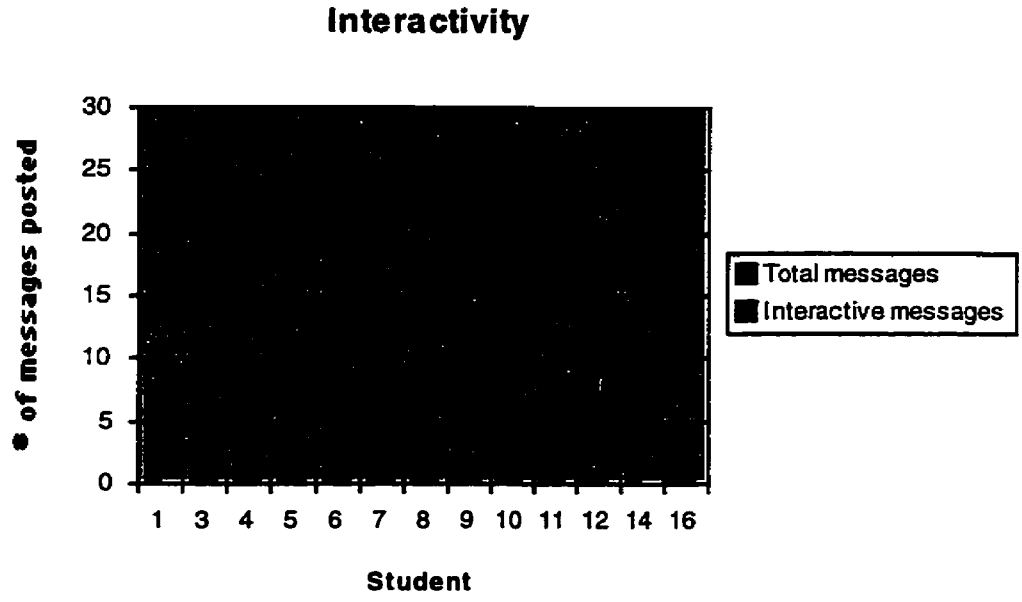

Figure 6: Interactive messages as a proportion of total messages posted by each student.

Critical Thinking

Content analysis was used to assess the degree to which student messages appeared to reflect the use of critical thinking. This analysis procedure is described in detail in chapter 3. The reliability of the analysis procedure was checked by having three independent judges analyze one sample conference and sort the students into the three critical thinking categories. Results of the three independent ratings are presented below. There was relatively high interjudge agreement on the overall level of critical thinking of the nine students who participated in the sample conference used for this analysis. Table 9 shows there was full agreement of all three judges in three of the nine cases and majority agreement in six of the nine cases. Furthermore, in eight of the nine cases the author (judge 2) was in agreement with at least one other judge.

Table 9
Extent of Interjudge Agreement on Overall Level of Critical Thinking for Each Student

All Judges				Two Judges		
Full Agreement	Majority Agreement	One Level Difference	Two Levels Difference	1v2	2v3	1v3
3/9	6/9	5/9	1/9	6/9	5/9	4/9

Interjudge agreement was not as high when it came to identifying the specific critical thinking skills used by each student. Table 10 shows that the three judges identified 107 different examples of the four categories of critical thinking skills and that 17 percent of those were identified by all three judges. Twenty-two percent were identified by at least two of the three judges. There was no agreement on 62% of the examples identified.

Table 10
Extent of Interjudge Agreement on Evidence of Specific Critical Thinking Skills (All Judges)

Critical Thinking Skill	Full Agreement	Majority Agreement	No Agreement
(+) Clarification	3/13	5/13	6/13
(-) Clarification	0/6	0/6	6/6
(+) Evidence	2/12	1/12	9/12
(-) Evidence	1/10	1/10	8/10
(+) Inference	8/35	10/35	17/35
(-) Inference	4/21	7/21	10/21
(+) Strategies	0/7	0/7	7/7
(-) Strategies	0/3	0/3	3/3
TOTAL	18/107 (17%)	24/107 (22%)	66/107 (62%)

In analyzing how the three judges scored the students there is evidence to indicate that one judge failed to understand properly the meaning of some of the categories of critical thinking skills. The scoring done by judge 3 deviated considerably from that of both the other two judges, and judge 3 was the only one to identify examples of the use of strategies. This was based on an incorrect understanding of the meaning of the strategies category. Judge 3 was under the impression that the strategies category referred to the students' suggestions for appropriate strategies for dealing with the issue under discussion and not strategies and heuristics used by the student to aid his or her critical thinking (Judge 3, personal communication, October 24, 1996).

Table 11 shows the extent of agreement between judges 1 and 2 on the evidence of specific critical thinking skills. Whereas there was full agreement in only 17% of the cases when all three judges were compared (Table 10), there was agreement between judges 1 and 2 in 58% of the cases (Table 11).

Table 11
Extent of Interjudge Agreement on Evidence of Specific Critical Thinking Skills (Judges 1 v 2)

Critical Thinking Skill	Full Agreement	No Agreement
(+) Clarification	7/11	4/11
(-) Clarification	0/0	0/0
(+) Evidence	1/5	4/5
(-) Evidence	4/6	2/6
(+) Inference	4/6	2/6
(-) Inference	13/22	9/22
(+) Strategies	0/0	0/0
(-) Strategies	0/0	0/0
TOTAL	29/50 (58%)	21/50 (42%)

Tables 12 and 13 provide further evidence of the difference between judge 3 and judges 1 and 2. These two tables show the extent of interjudge agreement on the number of examples of the different critical thinking skills identified in the messages of each student. Table 12 compares all judges and Table 13 compares pairs of judges. When the three judges are compared there is full agreement in 40% of the cases and majority agreement in 47% of the cases (Table 12). When pairs of judges are compared, judges 1 and 2 agree in 76% of the cases whereas judges 2 and 3 and judges 1 and 3 agree in 45% of the cases (Table 13).

Table 12

Extent of Interjudge Agreement on the Number of Instances of Specific Critical Thinking Skills Identified in Each Message (All Judges)

Student	Full Agreement	Majority Agreement	No Agreement	Variation of 1	Variation of 2	Variation of 3 or more
Student 1	6/8	2/8	-	2/8	-	-
Student 3	2/8	4/8	2/8	3/8	1/8	2/8
Student 4	5/16	8/16	3/16	8/16	2/16	1/16
Student 6	3/8	5/8	-	5/8	-	-
Student 7	5/8	2/8	1/8	2/8	1/8	-
Student 8	2/8	4/8	2/8	3/8	2/8	1/8
Student 9	6/16	8/16	2/16	8/16	2/16	-
Student 12	4/8	3/8	1/8	1/8	1/8	2/8
Student 14	2/8	5/8	1/8	5/8	-	1/8
TOTAL	35/88 (40%)	41/88 (47%)	12/88 (14%)	37/88 (42%)	9/88 (10%)	7/88 (8%)

Table 13
Extent of Interjudge Agreement on the Number of Instances of Specific Critical Thinking Skills Identified in Each Message (Two Way Comparison of Judges)

	Full Agreement		
Judges:	**1 v2**	**2 v3**	**1 v3**
Student 1	7/8	6/8	7/8
Student 3	6/8	2/8	2/8
Student 4	10/16	7/16	6/16
Student 6	8/8	3/8	3/8
Student 7	6/8	5/8	6/8
Student 8	6/8	2/8	3/8
Student 9	12/16	8/16	6/16
Student 12	7/8	4/8	4/8
Student 14	5/8	3/8	3/8
TOTAL:	67/88 76%	40/88 45%	40/88 45%

Table 14 shows the extent of interjudge agreement on whether or not students used specific critical thinking skills in their messages regardless of the number of examples identified. There was 90% agreement between judges 1 and 2 but only 55% agreement between judges 2 and 3, and 59% agreement between judges 1 and 3. Even when all judges are compared there was at least majority agreement in all cases.

Table 14
Extent of Interjudge Agreement on the Use of Specific Critical Thinking Skills in Each Message

Student	All Judges		Two Judges		
	Full	Majority	1v2	2v3	1v3
Student 1	7/8	1/8	8/8	7/8	7/8
Student 3	4/8	4/8	8/8	4/8	4/8
Student 4	8/16	8/16	13/16	8/16	10/16
Student 6	3/8	5/8	8/8	3/8	3/8
Student 7	6/8	2/8	7/8	6/8	7/8
Student 8	4/8	4/8	8/8	4/8	4/8
Student 9	9/16	7/16	13/16	9/16	10/16
Student 12	4/8	4/8	8/8	4/8	4/8
Student 14	3/8	5/8	6/8	3/8	3/8
TOTAL:	48/88 55%	40/88 45%	79/88 90%	48/88 55%	52/88 59%

Based on this analysis of interjudge agreement, the author conducted a complete content analysis of the transcript of the computer conferences using the procedure detailed in chapter 3. It is recognized that, given the results of the interjudge agreement regarding the identification of specific examples of critical thinking skills, caution will have to be exercised in drawing conclusions regarding this aspect of the analysis. However, it was felt that the interjudge agreement on the overall level of critical thinking was sufficiently high to warrant the use of this procedure for the full analysis.

As discussed in chapter 3, the content analysis was conducted in two phases. First, the transcripts were analyzed for indicators of the critical thinking skills identified in the framework presented in chapter 3. Then, in

the second phase, the students were assigned a critical thinking score, ranging from a low of one to a high of three, based on the criteria described in chapter 3.

The content analysis revealed that all students appeared to be thinking critically, at some level, about the issues raised for discussion. Individual mean scores for the course varied from a low of 1.2 to a high of 2.6. The overall mean critical thinking score was 1.83. The criteria for assigning overall critical thinking scores was described in chapter 3. According to these criteria, a student with a score of one would not be using any of the critical thinking skills identified, but a score higher than one would indicate the presence of some critical thinking. All students in this class received mean scores higher than one, and in all except two cases, they were 1.5 or higher. However, only three of the 13 students received scores higher than two. This suggests that, while all students were thinking critically to some degree, none were doing so at the highest levels on a consistent basis.

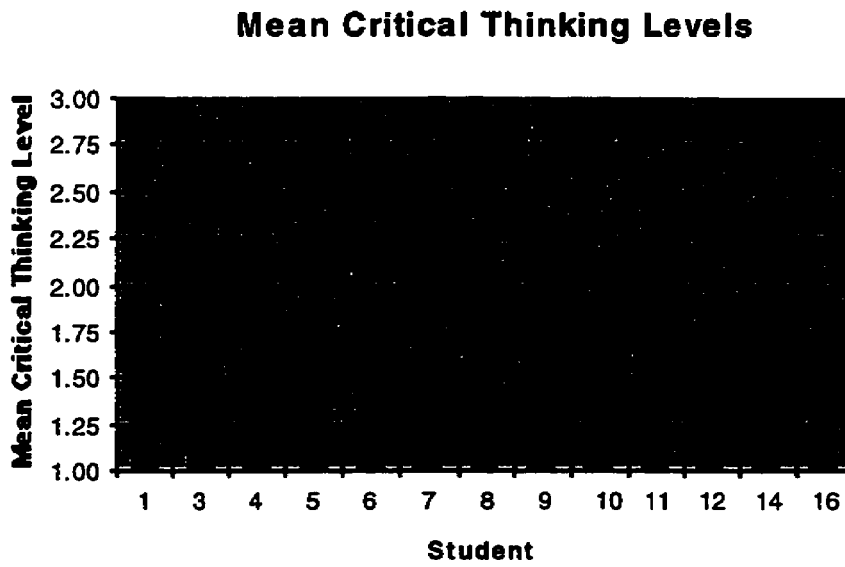

Figure 7: Mean student critical thinking levels for the course.

Critical thinking levels also varied considerably from conference to conference and there does not appear to have been any consistent trend over the duration of the course as figure 8 shows.

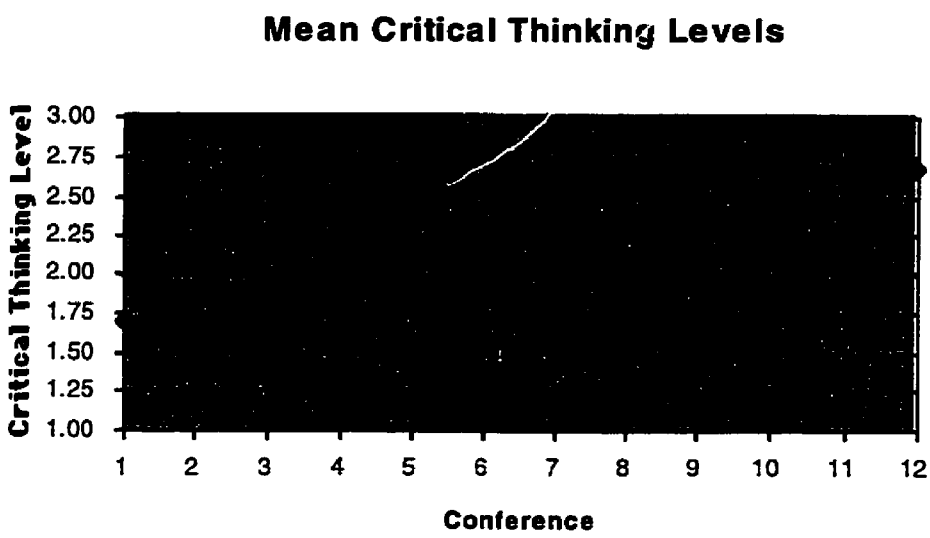

Figure 8: Mean critical thinking levels in each conference.

Critical thinking tended to be highest at the beginning and end of the course and lower in the middle weeks.

Participation, Critical Thinking and Student Characteristics

It was not possible to conduct statistical tests of association between student characteristics and participation levels because the sample size was too small and homogeneous with respect to age, gender, motivation and educational level. However, in categories where there were sufficient numbers, apparent relationships between participation levels, critical thinking levels and student characteristics were analyzed.

Motivation

Eight of the 13 students indicated that they took this course because they were interested in taking a course by computer and five indicated that this was not a factor. Comparing these two groups shows that the "computer-motivated" group contributed slightly more messages, had a slightly higher mean critical thinking level and was older.

Table 15
Participation, Critical Thinking, Age and Motivation

	Computer-motivated (n=5)	**Not computer-motivated** (n=8)
Mean number of messages posted	16.5	15.0
Mean critical thinking score	1.97	1.62
Mean age	27.75	21.4

Gender

Comparing males and females also reveals some differences. The three women in the course had a higher mean critical thinking score and contributed substantially more messages than the 10 males.

Table 16
Participation, Critical Thinking, Age and Gender

	Female (n=3)	**Male** (n=10)
Mean number of messages posted	21.33	14.30
Mean critical thinking score	2.13	1.75
Mean age	26.00	25.10

Educational Level

A comparison based on educational level does not reveal any major differences. The six students who indicated that their highest level of completed education was high school contributed slightly fewer messages and had a slightly higher mean critical thinking score than the six students who indicated that their highest level of completed education was college or technical institute.

Table 17
Participation, Critical Thinking, Age and Educational Level

	High School (n=6)	**College or Technical Institute** (n=10)
Mean number of messages posted	14.17	15.67
Mean critical thinking score	1.97	1.72
Mean age	21.17	24.33

Age

Participation and age seem to be positively correlated. As table 18 shows, the average age of the students in the low participation group (0-9 messages) was 21, compared to an average age of 23.2 for the medium participation group (10-19 messages) and 32.25 for the high participation group (20-30 messages). (See appendix 2 for a scatterplot depicting this moderate relationship).

Table 18
Participation and Age

	Mean Age
Low participation (n=4)	21
Medium participation (n=5)	23.2
High participation (n=4)	32.25

Age and critical thinking, however, do not appear to related. (A scatterplot is contained in appendix 2).

Participation and Critical Thinking

There appears to be no relationship between participation level and critical thinking level. Students who contributed a greater number of messages did not necessarily receive higher critical thinking scores. (A scatterplot is contained in appendix 2).

Summary

This chapter presented the descriptive analysis of the findings related to the context of the study and the quantitative and qualitative measures of student participation. In addition, it presented an analysis of the relationship between participation, critical thinking, age, gender, motivation, educational level.

The students enrolled in this third-year university-level course were mostly male, in their early to mid-twenties, studying fulltime, while working part-time. While they were experienced computer-users, only one had any previous experience with computer conferencing or online education, and

only two had any previous distance education experience. All of the students were taking the rest of their courses on campus.

The course was organized around a series of discussions of ethical issues. The instructor used varying degrees of direction and structure to encourage discussion, collaboration, and self-direction and he modified his approach several times in response to the students.

On average, the 13 completing students posted 15.92 messages during the 14 weeks of the course for a weekly average of just over one (1.14) message per student. Compared to the findings of other research this is a low-to-moderate participation level. Studies by Harasim (1993), for example, found student participation levels ranging from an average of 5 messages per student per week to a high of 10, in 12 different undergraduate and graduate courses.

Most of the messages were independent, making no reference to previous student messages. All students did show evidence of the use of critical thinking in their discussion of the issues, but in general this was also moderate. The mean critical thinking score was 1.83 with most students scoring between one and two on a scale that ranged from a low of one to a high of three..

The small sample and homogeneity of the students precluded the use of statistical tests of association between student characteristics and participation levels but possible relationships were observed between gender, reasons for taking the course, educational level, age, and participation. The three women in the course contributed more messages and had a higher average critical thinking score than the 10 men. The students who indicated that one of the reasons they took the course was because it was offered online contributed more messages and had a higher mean critical thinking score than those who did not indicate that was a reason. The students with some previous

postsecondary education contributed more messages than those with high school education, and older students contributed more messages than younger students.

In the next chapter, the perceptions of the students and the instructor about the factors that affected participation are presented.

CHAPTER 5 - FINDINGS: STUDENT AND INSTRUCTOR PERCEPTIONS OF PARTICIPATION

In this chapter the findings of the interviews conducted with the students and the instructor related to their perceptions of the factors that affected participation are presented. The results show that, at a general level, the factors identified by the students and the instructor fall into the categories of the conceptual framework: student characteristics, attributes of computer conferencing, and course design and facilitation.

Student Perceptions of Factors Affecting Participation

The Attributes of Computer Conferencing

The factors most frequently and consistently identified by students as either facilitating or inhibiting their participation in the computer conference discussions were those related to the attributes of computer conferencing technology.

Time-independence

Time-independence, in particular, was mentioned by all students as having either, or both, positive and negative impacts on their participation. Time-independence is related to the asynchronous nature of computer conferencing which allows students to participate any time they have access to a computer. In the literature, the time-independent nature of computer conferencing is often cited as a positive feature because it enhances student control over the time of interaction thus facilitating self-directed learning (Harasim, 1990). Ten of the 13 students in this course cited time-independence as a positive feature that enhanced their participation, but 9 of 13 conceded

that their inability to manage their time effectively was exacerbated by the time-independent nature of the learning environment resulting in procrastination and missed deadlines. Seven of the 13 students interviewed perceived time-independence to be both a positive and a negative feature. The double-edged nature of time-independence is aptly described by student #6 who makes the distinction between what he called "real" courses and this online course:

> *I think the most, the worst thing about the course was because it was online it doesn't seem like a real course. It was like I have four courses plus this online course which isn't a real course anyway and because I spend a lot more time with my real courses than I felt I should have I didn't put aside the time that might be suggested . . . but it was also helpful that it was something you could do at three in the morning if you wanted to, so you weren't really restricted by the fact that you were hungry or thirsty or tired or whatever, you could do what you want when you want which was both a help and a hindrance I think.* (6:1:1)

This theme is echoed by two of the students who dropped out of the course. Both indicated that they found it difficult to reconcile the time-independence of online learning with the traditional classroom-based style of education they were accustomed to. As student #15 put it:

> *There wasn't somebody looking over my shoulder. I didn't have to face an instructor two or three times a week to make sure that I had my work done so it was a lot easier to push it aside in favor of other things . . . and by the time the deadlines came around for this course it was too late for me to get to work.* (15:1:1)

Time-independence, then, provided a measure of flexibility to the students which, for some, was seen as a benefit because it allowed them to

participate according to their own schedule. For other students, however, it was perceived as a mixed blessing because they found it difficult to maintain the self-discipline necessary for this type of self-directed, independent study.

While the flexibility afforded by the time-independent nature of computer conferencing may have facilitated the participation of some students, another dimension of time-independence was perceived to have had a more profound impact on the nature of their participation. Six students said that freedom from time restraints allowed them time to reflect and to compose more thoughtful contributions. Four students also cited the democratizing effect of time-independence which, they said, prevented discussions from being dominated by a few articulate or verbose speakers, something they experienced in their face-to-face classes. Student #8:

> *If you can actually have a time to contemplate the issue you can come up with a better response and give, really have a better conversation with somebody even if it's electronically, because you've both thought about the issues and you have time to cool off and think about your response before you respond and in that way I think the issues get talked about more thoroughly and more intelligently which was very refreshing for me because it's hard when you go into a classroom and you get the typical loud mouth who dominates the classroom and no issues really get discussed except for that person's opinions.* (8:4:1)

Student #5:

> *I was taking an English literature course the same semester and I basically didn't say two words during that whole semester. I was just sitting there and everybody else, like all this stuff was flying around the room when I'm just like sitting there and then I'd think about what they were saying and think "yeah, yeah" or "no" then by the time I'm formulating a thought, like a clear thing to add, it's gone.* (5:6:1)

This was not a perception shared by all the students, however. Several expressed the opposite view, that the inherent delays in asynchronous communication militate against the development of a dynamic and interactive online discussion. Student #6:

> *When I do that sort of thing, that discussion, argument aspect I prefer talking to the person. It's a lot harder to sort of form the ideas when you have to wait a day and a half for the person to respond to your last idea, but if you're right there and it's right back and forth, I at least find it easier to get the thinking going, the thinking process to get rolling.* (6:7:2)

A related theme that emerged from the interviews was the sense that this form of communication was not real, that it did not adequately simulate a face-to-face discussion. Seven of the students said they had a feeling of remoteness, detachment or isolation and this discouraged them from participating. Some attributed this to the asynchronous nature of the communication and the delayed responses. Student #15:

> *When you're sitting there alone in your little office in front of your computer, it feels like you're all alone and you can type anything you want and nobody is going to say anything because it feels like you're completely alone, plus I think the pace at which discussions progress, well the fact that you're not facing anybody, you don't have to take immediate responsibility for what you said.* (15:9:1)

> *In a sense. . . it's kind of like a situation where you're required to submit a sealed bid in an auction or something. You know, you do your best, give it the best that you think you can but you don't really know what the response is until much later.* (15:9:2)

For student #11 the detachment and asynchronicity made it difficult for him to synthesize the messages and organize the ideas expressed into a coherent whole. For this student, there was no discussion or conversation but just a series of messages that seemed unconnected.

> *You just sent messages to the system and then someone else would read it off the system and it was just all different times.*(11:12:2)

> *And sometimes there was just so many already by the time I would get there, like 20 or 30 and you would read some of them and then think about it, you would read [the instructor's] question, think about it, you know, you would answer, but you wouldn't get everybody's, there wasn't . . . it was sort of separate. It wasn't all blended in like a classroom. You couldn't raise your hand and say something and everybody would hear it and then it was just sort of like if you wanted to you can read it and hear it, if you didn't, you would miss it and you wouldn't get that feedback.* (11:13:1)

For student #9 the feeling of isolation and detachment had both a facilitating and an inhibiting effect on his participation. He found detachment made him feel less inhibited about stating his opinions and that as a result his ideas seemed to flow quite easily:

> *There is a certain remoteness that you have. I guess there is this machine which is sort of in between you and the other person. You're not sitting next to them or you're not going to see their immediate reaction or whatever and so I think for me it sort of led to a greater degree of candour than is normal.* (9:1:1)

But the detachment also tended to work against an extended discussion because he felt no pressure to go beyond making initial responses:

I guess because there still is that bit of isolation that is going on there and I think it's easier online to keep that there, that isolation there. It's easier online as far as I know. I'm doing my thing, I'm contributing and I'm throwing it out there. If they don't pick it up, well. . . .

Interviewer:

So it's easier to contribute but there's less pressure to actually respond, to go on, to carry it on further.

Student #9:

Yeah, whereas a classroom you're right there and you're in the other person's face. (9:4:1)

Student #8 expressed a similar sentiment, but she perceived it more positively. In her view the lack of pressure to contribute that is sometimes felt in a classroom situation made the online course feel less threatening and thus encouraged her to log on more frequently. While it is not clear whether this had any impact on the number of contributions she made to the discussions, it can be argued that the chances are greater that students will contribute if they feel motivated to log on frequently than if they don't.

If I went on to my online course I could just read what somebody else had done or something that's there. I didn't have to actually, there's nothing demanding on me every time I went there whereas sometimes you'll go into some people's classrooms and maybe they do specifically pick on students and say "you I want your answer" whereas in here that's not going to happen so I was safe to go on there without any demand, so it was kind of nice that way. (8:12:1)

Not all students had a problem with the time-independence. Five students said they found the detachment and sense of anonymity comforting. They felt

it allowed them to say things that would not have said in a face-to-face situation and one student found seeking help from the instructor less stressful than doing so on the phone or in person. Student #8:

> *I'm just not comfortable calling a stranger and saying help me I'm having difficulty whereas this is sort of more anonymous even though it's not anonymous . . . I'll get nervous, I'll get butterflies in my stomach . . . whereas if I could just send a note to my instructor and say help I don't understand this or can I get a little bit of clarification here..that made it a little easier.* (8:13:1)

Whether or not students found the time-independence facilitated or hindered their participation, all expressed a desire for some form of real-time communication whether face-to-face or by computer, audio, or video conferencing. The reasons given for this varied. Some preferred real-time communication. Others said they needed the structure of regular meetings to force them to devote time to the course. For those who were generally comfortable with the asynchronous environment, the real-time component was seen as a way of getting more immediate feedback from the instructor and for compensating for some deficiencies of the text-based environment. They felt that if they could see and/or hear their fellow students they might get to know them a little better and that this would improve the subsequent asynchronous discussions. Student #8:

> *In a classroom you get to know your fellow students and so it's easier to talk to them and it's easier to discuss the issues. It's kind of hard to discuss the issues when you don't know what these other people are like, what they're thinking . . . . If you had something like an online chat where you start to see some of the personalities come through then maybe that would help the socializing because with just e-mail*

it's kind of difficult to find out what the other people are like. What can I say that's acceptable? (8:7:2)

Text-based Communication

The text-based attribute of computer conferencing was another commonly-mentioned factor that was perceived to have had an impact on student participation. Students were almost evenly divided over whether the attribute had positive or negative impacts. Three students cited positive impacts, five cited negative impacts, and two cited both positive and negative impacts. In some cases the perceived impact of the text-based attribute was similar to, or the same as, some of the impacts of the time-independence attribute: it created a sense of detachment, and a feeling of anonymity but in this case it was brought about by the lack of visual and auditory cues and the reliance on textual communication. For some students, the lack of facial expressions and voice intonation made computer conferencing a less human form of communication. For these students there was no "virtual community". The online activity was not an interactive discussion but just a series of messages posted to an electronic bulletin board. They felt no connection with their fellow students and thus felt no compulsion to go beyond the minimum participation required. Student #15:

I feel like if I had been able to get face to face with all these people then I would have contributed more to the discussions because I pay a lot of attention to body language and you know there are a lot of things, emotional content that you can't really convey too well in text and I probably would have enjoyed the course more if there had been more face to face contact. (15:4:1)

Student #6:

I think that probably would have been better to be done in a classroom where you can look at people and speak to people and yell and scream across the room. The discussions online seemed a lot more detached. They didn't have as much impact as speaking to somebody and discussing it with them or discussing it with the class. The few classes that I've had where it has erupted in discussion and argument has been more enjoyable. You get the whole human aspect. (6:7:1)

Again, the textual environment was not always viewed negatively. For some students it had a liberating effect allowing them to compose their contributions, reread them, and possibly revise them, before posting.

Student #14:

It's a lot easier to formulate a thought. . . . It's easier to put it into words and rewrite it. (14:5:1)

I personally find it easier to structure something coherently when it's cast in something solid than it is to verbalize in which discussions are mutated between what other people say and what's interpreted from both ends and so on and so forth. (14:5:2)

Student #4:

I find it a little bit easier talking like that or just writing stuff, messages than talking face to face especially like in front of a large group of people. I guess it's different for everybody but I find it easier. (4:1:1)

Computer-mediated Communication

The computer-mediated attribute has been identified as the most significant attribute of computer conferencing because it distinguishes this form of communication from others (Harasim, 1991). Computer-mediated

communication gives learners much more control over their learning than is offered by other forms of communication. Learners are not restricted to being passive recipients of information but can send, receive, process and manage information. As with the other attributes, however, there are both positive and negative impacts and students in this course experienced both.

A manifestation of this attribute mentioned by five of the students was the random access to a permanent record of conference discussions. For some this feature was viewed positively as enhancing their participation by allowing them to read selectively and reread and review when necessary. Student #6, for instance, found this to be "more orderly, easier to follow the way things were going" than in a classroom (6:3:1). Student #1 found this attribute eased him into the course because he "could get the gist of that class without doing every page of reading" (1:4:1). However the extent to which this translated into active participation is questionable since he goes on to say, "you could get the idea of what's going on even if you didn't participate in the discussions but read other people's discussions"(1:4:2). For some, then, it is possible that, while having random access to the record of discussions may facilitate their initial participation, it may also serve to discourage more active participation because they are able access all the information they feel they need by reading other contributions.

Negative manifestations of the permanent record were also experienced by some students. An example cited by six students was the issue of information overload. Certainly the permanent record was available, but as the course progressed the record got longer and longer and the ability to deal with it became more of a problem for these students, particularly those who did not have the self-discipline to log on on a regular basis. Student #11:

Yeah, especially when you start getting behind. It just, you know, builds upon itself. It's just like a lot of messages . . . to read at one time. It gets sort of boring after a while . . . some of the messages that come on to the system aren't really relevant to the topic, sort of like it's like small talk that you have in classrooms, you know, you just sort of hear it, but like in this case you've got to read every single one and it takes time...and it's just like wow, you know, and there's like a couple folders of those and it just gets like, overwhelming sometimes. (11:7:1)

The public nature of the permanent record also had an inhibiting effect on the participation of a few students. These students found it disconcerting to look back at some comments they made early in the course or in the heat of the moment. As student #14 stated, "It's sort of daunting . . . you can say something and then you learn a little bit more and you realize, I stated this when I was still little bit ignorant" (14:5:3). Or as student #8 put it, "I go back and look at this and think, god did I say that? I was so embarrassed and of course it's proof so you can't say, I didn't say that" (8:3:1).

Software and interface design features were also aspects of the computer-mediated nature of computer conferencing that were mentioned by students as having an impact on their participation. The computer conferencing software used in this course (First Class) required students to participate "on-line"; there was no "off-line" capability. This meant that all participation had to occur while the students were connected to the host computer and, because nearly all students were connecting from home, it meant a phone line was in use during this process. For student #14, knowing he was tying up the only phone line in his house forced him to log on and log off as quickly as possible thus negating some of the benefits of time independence such as having time to reflect and to compose and edit contributions:

Normally I would plan, I would say OK I'm going to do the online now and then I would respond when I was online just because I was . . . the problem with that is that if I was able to download it offline then yeah that would have quite possibly been a benefit if you can think of something in your sleep and go oh yeah this applies to this, write it in the morning I guess, referring back to it . . . but no because I did everything online. I would see it online, I would respond while I was still online because going offline cuts you off. (14:12:1)

It was possible to save files to a disk, but this was a cumbersome process that had to be done one message at a time. Furthermore, all formatting was lost in the process and the feature that indicated if a message had been read was not available when files were saved. This made it difficult if students read some messages online and then saved them to a disk and opened them later because it was not clear what had been read and what had not.

Many-to-Many Communication

The many-to-many nature of communication in computer conferencing makes it ideal for collaborative learning because everybody automatically has access to everybody else's contributions. In its ideal form, computer conferencing results in the development of a "virtual community" of learners who, through their online interactions, collaboratively generate knowledge. Whether or not this was achieved in this course is discussed in chapter 6, but the findings of the interviews with students do indicate some students began to appreciate the potential of this learning environment. The access to other students' ideas and opinions, the fact that everybody had equal access to the "floor" and the importance of feedback and interaction were cited by students as positive impacts. Student #8 found there was a far greater exchange of ideas in this course than she experienced in either

correspondence-style distance education courses or in classroom-based courses:

> *In correspondence courses you don't have anybody else to find out how they're doing or what their thoughts are or anything so it was really nice to have the other people's responses and compared to classrooms that was way better because you don't get those other people's opinions when you're in a classroom sometimes. You might get one person's or two person's opinions and they're usually the same people every time.* (8:13:2)

While the ability to engage in many-to-many communication was viewed positively by students and may have affected the quality of student participation, it is not clear if it had any facilitating or inhibiting effects. Students did not indicate they participated more because of this aspect or that they found it easier or felt more motivated to participate. Rather, it was seen as having a positive impact on the type and quality of participation.

Course Design and Facilitation

Student perceptions of the impact of factors related to course design and facilitation on participation fall into three broad categories: pedagogical design, interface design, and instructor participation.

Pedagogical Design

As discussed earlier, participation in the online discussions was mandatory in this course with 15% of the final mark going towards that aspect. The thinking behind this strategy is that if participation is voluntary, with no marks attached, then students will not feel compelled to take part. Eight students said they felt the mandatory participation had an impact on

their participation. For six of them the impact was negative. Two thought it had both positive and negative impacts. For student #8, it seems to have been a motivator. A maximum of three marks were awarded for each discussion, and when student #8 only received two marks for the first discussion she was shocked:

> *I guess I hadn't added anything extra and I only got two out of three instead three out of three. Well I was mortified. "What do you mean I only got two out of three!" Because I answered all the questions but I didn't do anything extra, I didn't suggest something or just say something on my own or, you know, that little bit of extra so that made me work harder because that was done right at the beginning then I really wanted to do well on the course so I did that extra work there.* (8:1:2)

But, while requiring students to participate may increase participation, it seems it can have some unintended side effects. Student #8 felt there were times when it did not really elicit meaningful participation.

> *There are some days where you just don't feel like it. Or there's some issues that you are just not interested in and I found that with a couple of things. There was one question that the instructor put on there that I just shook my head and said, "I can't answer that, I have no idea and I have no interest" so I just really hated it . . . . So if they had a group of five do this issue or this question and then you can concentrate on smaller groups and smaller responses because I don't think you can have a really good conversation with thirty people, twenty people.* (8:8:1)

For student #1, the marks associated with mandatory participation did not necessarily result in more participation. Instead the marks became part of an

ongoing type of cost-benefit analysis that he/she engaged in to determine how to apportion his/her time. Student #1:

> *It seemed that if I had something else to do, another class, I thought "it's only one participation mark we're missing this afternoon", if I had something else to do that was important, I tended to [do it instead]. Like the last two or three weeks of school you just had huge essays and everything.*(1:1:1)

> *I thought well I'd rather . . . lose three marks than lose 20 percent and have another class suffer when three marks in nothing.* (1:1:2)

Other students responded to the marks for participation, but not necessarily with enthusiasm. There was a sense that often what they had to say was not particularly original or insightful but they wanted to get the marks. They felt they were often simply restating what had already been said by other students. Student #14:

> *When you have a class of whatever, 15 people or so, contributing, basically you run out of things to say because it gets to a point everyone is in agreement . . . . I understand the need for everyone to participate. It might have been better to . . . say okay, we expect these people to participate in this discussion, maybe make the discussions more frequent, these people in this one, instead of forcing people to write when they really didn't have anything to say which is what I think happened.* (14:8:1)

Four students mentioned the importance of including some kinds of social activities that allowed students to get to know each other before they began the discussions. This was partly behind the almost unanimous desire for some form of real-time communication discussed earlier. Students felt they needed this form of communication in order to develop a social bond

and that some sort of social cohesion was a prerequisite to meaningful discussions of the course content. The only activity that was not content-related was the folder entitled "Coffee Break" which was set aside for informal messages unrelated to the main discussions. Student #16 singled out this feature because he said it "broke down some of the barriers . . . so instead of just being a rigid course it was a class where you had people just shouting jokes out which lowered the formality level a bit" (16:1:1). But this was the only social activity and it was completely unstructured. Student #8 felt some more structured activities designed to let students get to know each other would have facilitated subsequent participation in the content-related discussions:

> *I didn't know anybody in there. I knew who some of the people were and throughout the term I got to know who the other people were either by association or just by whatever, but I felt like I didn't know anybody and that was a little uncomfortable because I like to know people so . . . it would have made you feel more like I knew them.* (8:7:1)

Another crucial aspect of the pedagogical design of the course was the pacing. In campus-based education, regular classes serve a pacing function that helps to keep students focused and on task. Distance education completion rates increase significantly if substitute forms of pacing are used (DeGoede & Hoksbergen, 1978). In this course, pacing was achieved mainly by having regular online discussions with clear beginning and ending dates and specific deadlines by which students were required to contribute.

Student perceptions of how the pacing was handled in the course seem to indicate that it was only partially successful and that it may have had some unintended impacts on participation. Six students cited the deadlines as a

factor that had a negative impact on their participation. Five of them felt the discussion was stunted by the combination of the deadlines and the limited time frames for the discussions because they found they, or other students, waited until the deadline to contribute which then left no time for follow up comments or responses. Student #8:

> *It would have been nice to have if by Friday everybody has to have their responses in, OK by next Friday everybody has to have their responses to the responses in because that way you would have a chance to respond to the late people because sometimes late people had very good ideas that would have been good to make the discussion go further. That was the hardest thing I found . . . the discussions were good but they were very short. You didn't have time to do an ongoing conversation ... you didn't have time to really get into the issue.* (8:4:2)

Student #11 had a different perspective on the pacing issue. He felt the deadlines did not have the same psychological impact in this course as they did in his face-to-face courses because of the absence of any ongoing contact with the class.

> *You didn't really feel the pressure, I don't know . . . compared to the classroom you're there, the teacher's saying it to you and you're getting handouts, you're talking to your friends and all that, you've got to get this done. You know, say in classroom it's due in two weeks, you're there in class, and they're always reminding you. It's just slightly different. In this case he gives you an assignment in the folder and you go there and you read it and that's about it really,* (11:4:1)

Interface Design and Course Organization

Interface design refers to how the various elements were organized on screen and how these elements were used. In this case, the course was

organized into a series of folders. Each discussion topic had a separate folder and every message related to that topic would appear in that folder. When a folder was opened, a list of the messages related to that topic would appear. These could be sorted according to date, sender, or sub-topic. Unread messages were highlighted with a red flag. Closely related to interface design is the organization of the course and, more particularly, how the discussions were organized. This has been described in detail earlier.

Only one student complained about the interface, three made positive comments about it and the rest did not mention it. What was particularly troublesome for the student who complained was the rather inert or passive nature of the interface. Although folders with unread messages were highlighted with red flags, it was not obvious to this student what folders were current. For students who read all messages, this would be clear because it would be the folder(s) with the red flag(s), but the interviews revealed that some students did not read all messages, so these students might end up with several folders with red flags and only one of them might be current.

The way the discussions were organized presented a further complicating factor for some students because there were usually two concurrent discussions and some discussions overlapped so at any time there might be several ongoing discussions. In addition, comments from the instructor were treated the same as student comments in that they appeared in the topic-related folder, which some students found difficult. Student #14:

> *I found it difficult to stay focused. In going through, I found multi-groups distracting, especially when there were new posts. It would have been nice if there was something specific that was seen every time you logged in from [the instructor] as opposed to it being separated into groups. Like on one occasion . . . he put something in the "Check In"*

and I thought okay we're finished with the "Check In" group, someone's just posting something there and I sort of ignored it, marked it as unread and then I called him and talked to him about something and he said it was in there and I had to go back to find it . . . so when it starts getting scattered like that I found it really difficult. (14:4:2)

It would be really nice to have some sense of order as far as what is discussion separated from what is lectures separated from what's the conclusion. I think the discussions should have been on their own. I think everything that was relevant to the weeks should have been more obvious. It shouldn't have been buried as they would be if [the instructor] posts something, if someone posts something to the group then [the instructor] posts something in the middle of it and it gets buried with a lot more things. (14:4:3)

Instructor Participation

As discussed in chapter 2, the literature indicates that the instructor plays a key role in computer conferencing but has to tread a fine line between too much and too little participation. Insufficient participation from the instructor may leave the students feeling uncomfortable and unsure of how proceed in this new environment, and too much instructor participation may intimidate some students and prevent the development of an interactive discussion.

Five students felt that more instructor involvement in the discussions might have stimulated further student involvement and helped generate deeper discussions. Two students were generally satisfied with the amount of instructor participation and did not feel that increased involvement was necessary.

Student #3:

He didn't get in on the discussion like as far as his own opinions at all but I guess that's fine I wasn't really expecting. I guess it would be fine either way but I thought he was good. You knew he was on there every other day because there was always responses uploaded by him and a lot of them were things just like "good comment" or whatever, you knew he was there.

Interviewer:

Do you think it would have made any difference to how the discussions were unfolding if he were guiding it more, not putting his own opinion in as much as getting in there and maybe encouraging people to contribute a bit more.

Student #3

Yeah, I guess just to encourage a little more contribution may have been good. I don't know how you'd do that. I mean I'm just trying to compare it to a classroom setting, like he should just be saying, "okay what do you think", that sort of thing. (3:6:1)

Student #8 thought that when the instructor did respond directly to student comments and provide direction it at least resulted in more participation from that particular student. She found it also helped her understand the issue better. Student #12 thought increased instructor participation may have helped, but felt that the onus was on the students to contribute more. Student #13 felt one of the reasons he dropped out was because of the general lack of instructor direction:

In most of my studies I've relied mostly on what the teacher has said in class and less on what I've read so it was like no teacher's influence

and all reading and I dropped behind quite quickly because of that. (13:2:1)

Student #16 expressed similar sentiments and contemplated dropping out but decided not to.

Student Characteristics

Students mentioned a number of situational and dispositional characteristics that they felt had an impact on their participation. The situational characteristics mentioned included factors related to the study environment, and the time available for study. Dispositional characteristics included factors related to students' personality, learning style preferences, and time management.

Situational Characteristics

The student's study environment is a crucial factor in the success of distance education students because it plays a much larger role in the learning of the distance education student than it does for students attending campus-based classes. In this course, most of the students were participating from their homes. However all were also attending other classes on-campus, so the home study environment may have been less important than it would be for fulltime distance education students. Nonetheless, many students cited their home study environment as one of the factors that affected their participation.

Most students said their home study environment did not cause any problems and had no impact on their participation. They had ready access to a computer, modem and phone line and sufficient privacy and quiet to participate and study effectively. Several students, however, indicated they

did encounter problems with their home study environment, either with the quality of their desk and study space, their access to the necessary computer equipment, or the availability of privacy and quiet. The most extreme example was the situation faced by student #13:

> *One of the situations is here with the computer right there and the TV in the same room. For the first half of the semester my sister would be home watching "soaps" during the day and my brother would be home at night or my dad would be home at night watching TV. It was very difficult to do my studying on the computer. The other one is that it's a 286 and it was a little slow.* (13:1:1)

Not surprisingly, this student dropped out of the course, but other students who faced similar barriers, persevered but felt their participation was diminished. Student #1 did not have a modem so he was forced to make a 30 minute drive to use one of the college computers. Student #6 complained of a lack of desk space which meant he could not refer to the readings at the same time as he was using his computer. Student #16 was renting a room in a family home with three children and found the noise distracting.

Two students felt that home study itself had a negative impact on their participation. Regardless of the suitability of their home study environment and their access to computer equipment, these students found home study offered potential distractions that often sometimes resulted in procrastination. Student #14:

> *It made it easier to be lazy is what it did because I typically study at home unless I have projects in which case I'll work on them at the college. When you're at home and you've got food, all sorts of fun distractions and everything else, it delays it.* (14:6:1)

Another factor that was mentioned related to the nondistance nature of most of the students in this course. Student #16 indicated that he often met face-to-face with some of the other students in the class and they sometimes discussed some of questions that were meant to be discussed online. Later, the results of these discussions would end up in the online discussion. For this student, this was a positive impact because he felt he had to establish some connection with his fellow students before he could participate effectively.

Time available for study and participation was also an issue for most students. Nearly all the students were studying fulltime and working part-time, some were even studying and working fulltime, and some had other extra-curricular activities that competed with the time available for studies. One student was preparing for competition in the 1996 Summer Olympics while studying fulltime.

Dispositional Characteristics

Learning style preferences and personality may help to explain why some students feel comfortable in this online environment almost immediately while others struggle with it and in some cases never accept it. Three students indicated a clear preference for face-to-face classes and all but one felt that their participation would have been enhanced if there had been some type of real-time discussion. They had difficulty with the asynchronous nature of the communication and the lack of visual and verbal cues. Student #16 made his preference clear:

> *I definitely learned a lot about ethics in that course but I know I could have learned more in a classroom. I would have paid more attention in a classroom. I would have been in class more often in a classroom. I would have talked to the teacher. We would have had a better*

discussion in the classroom. You would have got a lot more work done in the classroom. (16:14:1)

Since this was the first experience with an online course for most of these students, it is difficult to say to what extent this lack of comfort with the medium is due to a lack of familiarity that might diminish with more experience and to what extent it is related to deeply ingrained learning styles or personality traits that may be difficult to change.

On the other hand, three students who described themselves as shy or introverted and said they had difficulty participating in campus-based classes, found the online environment liberating because it allowed them time to contribute, free from the competition of more verbally adept students. Interestingly, student #15 who admitted to being introverted found the online environment incompatible:

Extroverts have to talk a lot in order to know what they actually want to say, introverts have to know what to say before they can open up their mouths and talk which I'm an introvert and I recognize that I have to know what to say before I can talk so the problem with having to participate every day was that I think I didn't have enough time to prepare myself, to prepare what I wanted to say. (15:5:1)

Another learning style-related issue that emerged was a preference or need for more teacher direction. The learning environment of this course presented a challenge for these students because its online nature meant it was essentially an independent study course that lacked strong teacher direction and that, therefore, required self-discipline and effective time management. Four students specifically cited the need for more teacher direction as a factor that had a negative impact on their participation and 11 students felt they were not prepared for the self-discipline that was required

by the course. Student #15 dropped out of the course and attributed that decision largely to the fact that he felt he was not ready to handle the self-discipline required to participate in a course that was much less teacher-directed than most college course he had been exposed to. Student #13 also attributed his decision to drop out partly to his inability to deal with independent study.

Time management was a major issue for several students that appears to have been compounded by the time-independent nature of the course and the fact that it was largely an independent study course. These students seemed to need the pacing and focus that is offered by campus-based courses that have regular classes several times a week. As discussed earlier, these students were unable to set aside a regular time to work on this course even though regular deadlines were provided. These students ended up procrastinating and making last minute contributions to the discussions or falling behind, and in some cases, dropping out.

Table 19 presents a summary of the student perceptions of factors affecting their participation.

Table 19
Factors Identified by Students as Affecting their Participation

Factor	Positive Impact	Negative Impact
1. Attributes of Computer Conferencing		
a) Time-independence	Flexibility: students can participate according to own schedule Time for reflection Equal access/no domination Lowers inhibitions	Flexibility results in procrastination Detachment, isolation inhibits discussion Less engaging than real-time discussion
b) Text-based	Ability to compose, rewrite	Lack of visual, auditory cues results in detachment
c) Computer-mediation	Access to permanent record facilitates access to course	Permanent record results in information overload Public nature of record is inhibiting
d) Many-to-many communication	Facilitates discussion	
2. Pedagogical Design		
a) Mandatory participation	Forces students to focus	Results in superficial participation for marks only
b) Pacing		Inhibits development of sustained discussion because students wait until deadline to contribute
c) No "social" activities		Dissuades some students from participating because they don't "know" fellow students
d) Instructor participation		Limited discussions: some students felt more instructor participation would have improved the discussions and encourage more student participation
3. Interface Design		
a) Passive		Unclear what is current

Factor	Positive Impact	Negative Impact
4. Situational Characteristics of Students		
a) Home study environment	Good study environment allows them to take advantage of time-independence	Potential distractions Lack necessary computer equipment Sharing phone line
b) Part-time work		Interferes with time available
c) Ability to meet face to face with other students	Facilitates participation in discussions	
5. Dispositional Characteristics of Students		
a) Learning style		Preference for face to face inhibits participation online Need for teacher-direction leads to lack of comfort with self-directed environment
b) Personality	Introverted or shy students feel more comfortable participating in less threatening environment	Introverted or shy students prefer comfort of familiar face-to-face environment
c) Time management skills		Inability to manage time effectively results in lowered participation

Student Perceptions of Factors Affecting Critical Thinking

In this study critical thinking is conceptualized as a qualitative dimension of participation. Student perceptions of the factors that affected their ability to think critically are closely related to their perceptions of the factors that affected their participation in general. The factors identified relate to the attributes of computer conferencing, the design and facilitation of the course and student characteristics. Before discussing student perceptions of these factors, however, students' understandings of the meaning of critical thinking will be examined.

Students' Understandings of Critical Thinking

Analysis of the responses to the question of how they understood the meaning of critical thinking indicates that, in general, the students had an incomplete understanding of the concept that did not conform to the definition used in this study and by the instructor. Four of the 13 students mentioned skills in all three of the four categories: seeking clarification, using and assessing evidence, and making and judging inferences. Seven students mentioned only one or more skills in the category of seeking clarification; and two students mentioned skills in two of the four major categories: seeking clarification and using or assessing evidence. None of the students mentioned skills in the category of using appropriate strategies and tactics. Although most students identified the importance of evidence and conclusions in the critical thinking process, their explanations were restricted to the use of evidence to support conclusions and did not include assessing evidence or judging inferences.

Students #4 and #11 had the most incomplete understandings of critical thinking:

Um, just that ,um, I guess, (laughter).,um, give your opinions on something, ah, both sides of the topic I guess, you know.

Interviewer:

How would it, how would thinking critically about an issue differ from not . . . from being uncritical, uncritical thinking?

Student #11:

Um,(laughter), I guess. . . to . . . just to give your opinions on the topic I guess.(laughter)

Interviewer:

Okay, so would you, would there be any difference between somebody who just gave opinions and somebody who gave opinions? I mean there are opinions and opinions and some of them can be supported and others not so well-supported. Is that a distinction you would make between critical and uncritical thought?

Student #11:

I think that, ah, um. I don't know actually. (11:11:1)

Student #4:

Forming your own opinions and (pause) compare them to other people's points of view .

Interviewer:

What would the difference be between thinking critically about something and noncritically?

How would you know?

Student #4:

I would say it's trying to decide whether something is right or wrong. It's not that it's better but you have to kind of think if it's the right way or the wrong way. (4:8:1)

Both these students' understandings of critical thinking appear to be limited to forming opinions. Neither seems able to articulate how the opinions are formed nor what kind of process might be involved in reaching a decision. Student #4's identification of "the right way or the wrong way" indicates that he may still be thinking dualistically and may not yet be

comfortable with the notion of the contextuality and subjectivity of knowledge which is central to reflective thinking (King & Kitchener, 1994).

Student #14 had one of the most complete understandings of critical thinking:

> *It's evaluating possibilities, formulating a conclusion, and supporting it with strong premises if you can. It's about focused thinking, it's about thinking logically and weighing the cons and pros of events which applies a lot to ethics which is what I felt the course was based on.* (14:10:1)

This student has identified several of the key components of critical thinking: making inferences that can be supported with evidence, focused and logical thinking, and the consideration or analysis of multiple perspectives. However, he did not identify the importance of assessing evidence and judging inferences.

Related to the students' understanding of critical thinking are their perceptions of the purpose of the online activity and what they were expected to do online. Again, most students had an incomplete understanding of this element of the course. Student responses were analyzed for an indication that they understood the basic quantitative requirements of online participation (regular logging on, minimum of three messages per week related to the current topic) but also an understanding that the purpose of the discussions was to facilitate their critical thinking about the issues. All students understood the quantitative requirements, but only two were able to articulate clearly the purpose of the discussions. Five seemed to have a partial understanding and four seemed to completely misunderstand the purpose.

Student #3 was one of the two students who demonstrated a clear understanding of the purpose of the discussions:

As far as the purpose of what we were doing online, I think it was, well one thing to facilitate discussion so we would think deeper about the issues because it was an ethics course about something you don't usually just read about and go OK, you have questions and concerns and arguments so I think that what it was for was to facilitate that type of discussion and then to get clarification on things too. (3:5:1)

Student #16 was one of the four students who appeared not to understand the purpose:

You answer the questions, read the responses, answer the question, hang up. That's what I did. That was the bare minimum you had to do basically. There was other stuff online but it wasn't really clear. I mean there was some neat stuff there. He said read this and read this stuff. I suppose most people did but I didn't. I didn't have time quote unquote, it wasn't a priority.

Interviewer:

What about answering the question. How did you understand what you were supposed to do there?

Student #16:

Oh that was easy, yeah you just answer the question and you just put a little, I asked Student #6 and he said you just put your little X under this one or this one and so okay, sure and then you give a justification for it, quick explanation and away you go. (16:11:1)

The Attributes of Computer Conferencing

The attributes mentioned by students as having an impact on their critical thinking were the time-independence, the many-to-many dimension, and the text-based nature of the communication.

Time-independence

As discussed earlier, time independence was perceived by some of the students as allowing them time to reflect on the issues under discussion and to contribute without the pressure that they often felt in classroom situations. But while these students identified this as a factor that facilitated their participation in a general, quantitative sense, four students cited this factor as having a more profound impact on their participation by facilitating their ability to think critically. Student #3:

> *Actually I think in a way it might have been a little bit better than in a class because you had a little more time. Like you could, in that respect you could read a message and just spend a little more time thinking about it. Like this course really did get me thinking. I would sleep on things sometimes when I would really be thinking about them when I went to bed and that sort of thing whereas in a course that's once a week in a classroom or whatever you know your discussion is done in that short period of time and you might not be able to think about things more and by the next week you may have forgotten about it or it just doesn't get picked up again so I think, yeah, I almost think it's better for critical thinking.* (3:8:1)

This view is echoed by student #8:

> *I think that something like this online course was conducive to critical thinking because it wasn't conducive to come out with a response right away. It wasn't, that wasn't the natural way to do things whereas if you were in a classroom the natural way to do things is if you're asked a question and give you give a response very quickly.* (8:15:1)

Student #8 felt the time-independence had another positive impact on her ability to think critically. It meant the class was always "open" because she could log on at anytime so she never really got the sense of leaving the class

as she did with campus-based classes. She says this meant there were times that she was always thinking about some of the discussion issues even when she engaged in other activities, something she did not experience with her campus-based classes. As she said, "You never leave it. It's always there" (8:1:1).

Two students had somewhat different perspectives on the impact of time-independence on their ability to think critically. Student #14 did not feel the time for reflection was helpful because, for him, thinking critically is something that is best done "live":

> *If anything a live course forces you to think on the moment and an online course you can delay. It allows you to formulate thoughts and so on, but I don't think it was that advantageous.* (14:11:1)

> *As far as stating something appropriate it was nice to have a longer time but as far as thinking critically I don't think having more time allowed you to think more critically.* (14:11:2)

For student #16, it was the independence of time-independence that was the key. He found studying on his own aided his critical thinking and, contrary to conventional wisdom, did not feel the interaction with others was that useful.

Four students felt that the asynchronous attribute had a negative impact on their ability to think critically. The underlying theme of their comments was that this attribute prevented the development of a coherent and ongoing discussion. For these students, the bulletin board metaphor rather than a conference or discussion metaphor was a more accurate description of the online activity. They were unable to perceive the individual messages as part

of a discussion and thus their ability to respond critically was hampered because, for them, there was no real discussion. Student #11:

It just sorta felt like a student would say something then someone else would say something, it was just.

Interviewer:

It was not related, you mean?

Student #11:

Yeah, some of them were related and some of them were almost the same thing. I don't know, I guess you just sorta answer before you had read everything sometime . . . so you couldn't really build on the topic or the idea of what the students said, I guess. You just sorta, everybody gave their own opinions and you know you would read I guess later on whatever and respond but you wouldn't really build on it.

The way it's set up you can't have interaction. You can just send messages. There wasn't, you know, you couldn't ah, ah, sorta like ah talk to someone. (11:12:1)

A related problem for these students was the delayed feedback and a sense of isolation. It seemed important for these students to have their ideas validated, either by the instructor or by other students. As discussed in chapter 4, this did not happen very often. While the instructor did try to provide encouragement and redirection, this was not done consistently and messages were rarely followed up by other students.

Many-to-Many Communication

The many-to-many attribute of computer conferencing allows for group discussion and collaboration to develop in an online environment. In this

course there were differing opinions as to how well this aspect developed and what impact it had on critical thinking. Two students attributed their ability to think critically in the class largely to the discussions, which they felt allowed them to consider multiple perspectives on the issues and to refine and revise their ideas based on feedback and from reading the contributions of other students and the instructor. Student #8:

> *A lot of times I just took sides and having their interaction I had to look at the other side as well which I don't do all the time and it opened up some things that I would never have thought of. Some people would come out with ideas or responses that were just totally the farthest thing away from my mind at the time when I read the article or the question and especially when you're dealing with something like ethics you really want to look at all the issues so it's really important to get everybody's opinion so that was very important to me. I mean that sure helped me think about things and we're talking about critical thinking.* (8:13:3)

But, as discussed earlier, four students did not perceive any positive impact from the discussions on their critical thinking ability. These students attributed this to the asynchronous nature of the communication, and the ability to engage relatively easily in group communication did not seem to mitigate this problem. These students felt the discussions did not amount to much more than a series of unconnected messages posted in response to the initial question from the instructor and provided little, if any, insight into the issues under discussion.

As discussed earlier, student #3, who felt she was able to think critically better than she would have in a classroom, attributed this to the time-independence and not to the discussion or interaction with other students:

There wasn't really a lot of back and forth dialogue so [when] I talked about when I was really thinking about stuff and trying to come to a conclusion it was mostly, almost 95% or more, in response to what the book said. It wasn't really in response to what other people said. So as far as discussion promoting critical thinking it didn't really. (3:9:1)

The text-based nature of communicating by computer conferencing was also mentioned by one student as aiding critical thinking. This attribute has also been identified as facilitating participation in a general sense, but this student also felt it forced him/her to focus more clearly on the topic and to refine and revise his/her ideas before posting thus aiding his/her critical thinking.

Design and Facilitation

Two design and facilitation issues emerged as factors affecting critical thinking: the mandatory participation and the feedback from the instructor.

Mandatory Participation

This aspect of the course design was discussed earlier as an issue related to the general participation of students. It also emerged as an issue related to critical thinking because two students felt that being required to participate either forced them to think more deeply about the issues so that they could make a meaningful contribution or the mandatory contributions from other students allowed them to consider other viewpoints they may not have been exposed to had participation been voluntary.

Instructor Participation

Earlier, instructor participation was discussed and several students indicated they were not satisfied with instructor involvement. Two students

identified the lack of instructor feedback as a factor affecting their ability to think critically. One student seems to have needed it for the validation of his/her ideas; for the other it was seen as a way of stimulating and directing the discussions which were perceived as being somewhat superficial.

Student Characteristics

The only student characteristic that was identified by students as affecting their critical thinking was the lack of interest in the subject matter. Student #11 seems to have had a difficult time with the open-ended nature of the content, expressing a clear desire for more technical courses such as database design.

> *Some of the topics were boring, especially, I guess, in this course, it's an Ethics course . . . some of the topics are a little more bland than other courses that you may be interested in, like I'm in CIS so I'm really in to the computer aspect of the courses, like programming and stuff like that, sort of like the ethics part of it . . . wasn't as appealing . . . .if I had a choice of taking an ethics course online or a database course online I would probably take the database course online instead of the ethics and take the ethics in class so some of the topics were hard for me to get into and actually focus on thinking about the topic.* (11:13:2)

Garland (1993) identifies this as an epistemological barrier, "a lack of congruence between the student's cognitive and affective characteristics and perceptions of knowledge, and the nature of the knowledge presented in the subject matter" (p. 192).

Table 20 presents a summary of student perceptions of the factors that affected their ability to think critically.

Table 20
Factors Identified by Students as Affecting their Critical Thinking

Factor	Positive Impact	Negative Impact
1. Attributes of Computer Conferencing		
a) Time-independence	Time for reflection, encourages critical thinking Class always "open", encourages critical thinking Independent study encourages critical thinking	Not a "real" discussion, inhibits critical thinking Isolation, delayed feedback, inhibits critical thinking
b) Text-based	Ability to compose, rewrite encourages critical thinking	
	Forces students to focus which encourages critical thinking	
d) Many-to-many communication	Facilitates discussion which promotes critical thinking	Not a "real" discussion which inhibits critical thinking
2. Pedagogical Design		
a) Mandatory participation	Forces students to focus and think more deeply or consider other viewpoints	
b) Instructor participation		Instructor feedback needed for validation of ideas. More instructor participation would have stimulated deeper discussion.
3. Dispositional Characteristics of Students		
a) Cognitive maturity		Student has trouble with open-ended nature of content. Epistemological barrier.

Instructor Perceptions

The instructor concurred with the results of the preliminary analysis of the conference discussions, that the discussions were not very interactive and that most students were making independent comments that did not relate

to, or build on, comments made by other students.[1] However, he felt the students demonstrated a good grasp of the issues presented for discussion and he was generally satisfied with the level of participation and the use of critical thinking in the discussions. He conceded that the discussions did not reach the same level of intensity as they did in the previous year, but he felt that, given the generally passive nature of the students and their experience with a predominantly didactic style of teaching, that they performed well in this class.

> *Compared to face to face seminar courses I do, I don't get this much out of these students. I mean even when we sit there and I don't say a word because you know it's their turn to talk I don't get as in depth, rarely, as in depth kind of perceptions of the material we're dealing with or certainly as much of it on a constant basis.* (I:2:2)

> *So I'm pleased with it from that. I feel I get a chance to know what they're thinking better than I do when I see them face to face.* (I:3:2)

The instructor's perceptions of what factors may have had an impact on student participation and critical thinking relate to the attributes of computer conferencing, his role in the design and facilitation of the course, and the characteristics of the students.

The Attributes of Computer Conferencing

The instructor echoed some of the student comments regarding the impact of the attributes of computer conferencing on participation and critical thinking. He specifically cited the asynchronous nature of the

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[1] At the time the interview with the instructor was conducted, a full analysis of the conference discussions had not been conducted.

communication and the design of the software as having an impact on students' feeling of inclusion, which in turn may have affected their participation.

Asynchronicity, it seems, can be one of those things that everybody wants to take advantage of but would rather not have others make use of. In other words, people like the convenience of being able to participate when it suits them and not at a predetermined time, but they would like others, especially the instructor, to respond to their contributions in a more timely manner. The instructor felt that his inability to respond to this asynchronous/immediacy dilemma may have resulted in some students not participating as intensively as they might have had he been able to respond more quickly:

> *Even though it's asynchronous as soon as you ask a question, I guarantee you're on that evening to see if you've been answered yet or the next day at the latest and there were a couple of gaps, because of stuff I was doing, that were longer than I wished they would have had to have been before I got back to people and I think that may have had some influence on people's inclusion into the thing at the start.* (I:5:1)

The instructor's view on the importance of rapid responses is supported by Tagg & Dickinson's (1995) study which found that frequent and prompt responses to students that offer guidance encourages student participation.

The design of the First Class computer conferencing software was also seen by the instructor as possibly having an impact on students' feeling of inclusion and, consequently, their participation. He raised two issues: the impersonal nature of how the messages are handled and the passive nature of the interface.

When a message is posted to a conference in response to another message, the response is only posted in the conference. The author of the original message does not know that anybody has responded to his or her message unless he or she checks the conference. In some other conferencing systems, when responses are made they are posted in the conference as well being sent to the original author's e-mail address. In this way the original author gets personal notification that somebody has responded to her or his message. This feature may be useful for people who use e-mail on a regular basis, but data from the student interviews indicates that many only logged on to their Internet accounts once or twice a week, so it is not clear that this kind of e-mail notification feature would have made much difference to their feelings of inclusion.

The other aspect of the software that was mentioned by the instructor was its passive nature. By this he meant the fact that all messages in all conferences are always shown and the only distinction between those that have been read and those that have not is a small read flag. Furthermore, you have to open up each conference folder to find out if there are any new messages. Other conference systems provide a much more active interface that provide an alert on the desktop of new messages and can be configured to show only the unread messages. The passive nature of the interface was only mentioned by one student, but it should not be ruled out as having a wider impact on that basis. People are often not aware of why they react in particular ways to technology and it is possible that students, other than those who specifically mentioned this aspect, were also affected by the design of the software.

Design and Facilitation

Four issues related to the design and facilitation of the computer conferences were raised by the instructor. They were the lack of dissonance, the use of old course material, marks for participation, and the length of the discussions.

The instructor attributed the lack of sustained discussion, in part, to the absence of substantial differences of opinion on most of the issues. Most students offered similar points of view and when there were differences they were stated very mildly. In fact, students seemed to be overly concerned about offending the instructor or other students. He felt he may have been able to stimulate some discussion if he had taken a more active role, challenging students to elaborate their positions and to compare them with other students but he felt somewhat removed from the course because he was reusing material from the previous year.

He also felt hampered in his efforts to generate discussion by the marks that were assigned for participation in the conferences.

> *I should have been probing more, I should have been digging more, but most people felt, well, and part of it was the way I had the participation mark schedule - say something and get a mark kind of thing. It was like what comes off the top of my head and nothing was going much further. I see some ways that we could change that. First of all . . . I could immediately come back and take it to another level and say what do you mean by this . . . and take it further and I probably should have done but I think there's other ways I could have done it where I had them working with each other doing it.* (I:9:3)

The length of the discussions was another issue raised by both the instructor and many of the students. Both correctly observed that during the

two weeks assigned for each discussion most of the activity would occur in the last few days. They felt this stunted the development of the discussions because there was not enough time left for students to respond to each other's contributions. The instructor had hoped and expected that students would log on on a regular basis, every day or two, but this did not happen. Most students said they only logged on two or three times during each conference. It is not clear whether or not shortening the length of the discussions, alone, would have any impact on the amount and quality of discussion because in the cases where students did make contributions early in the discussion there was often little follow-up discussion from other students.

Student Characteristics

The instructor identified several student characteristics that he felt had an impact on participation. He found that most of them were not motivated to participate and tended to view their education as a necessary evil, not something in which they had any inherent interest. Looked at in terms of motivational orientation, if the instructor's assessment is accurate, most of these students would be considered goal-oriented (Houle, 1961). That is, they were enrolled in this program with a very clear-cut objective in mind: to get the necessary qualification to obtain a job in the information systems business. To make matters worse, this was the only course in their program that did not have a technical and instrumental focus so it may have been viewed as an unnecessary frill.

> *This type of course is tough for them because it does demand different kinds of involvement than the other courses do. So I guess I'm getting jaded. I don't expect all of my students to be fired up by higher ambitions to the truth. I suspect most of them are, you know, "what do*

I need to get done . . . well what do you want me to do? how many words is that?" right, and on and on, "I don't want to have to do more work than I have to do," but then we had some students in the class who were just exemplary. They did very fine work and more than needed to be done. (I:9:2)

An issue identified by the instructor that may have been related to the lack of motivation was lack of time. The instructor felt that most students were pressed for time because of their part-time jobs and full course loads. According to the instructor most of the students were working at part-time jobs for at least 15 hours a week, with many working more than 20 hours per week. Lack of time also emerged as a theme in the student interviews. What surprised the instructor about the time issue is that the students did not seem to consider the possibility of reducing their work commitments.

School's part time, they're full time students but school is part time. There' s no doubt in my mind that that's how they look at it.(I:9:1)

So it's very apparent to me they are not willing to give up work time, whatever that means in terms of income, and then they just squeeze in whatever they can do for courses and, really, I think it would be fairly rare to find one of them who said, "well my marks are suffering I'm going to cut back on work." I would think that would be extremely rare. What's happening is they say "my marks are suffering so I better drop a course." (I:2:1)

Earlier, the instructor's inability to generate a sustained discussion was discussed and attributed, in part, to the lack of disagreement. The cause of this problem may also be traced to another student characteristic identified by the instructor: their lack of experience in the world of work related to their field of studies - information systems. He compared the students in this group to

those in the same course offered the year before, many of whom were working full time during the day. "They were systems managers who'd run into things, who would come with scenarios . . . they had real life scenarios and that added a lot . . . I'm hoping that the next go round of the course I can coerce some working professionals into the class who will say, 'yeah, well this happened yesterday'" (I:5:2).

The instructor also identified passivity as a characteristic of many of the students that tended to inhibit their participation. Based on his experience teaching in the Computer Information Systems program he has found the students are generally reluctant to initiate discussion. He attributes this partly to the predominantly didactic instructional style used in the program which allows students to be passive recipients rather than active participants. Discussion, dialogue, and group work are not commonly used instructional techniques in this program. Given this lack of experience with a dialogical, discussion style of learning, the instructor was pleasantly surprised by the participation in his class.

> *As a group the CIS students are not used to having to initiate and so I'm impressed with how much they really did do, and some of them have admitted to me, because I see them in the hall all the time, "I really like this because it is different, we're driving things instead of sitting there and kind of being bored."* (I:3:1)

Summary

This chapter has presented the results of the interviews with the students and the instructor regarding their perceptions of the factors that affected participation and critical thinking in the course. The factors identified fit into the categories of the conceptual framework that guided this study: the

attributes of computer conferencing, course design and facilitation, and student characteristics.

Time-independence, text-based communication, computer-mediation, and many-to-many communication were the attributes of computer conferencing identified as having an impact.

Course design and facilitation factors identified included the mandatory participation, the absence of online "social" or noninstructional activities, the pacing, interface design, and the instructor's participation.

Student characteristics mentioned included students' study environment, time available for study, personality, preferred learning style, and time management skills.

In the next chapter the results presented in this chapter and chapter 4 are discussed.

CHAPTER 6 - DISCUSSION OF THE RESULTS

This chapter discusses the results of the study in relation to the purposes, research questions and the literature. The purpose of this study was to determine to what degree students participated actively, built on each other's contributions and applied critical thinking to the discussion topics, and what factors might have had an impact on this. The results presented in chapter 4 indicate that, while all of these activities or features were present, this course did not become "an interactive group knowledge-building process in which learners actively construct knowledge by formulating ideas into words that are shared with and built upon through the reactions and responses to others" (Harasim et al., 1995 p. 4). In short, while all students contributed to the online discussions, and all appeared to be using at least a minimal level of critical thinking, this course was not an example of the new paradigm of online learning that is mentioned in the literature. However in the view of many of the students, and the instructor, it was a more interactive, participatory, interesting, and engaging learning experience than many face-to-face courses they have been involved with. In this chapter the results presented in the previous two chapters are discussed and explanations are offered as to why this was so and also why the course did not measure up to some of the descriptions of computer conferencing as a virtual community of inquiry. Why was there a generally higher level and quality of participation than the instructor was used to getting in the face-to-face classes he taught? Conversely, why were there not greater levels of participation and much deeper, more interactive and sustained discussions?

Participation

Relative to the results of the research on participation levels in computer conferencing reviewed in chapter 2, the student participation in the course that was the focus of this study was considered to be low or moderate. Students contributed an average of 1.14 messages per week to the 12 online discussions. By comparison, in 12 graduate and undergraduate courses offered at two Canadian universities, Harasim (1993a) found average weekly student participation ranged from a low of five messages to a high of 10. Participation in the graduate courses tended to be higher, but even in the six undergraduate courses, average weekly participation ranged from 5 to 7 messages per week. However, participation levels in this course were higher than those found in the undergraduate course studied by Hansen et al. (1991). Fifty seven percent of that class never contributed a message and those who did contribute, rarely contributed more than one message.

Interactive participation was also low when compared to the results of other research. Of the 207 messages posted, 48 or 23% were classified as interactive. This compares to between 65% and 70% in a study by Harasim (1987a, 1987b), 73.5% in a study by Davie (1988), 85% in Mason's (1991) study and 33% in Henri's (1992) study. It is important to note, however, that all of these studies involved students older than those in the course that was the focus of this study. In addition, Harasim's and Davie's studies involved graduate students.

Mason (1989) found cost of access to be a barrier to participation and the students in the course studied by Hansen et al. (1991) were inexperienced computer users with limited access to computers. Those issues do not appear to have been factors in the low levels of participation and interactivity in this

course as these students were all experienced computer users and most had ready access to a computer.

A number of factors should have helped to increase participation in this course: 15% of the course grade was assigned to online participation, the course content lent itself to discussion, and the instructor followed many of the recommendations for effective online teaching. For example, he did not lecture excessively, he made his expectations of participation clear, he tried to guide the conversation rather than dominate it, he did not overload students with contributions, and he experimented with different approaches to online activity (Harasim et al., 1995). The results of this study clearly indicate, however, that this was not enough to foster active participation in the course and that the ability to participate in a course delivered by computer conferencing is affected by a number of factors. Several related factors appear to have been particularly relevant in this context and a discussion of these factors follows.

Student Experience with Distance Education and Dialogical Teaching

Most of these students were in their early to mid- 20s and in their second or third year of college, with a few having come directly from high school. Only one of the completing students had any previous distance education experience. According to the instructor, these students were accustomed to what Sternberg (1987) describes as the didactic approach to teaching in which the instructor lectures, the students listen and take notes, and there is limited student interaction with the instructor and/or other students during class. Furthermore, as described in chapter 3, they were enrolled in a technically-oriented degree program which consisted primarily of courses dealing with computer programming, information systems management and other

technical subjects. The course that was the focus of this study was the only required course in the program that, in both its face-to-face and online versions, resembled a social sciences or humanities course in which there were discussions and the consideration of multiple perspectives on complex social issues. In the words of Paul (1993), this was multilogical subject matter, not the monological content of most of the other courses these students were taking, in which correct procedures were learned and applied. In short, these students were used to sitting and listening, used to learning the correct way to do things in the world of information systems and applying this knowledge in different contexts. For many of these students, the extent of their participation was showing up in class on a regular basis. They were not used to discussing controversial ethical issues with their fellow students and instructors, and they were not used to being able to determine when, where and how they would participate in class. Student #6 summed up the perspective of these students:

> *Most people have gone through school, they get up in the morning, they go to school, they sit down at a desk, and they come home, and this was something I'd never experienced before, this online class, so it was different and in that way it seemed almost like it wasn't an actual course because there was no class time or no assigned class time. There was no sitting down at a desk and listening to a teacher talk. That's why I think of it as a fake course.* (6:1:3)

This online course placed tremendous demands on these students. Accustomed to the security of the classroom environment in which their presence was their participation, they suddenly found themselves in a situation in which they were required to participate actively by making written contributions to discussions, in which they were given the freedom to

choose when to participate, from where, how frequently and how substantially. While the instructor's expectations were laid out clearly in the course outline, the interviews with the students indicate that most only had a vague idea of what an online course was and what they were expected to do.

Compounding the effect of this inexperience with distance education, a dialogical teaching style and multilogical subject matter was the fact that this was the only distance education course, the only course that was time and place-independent, that did not require the students to attend classes on a regular basis, that most of these students were taking. The rest of their program consisted of face-to-face classes. Ironically, several students took this course because of the flexibility it afforded, yet as the interviews revealed, many could not handle the self-discipline and time-management that was required to successfully integrate this course into the rest of their program. This is consistent with the results of the Hiltz (1994) study which found that self-discipline was a key factor in student success in an online environment. For these students this was not a "real" course as student #6 put it.

For these students, it seems, a real course was one in which the requirements were manifested by the presence of an instructor and through regular physical attendance. The idea of the virtual classroom was too abstract, and required too much self-directed cognitive engagement for these students. Time and place-independence became unmanageable responsibilities instead of features that facilitated access and participation. In setting their priorities, it was only natural for these students to deal first with the things that demanded their attention such as the presence of an instructor or attendance at a lecture. The online class may be open 24 hours, but students may rarely venture in if attendance is entirely up to their discretion. These students were frank about the priority they gave to this course: as student #6

said, "There was that factor, 'Oh I don't really have to do this, I can get to it later,' and three weeks have gone by and you haven't logged in" (6:2:1). As student #14 explained, he would take care of all the requirements of his face-to-face classes and then, if he had time, deal with this class when he got home.

> *I would sometimes go a week without participating, unless I'd plan. I would say, "okay, I can do it tomorrow night" and tomorrow night would come along and I'd have a project due the next morning and I'd go, "well I'll wait until project is done," and progress like that constantly, continuously.* (14:4:1)

The face-to-face context in which all of these students were taking this distance education course may have had another impact. Distance education has traditionally been employed to provide access to students who cannot make it to campus. In this context, all the students were attending the college campus for their other courses and some were seeing each other on a daily basis. This may have made the online discussions seem somewhat artificial. Student #16 alluded to this:

> *Some of the people were around the college and were my friends and so I'd talk with them and we'd discuss it outside of class and then go on later and put our stuff on the computer. Now, we've already had the discussion. The discussion did not take place on the computer. Why not? Because we knew each other. We had a discussion and then entered the results of that discussion in the computer so the discussion wasn't going on online. It was going on behind the scenes and then getting inputted* (16:4:1).

This will be an issue that many institutions will face as they move to combine distributed forms of teaching with regular face-to-face teaching.

Students who see each other on campus in other classes, and social settings may find participating in an online environment forced and artificial, particularly if they have already been discussing course-related issues with their fellow students in person.

So while, in theory, the time and place-independence of this course should have given students greater flexibility of access and thus facilitated their participation, in practice it ended up acting as a barrier to the participation of some students because they participated from home, in the evening, and then often only after they had completed other studying and assignments. So while this course was time and place-independent, by default, the students became time and place-bound and when there was not enough time, participation waned.

Applying the conceptual framework to this explanation, we can see that factors in the categories of student characteristics, attributes of the technology and course design appear to have played a role. The combination of the students' lack of experience with the self-direction and self-discipline required of distance education and their lack of exposure to a dialogical style of teaching (student dispositional characteristics), the face-to-face context in which the course was taken (student situational characteristics),the time and place-independent nature of computer conferencing (attributes of computer conferencing), and a course that is discussion-based and dialogical in style (course design), interacted to inhibit student participation.

Comfort with Asynchronous Communication

There is an implicit assumption in much of the literature on computer conferencing that, for many educational purposes, this form of asynchronous, mainly text-based communication, is in many ways superior to synchronous

and face-to-face forms of communication. However, it is important to remember that, for most people, it is an unfamiliar form of communication and that, regardless of how great its potential advantages for facilitating or encouraging interaction, people must adjust to its peculiarities before they become comfortable with it. This lack of familiarity may explain the almost unanimous desire expressed by the students for some form of synchronous communication. With the exception of an introductory orientation session and the final examination, all learning activities in this course were handled through computer conferencing. While all of the students were experienced computer users, familiar with e-mail and the Internet, only one had any previous experience with an online course. As mentioned earlier, their educational experience to this point was almost entirely classroom-based. The desire for some type of real-time communication was expressed by students who were enjoying the asynchronous experience as well as by those who seemed to be enduring it, by those who were participating extensively as well as by those who were making minimal contributions. The underlying theme in their comments seemed to be that, regardless of their willingness to engage in this new form of communication, it was still, in a sense, a second language for them. Some seemed to be more fluent than others, but most missed the familiarity of synchronous communication. Feenberg (1987) calls this communication anxiety, the feeling of detachment, of not being sure who is really out there, when to expect a response and what kind of response that will be.

This lack of comfort with a new form of communication seems to have affected different students differently, however. Some students were able to overcome, or put aside, their feelings of detachment and isolation and to make frequent contributions while others appear not to have been able to

deal with these issues as effectively. It should be noted, however, that it was not possible in this study to isolate precisely which factors had what effects on which students. As mentioned earlier, participation appears to have been affected by a number of factors and the lack of comfort with the medium is just one of them.

Personality and Preferred Learning Style

Personality and preferred learning style were identified in chapter 5 as factors that were perceived by several students to have affected their participation. There is a relationship between these factors and the previous discussion of the near-unanimous desire for some form of real-time communication. It was argued that underlying this was a lack of comfort with this new form of communication and a concomitant assumption that more experience with it might alleviate this. However, the student perceptions of how their personalities and preferred learning styles affected their ability to adapt to computer conferencing indicates that the relationship between experience and comfort may not be as simple as it appears. Furthermore, the effect of personality and learning style may be more complex than it first appears.

The literature on computer conferencing suggests that students who find it difficult to participate in face-to-face learning environments because of shyness or a preference for written communication will find computer conferencing a more comfortable learning environment because it is text-based and they are able to participate without having to compete with others to be heard. They will also have as much time as needed to formulate their thoughts (Harasim, 1990). The results of this study generally support that view but not unequivocally. Several students who indicated they found

participating in classroom environments difficult said they felt more comfortable using computer conferencing and this may explain, in part, why most students and the instructor felt there was greater student participation in this class than in similar face-to-face classes and in the same course offered face-to-face. However, the experience and perceptions of one student indicate that there may be exceptions to the rule that computer conferencing is an ideal environment for students who have difficulty participating in a classroom. Student #15, who said he was an introvert, found the need for what he called, "constant contact", overwhelming. It did not seem to matter to him that the contact was asynchronous and text-based, nor that, beyond the minimum requirement, participation was voluntary. In order to stay on top of the discussions, he perceived a need to log in regularly and to make regular contributions. For him this was constant contact and he found it taxing. However, he also admitted to being unable to deal with the self-discipline and self-direction required of this distance education course so isolating the impact of these two factors is difficult. Did he find the course taxing because of his personality or because he was accustomed to a much more teacher-directed environment? In this student's view, both played a part in his decision to drop out of the course after six weeks. His personality was not compatible with what he perceived to be the constant contact that the course required and his preferred style of learning was not compatible with the self-discipline and self-direction required. This student's experience indicates that the relationship between personality and comfort with this medium may not be as obvious as some of the literature may indicate.

The Role of the Instructor

The instructor's approach to organizing and moderating the discussions may also have had an impact on student participation. The literature indicates that the role of the instructor in computer conferencing environments is crucial to the success of the course. In order to promote and encourage student participation, the instructor has to ensure that she or he does not become the center of attention, the authority that students look to for the "correct" answers and for approval (Harasim et al., 1995). On the other hand, without the appropriate guidance of the instructor, the discussion is likely to wither and die.

Most of the students were generally satisfied with instructor's participation but, when pressed, several did indicate that greater instructor involvement might have helped stimulate the discussions. The instructor agreed that student participation may have increased if he had gotten more involved and tried to provoke more discussion. The instructor's participation followed a fairly consistent pattern. He began by posing the discussion question, then after three to five days he would respond to one or more student responses. This would be followed by another several days of "silence" when he would again make one or more responses to student contributions. His contributions were positive and encouraging and occasionally he would redirect an issue to students for further consideration. Students indicated they appreciated the instructor's comments but the comments did not appear to promote further discussion. The instructor's comments were rarely pursued by the students and they seemed to have little impact on the style of the discussions which continued to consist of overwhelmingly independent messages that were direct responses to the initial discussion questions.

While the instructor contributed a large number messages to each discussion, they were usually clustered on one or two days. In other words, while he may have responded to the contributions of many students, he tended to do it all at once, on the same day. This may have given the impression to students that the instructor was not really "present" other than on those one or two days on which he posted messages. Research by Tagg & Dickinson (1995) indicates that this style of instructor participation does not encourage student participation. Their study concluded that student participation is enhanced if they feel the continuous presence of the instructor. They suggest this can be achieved through the use of messages of encouragement that are frequent and prompt, offer guidance and address individuals rather than the group. The instructor's participation met most of these criteria: his messages were positive and encouraging, they sometimes offered guidance, and they were mostly addressed to individuals, however they were not frequent and prompt and they were clustered rather than dispersed throughout the discussions.

The instructor also followed many of the recommendations for online teaching, discussed earlier, that are designed to promote participation and interaction (Harasim et al., 1995; Berge, 1995; Paulsen, 1995). Among them, online instructors are urged to give up center stage so that they do not discourage students from taking a more active role: "though the teacher needs to be present, the network enables the teacher to play a facilitative, observant, but background role" (Harasim et al., 1995, p. 174). This is a common theme in the literature on online instructional techniques (Davie, 1988; Davie & Wells, 1991; Berge, 1995; Paulsen, 1995) and perhaps the instructor interpreted this recommendation too literally, especially when it

became evident that students were not participating as actively as he would have liked.

Finally, it should be noted that the lack of participation and interaction may itself have been a factor in the general lack of participation. While this may sound tautological, it is not. It indicates how interrelated the various factors are and how self-perpetuating a sustained and lively discussion can be. Several students and the instructor commented that there did not seem to be anything to "grab on to", that there was a lack of dissonance or disagreement that could spark a sustained and interactive discussion. Sometimes one controversial remark can serve as the catalyst to get such a discussion underway, but it also may depend on a critical mass of participation because what may be controversial for one person may not be for another so the more people who participate the greater the likelihood that a contribution will be made that serves that catalytic function. These results support the literature which suggests that online education requires a new pedagogy, one for which conventional teaching in face-to-face environments does not adequately prepare instructors (Berge & Collins, 1995; Harasim et al., 1995; Paulsen, 1995).

Course Design Issues

Two course design issues that seem to have had a major impact on participation were the participation marks and the deadlines for participation. Several students commented or implied that they participated solely for the marks and that when they had made the minimum required contribution they stopped. Others commented that they would sometimes opt not to participate if they needed to spend time on an assignment for another course that was worth more marks. So, instead of stimulating participation, the

marks seem to have been used strategically by some students to get maximum marks for minimum participation.

The deadlines for participation had a similar effect in that, instead of encouraging students to participate early and often, the deadlines seem to have caused some students to wait until the last moment to contribute. By having the deadlines so close to the end of the discussion, little or no time was left for other students to respond and for a sustained discussion to develop.

This course may not have measured up to some of the descriptions of computer conferencing in the literature, but most of the students and instructor felt that there was more participation and interaction in this class than in similar face-to-face classes. The main reason for this seems to relate to three of the key attributes of computer conferencing: time independence, place independence and the many-to-many communication. The convenience of being able to participate at any time and from home were the first factors cited by most students as facilitating their participation. Even students who admitted to having trouble handling the self-directed nature of the course, commented that they found these attributes facilitated participation. This may not be as paradoxical as it first sounds. Students who admitted to procrastinating because of the time-independence usually ended up making some contributions to the discussions. So while time-independence may have played a part in postponing their participation, in the end it allowed them to participate because the classroom never closed. Their contributions may have been perfunctory but these attributes of computer conferencing allowed them to make them. Add to this the several students who said they felt less inhibited in the asynchronous computer conferencing environment than in face-to-face situations and we have a

possible explanation for why there may have been more participation in this online course than in similar face-to-face courses.

Critical Thinking

Critical thinking is conceptualized in this study as a qualitative dimension of participation so the factors affecting general participation are likely to also have an impact on critical thinking. The analysis of the conference transcripts indicates that all students appeared to be using critical thinking skills at least at a minimal level, but that, in general, critical thinking was not occurring at the higher levels on a consistent basis. The mean critical thinking score was 1.83 on a scale of one to three. The qualifier "appeared" is used here because it must be remembered that evidence of critical thinking was sought in the record of the student contributions to the discussions. As Mason (1989) points out, this is not necessarily an accurate indicator of the totality of student thinking, only what they have chosen to put on the record. A great deal of thinking may be going on that never gets translated into words. Students #3 and #8, for example, mentioned that the online discussions stimulated their thinking and they found themselves frequently thinking about the issues when they were offline, doing other things. Nonetheless, this is the only observable evidence of critical thinking that was available in this study.

Methodological problems and differences in approach in the studies that have attempted to analyze the educational quality of computer conference transactions make comparisons with this study difficult. Henri (1989), for example, used a different conceptualization of critical thinking and found most students were using lower level clarification skills at the surface level. Mason (1991) did not look specifically for evidence of critical thinking but used a typology of six types of student contributions. She concluded that

students were reflective, self-directed and active. Harasim (1991a, 1993a) found students used active questioning, elaboration and/or debate. Webb, Newman & Cochran (1994) did find evidence of critical thinking, but, as discussed in chapter 2, there were methodological problems with their approach.

There are several factors that appeared to have had an impact on the students' ability to use critical thinking skills in their contributions to the discussions: cognitive maturity, the instructor's style of teaching, the students' experience with a dialogical style of teaching, and their understanding of critical thinking.

Recall that, with one exception, these students were all in their early to mid-twenties. The work of King & Kitchener (1994) and Perry (1968) suggests that, in general, age and educational level are reasonably accurate proxies for cognitive maturity and that students of this age have not generally reached the higher levels of cognitive maturity which allow them to engage in reflective thinking. King & Kitchener's *Reflective Judgment Model* describes the development of epistemic cognition from childhood to adulthood. There are seven stages in this developmental progression in reasoning which represent "distinct sets of assumptions about knowledge and how knowledge is acquired" (p. 13). A review of cross-sectional and longitudinal studies conducted on this model found that reflective judgment scores increased consistently with age and educational levels and that the mean scores for college freshmen and seniors were 3.60 and 3.99 respectively (Kitchener & King, 1989). Stage 3 is at the highest level of pre-reflective thinking in which knowledge is assumed to exist absolutely and beliefs are assumed to need no justification. Stage 4 is the first level of quasi-reflective thinking in which knowledge is viewed as uncertain and knowledge claims as idiosyncratic to

the individual. Beliefs are justified at this stage with reasons and evidence, but the choice of evidence and arguments are idiosyncratic.

Support for this explanation is found in the analysis of the students' understandings of the concept of critical thinking. Most did not have a complete understanding and several had difficulty articulating what they thought it meant to think critically.

Teaching style is another issue that can have an impact on students' ability to exercise their critical thinking abilities. Sternberg & Martin (1988) suggest the best approach for facilitating this is a dialogical style of teaching in which there is ongoing interaction between students and the students and the instructor, and that involves discussion, inquiry and the free exchange of ideas. This is also the essence of the recommendations of Harasim et al. (1995), Berge (1995) and Paulsen (1995) for online teaching. As discussed earlier, the instructor followed most of these recommendations and tried to use a dialogical teaching approach, but its effectiveness in facilitating critical thinking may have been diminished by the fact that participation and interaction were limited, and that when this became obvious, the instructor did not adjust his approach in order to stimulate greater participation and interaction. As discussed earlier, most of these students were accustomed to a didactic style of teaching and content-based courses. The dialogical style of teaching used in this course and its focus on process rather than content may have been incompatible with the experience of some of these students. The visible cues of student engagement available in the face-to-face classroom are not available in the online classroom, therefore, in using a dialogical approach, the instructor must also be prepared to become more interventionist and directive than is suggested in the literature in order to foster participation and critical thinking.

Generative Potential

While the findings of this study have provided tentative answers to the research questions that guided it, they have also provided what could be called "generative potential" by suggesting areas for further research. The relationship between age, gender, participation and critical thinking, is one example. The data in this study suggest that the three women in the course had higher participation levels and critical thinking scores. There is also an indication that the older students participated more. These results have to be interpreted with great caution because we are only dealing with a sample size of 13 and, in the case of critical thinking, the differences in scores were small. Nonetheless the direction of the relationships is supported by the literature which suggests that this online environment may be attractive to individuals who do not participate equally in face-to-face discussions because age, ethnicity, or gender (Cooper & Selfe, 1990; Kiesler, Siegel, & McGuire, 1984). The higher participation levels of the older students is also supported by the literature on cognitive maturity which suggests that reflective or critical thinking develops with age and education (King & Kitchener, 1994; Perry, 1968). While no relationship between age and critical thinking was found, the higher participation levels of the older students may be an indication that the more cognitively mature feel more prepared to participate in discussions that require critical thinking.

Another example of the generative potential of the results of this study are in the area of analyzing critical thinking. As discussed in chapter 3, the process of analyzing the transcripts for evidence of critical thinking was problematic and it may be that a different process based on a different conception of critical thinking or a different type of thinking is called for. The way in which critical thinking was operationalized for this study could be

characterized as "reductionist" in the sense that critical thinking was broken down into four categories of skills which were then further subdivided into groups of identifiable positive and negative indicators. A more holistic approach to analyzing thinking which emphasized the socially-constructed nature of knowledge and the interrelationship between interaction and thinking might yield interesting results. The problem faced by researchers is how to translate conceptions of thinking into operational research procedures that can yield meaningful data.

The Conceptual Framework

As discussed in chapter 2, this study was guided by a conceptual framework which was constructed based on a review of the literature on computer conferencing. It suggests that participation in this online environment is affected by student situational and dispositional characteristics, the attributes of the medium of computer conferencing, and the way in which the course is designed and facilitated. The results of this study indicate that this framework is a useful organizing framework and that it may prove useful for future research in this area.

However one area that emerged in the study was not fully accounted for in the framework and suggests a possible revision. The institutional context in which the online course is offered appeared to have played an important role in the participation of the students in this course. That is, the fact that this course was the only distance education course in their program appears to have had a negative impact on their participation because the conflict between the time-independent nature of this course and time-dependent nature of their other courses . This factor is not mentioned in the literature and was not anticipated in the conceptual framework. It could be argued that

it falls into the category of student situational characteristics because it relates specifically to the students' situation, broadly defined. However, creating a new category of "institutional context" may be more useful heuristically because it may focus attention on other institutional factors that may have an impact on participation. None were identified in this study but one can imagine that institutional policies relating to on campus computer access or limits on the number of distance education courses that can be taken might have an impact on participation.

The Research Questions

The research questions for any study are carefully designed to achieve the stated purposes of the research. In this case the questions stemmed from Harasim's (1990) conceptualization of computer conferencing environments and were an attempt to determine the extent to which the learning environment in this course resembled Harasim's conceptualization and to offer explanations for the differences and/or similarities. Obviously different research questions would have yielded different results but they may not have addressed the research purposes. One could speculate endlessly about what different questions would have produced but it is not unreasonable to reexamine the research questions with a view to determining whether or not different wording or additional questions may have produced more useful results that were still consistent with the original purposes of the research.

One area that has already been discussed in this chapter relates to the question of how critical thinking was examined. In addition to using a different conception of critical thinking, as has already been suggested, it might have been profitable to examine different dimensions of student

thinking such as creative thinking, divergent versus convergent thinking or problem-solving.

The student interviews focused on the their perceptions of the factors that affected their participation and critical thinking. This was an appropriate focus given the research purposes, but a deeper examination of what students did online and the processes they followed in participating online would still have been consistent with the research purposes and might have revealed some interesting insights. This kind of examination would focus on metacognitive strategies which would complement the work of Burge (1994) who studied the learning strategies that students use in an online environment. It would also further the work of Henri (1992a) who examined metacognitive strategies by analyzing conference discussions rather than by seeking student interpretations or their use of metacognitive strategies.

The results indicate that students' cognitive maturity and understanding of critical thinking were issues that affected participation. A greater understanding of the role of student cognitive and epistemological factors might have been gained if there had been more emphasis on these areas in the interviews. The students were asked for their understanding of critical thinking and this proved to be quite revealing but questions that focussed on their conceptions of knowledge, what it is, how it is acquired and/or developed and questions that dealt with their understandings of the purpose and value of education might have helped present a richer description of the students' dispositional character and might have helped to explain their different levels of engagement in the course.

Limitations of the Study

This was a case study of one university-level course that used asynchronous computer conferencing as its primary means of delivery and asynchronous online discussions as its main learning activity. All the results, then, must be viewed in the context in which they were obtained because the study was not designed to produce results that could be generalized to other courses. Transferability, rather than generalizability, is the issue in qualitative-interpretive research (Guba & Lincoln, 1989). In order to assist the reader in determining the extent to which the results of this study are transferable to other contexts, the research site, the students, the course, the research design, and the findings were described in detail. To the extent that other computer conferencing contexts resemble the one in this study in terms of course design, instructor role, student characteristics, and course content, it may be possible to make tentative and limited generalizations.

Two sources of measurement error were also possible limitations of this study. The critical thinking of students was measured by analyzing their contributions to the online discussions. This assumes that all student thinking would be present in those contributions and ignores the possibility that some students may have chosen not to record all their thoughts on the issues under discussion. Thinking cannot be observed and relying on indirect, observable evidence to measure thinking may not produce an accurate result in all cases. This study relied heavily on interviews with the students and the instructor. While all possible attempts were made to assure the subjects of the confidentiality of their responses, it is possible that some students may still have been hesitant to be completely frank with the researcher. The researcher saw no evidence of this in the responses, but this is always a possible source of error in this type of research. Finally, it must be acknowledged that researcher

bias in the collection and interpretation of the data is another possible limitation of this study.

CHAPTER 7 - SUMMARY, CONCLUSIONS AND IMPLICATIONS

In this chapter the results of the study are summarized in relation to the research questions that guided the study, the conclusions are presented and discussed, and implications for practice and future research are offered.

Summary of Results

The following is a summary of the main results of the study organized according to the seven research questions.

1. How frequently and how much did students contribute to the computer conferences?

Students contributed a weekly average of just over one message (1.14) to the 12 online discussions. Individual levels ranged from a low of .15 to a high of 2.5 messages per week.

2. To what extent did the online activity resemble a discussion in which students responded to, and built on each other's contributions?

Student messages were mostly independent. For the most part students restricted their contributions to responding to the discussion questions posed by the instructor. Only 48 of the 207 messages posted (23%) were classified as interactive in which reference is made to previous students messages.

3. To what extent did the students think critically about the issues under discussion?

The mean critical thinking score was 1.83 on a scale that ranged from a low of 1 to a high of 3. The individual mean scores ranged from a low of 1.2 to a high of 2.6. Thus, while most students appeared to using some critical thinking skills, they were not doing so consistently at a high level.

4. How did the quantitative and qualitative characteristics of participation change over the duration of the course?

Critical thinking scores varied over the duration of the course, but there does not appear to have been any consistent trend.

Participation levels tended to climb until about halfway through the course and then decline until the end.

5. What instructional techniques did the instructor use that may have either facilitated or inhibited participation and critical thinking?

The instructor used a dialogical approach to teaching. He presented a few "electures", but these comprised only 10% of his messages. In general he posted messages of encouragement, redirection or summary directed at individual students. In addition to the regular discussions, he experimented with different online group activities, including dyads and role-playing. Participation was assigned 15% of the course grade and clear deadlines were established by which students were expected to contribute to each discussion.

The instructor's messages tended to be clustered on a few days during each discussion which may have resulted in the students perceiving that the instructor was not present. Additionally, he usually did not respond to student messages for two or more days and in, doing so, often missed opportunities to seek clarification or elaboration from students.

6. What were student and instructor perceptions of the factors that affected participation and critical thinking in the course and how did they perceive the impact of those factors?

The factors identified by the students and the instructor as affecting participation and critical thinking fall into the categories of attributes of computer conferencing, course design and facilitation, and student characteristics.

Time-independence, text-based communication, computer-mediation, and many-to-many communication were the attributes of computer conferencing identified as having an impact.

Course design and facilitation factors identified included the mandatory participation, the absence of online "social" or noninstructional activities, the pacing, interface design, and the instructor's participation.

Student characteristics mentioned included students' study environment, time available for study, personality, preferred learning style, and time management skills.

7. What was the relationship between the level of critical thinking or participation and selected student characteristics?

The sample was too small and homogeneous in terms of age, gender, previous education and motivation to use statistical tests of association, but apparent relationships were observed between several student characteristics and participation and critical thinking. Students who took the course because it was offered online tended to have higher participation and critical thinking levels than those who did not have the same motivation. The three women in the course had higher participation and critical thinking levels than the men. Students whose highest level of education was high school had lower participation levels, but higher critical thinking scores than those with a college education. Older students had higher participation and critical thinking levels than younger students.

Conclusions

A number of factors help to explain the quantitative and qualitative characteristics of student participation in this course. The students' lack of experience with distance education, dialogical teaching, and multilogical

content, their lack of comfort with the asynchronous environment, the perception that the instructor was not continually present, and the marks and deadlines for participation all appear to have played a role in inhibiting the general participation of many of the students. Conversely, the convenience of the time and place-independence of computer conferencing appears to have facilitated participation of most students, even those who admitted to procrastinating. Furthermore, the asynchronous environment appears to have facilitated the participation of students who are anxious or nervous about participating in a face-to-face classroom situation.

Critical thinking appears to have been particularly affected by a number of interrelated factors: the cognitive maturity of the students, their lack of experience with a dialogical style of teaching, and their generally incomplete understanding of what it means to think critically.

The results of this study indicate that getting computer conferencing to work in the way envisioned by some of its proponents is not a simple task. While the technology may have attributes that have the potential to facilitate a dynamic and interactive educational experience, making this happen depends on much more than the technology. Of all the factors that help to explain the quantitative and qualitative characteristics of participation in this course, most have little to do with the technology of computer conferencing. Student characteristics such as their previous experience with distance education or independent study, their cognitive maturity and their experience with participatory and interactive learning environments seem to be necessary preconditions for the successful implementation of computer conferencing where success is measured by high levels of participation, interaction and critical thinking. The context in which the computer conferencing is implemented is also key. In campus-based environments, a

single distance education course using computer conferencing in a student's program may turn what are considered positive attributes into negatives. Time and place-independence, instead of offering flexibility, may offer too much temptation to procrastinate. It seems that a course that allows a student to participate anytime, anywhere is easily forgotten when all the student's other courses demand attention at particular times and places. Time-independence, by default, becomes time-dependence as the course with flexibility gets put off until everything else has been attended to. Student perceptions of the factors that facilitated their participation in this course support the view that the attributes of computer conferencing play an important role, but it is also clear from what the students had to say that meaningful participation and interaction depend on more than these attributes. Just as having a classroom with comfortable seats, and a whiteboard does not necessarily ensure an effective course, having an online environment with the attributes of time and place-independence, many-to-many communication, computer mediation and text-based communication does not ensure an effective online course. The results of this study support the view of Harasim et al. (1995) and others that these attributes must be exploited by using appropriate design and facilitation techniques. The results also suggest that student situational and dispositional characteristics must also be taken into account. Effectiveness, then, depends on an appropriate combination of factors related to student characteristics, course design and facilitation and the attributes of computer conferencing.

Implications

In chapter 1 it was suggested that computer conferencing is an instructional technology that might improve the practice of distance

education. It was argued that it might do this because, according to its proponents, its key attributes facilitate interaction between and among students and between students and instructor, which is a necessary prerequisite to the use and development of critical thinking skills. The rationale for this study was that there was a scarcity of empirical evidence to support this argument. The results of this study provide limited support for this argument. In the context of the course that was studied there was interaction and critical thinking although not to the degree that might be expected from reading some of the literature on computer conferencing.

Implications for Future Research

The characteristics of the course that was the focus of this study are consistent with Harasim's (1990) conceptualization of computer conferencing as consisting of five attributes: many-to-many communication, place-independence, time-independence, text-based, and computer-mediated interaction. All of these attributes were mentioned by one or more students as having an impact on their ability to participate. However, the study also revealed that participation was a function of more than just the attributes of the technology of computer conferencing.

The results support the conceptual framework which guided the study. Participation was conceptualized as resulting from the interaction of the attributes of computer conferencing, course design and facilitation, and student characteristics. However, because this was a case stud, isolating the impact of particular factors was not possible. Future research could build on the results of this study by focusing on one or more factors. For example, it would be useful to know what impact different styles of instructor participation have on student participation. In this course student

participation consisted primarily of independent messages that responded to the initial discussion question posed by the instructor. There was a minimal amount of student-to-student interaction, and dynamic and sustained discussions never developed. The instructor tried to use a dialogical style of teaching but his contributions tended to be clustered on one or two days during each discussion. Research by Tagg & Dickinson (1995) suggests that student participation will increase if they sense the continual presence of the instructor and if she or he provides responses targeted to individuals rather than the group. Future research might focus on particular styles of instructor participation and their impact on student participation.

Two other related factors that emerged from this study were the lack of student experience with distance education and students' difficulty integrating this distance education course with the rest of their campus-based program. These factors could serve as the basis for a future study that compared the participation of fulltime distance education students with those taking only one computer conferencing course as part of a campus-based program. Do fulltime distance education students find it easier to participate and take advantage of the attributes of computer conferencing than students who are fulltime campus students taking only one distance education course? And does previous experience with distance education of any form have an impact on participation?

There also appears to be a need for research that compares online instruction with other modes of distance education for their effectiveness in promoting participation and critical thinking. This type of comparative study might help to isolate the impact and role of some of the key factors that were suggested by this study. For example, many of the students in this study appeared to have been uncomfortable with the asynchronous environment

and it was suggested that this may have been one of the factors responsible for their limited participation and use of critical thinking. A study that compared synchronous and asynchronous online instruction or asynchronous online instruction with distance education that was delivered using other synchronous technologies might shed some light on the impact of student comfort with asynchronous communication.

Cognitive maturity and students' understanding of critical thinking are two other issues that appeared to have played a role in students' ability to participate and could prove useful as the basis for future research. The instructor in this course provided a brief explanation of what he meant by critical thinking and how he expected students to apply critical thinking skills to the discussions, however no extended instruction in critical thinking was provided. The course was not designed to develop these skills, only to facilitate their use. A future study might examine whether or not students' understanding of critical thinking has an impact on their use of critical thinking skills and how these skills could be developed in an online environment. Such a study might make use of King & Kitchener's (1994) Reflective Judgment Model to determine students' Reflective Judgment scores and their relationship to participation and critical thinking.

Implications for Practice

The results of this study indicate that students do not necessarily adapt easily to the online environment. Almost all admitted to some discomfort with asynchronous communication. This suggests that students, like instructors, need adequate preparation before they can work online effectively. Harasim et al. (1995) suggest that many newcomers to online instruction spend 10 to 20 hours reading messages posted by other students

before they post anything of their own because they feel inhibited by the new form of communication. If an online course has many newcomers, this period of adjustment can be very unproductive and suggests that strategies for preparing students for the online environment should be considered. For example, having a mandatory noncredit online course that introduced students to online learning and how to make effective use of the online environment might help ease the transition from the classroom. This type of introductory course should not only cover the fundamentals of online learning but also the related, but more general, issue of self-directed learning and the impact this will have on student's learning and studying strategies and time management.

The results of this study also indicate that student participation in computer conferencing depends on much more than just the attributes of the technology. Student characteristics such as previous experience with distance education and dialogical instruction, cognitive maturity, course design issues such as mandatory participation and deadlines for participation, and facilitation issues such as instructor's approach to participation all have an impact on the quantity and quality of student participation.

If the course that is being delivered using computer conferencing is the only distance education course that students are enrolled in, it is worth considering having several face-to-face sessions during the term. Many students in this course had difficulty integrating this distance education course into their campus-based program and several indicated that face-to-face sessions may have helped. These could serve several purposes. First they could help ease the transition from a campus-based program to distance education format, particularly for students who have had no previous distance education experience. Secondly, face-to-face sessions might help

students develop a social connection that facilitates their online participation. Several students mentioned that their sense of detachment or isolation from their fellow students hindered their participation and that some form of real-time communication might have eased this. In this regard, a synchronous chat facility might be worth experimenting with, again to ease the transition, in this case from synchronous to asynchronous communication. The instructor was not convinced of the value of this feature, but almost all of the students indicated they would have liked to have been able to communicate in this way.

Online participation has to be seen by students as something integral to their success in the course. If it is viewed as busy work that they only do in order to get the participation marks then it is unlikely that meaningful discussions will result. Some students in this course willingly gave up some of their participation marks because they knew they could get a satisfactory grade by completing their assignments and writing the examinations. Making participation mandatory in itself will not necessarily result in high quality participation. Online participation and offline work should be related so that students see online participation as more than just a way of gaining a few extra marks. There are a number of ways of accomplishing this. One might be to have students work collaboratively online to complete one or more assignments and then participate in an online discussion of these assignments. Another might be to use the record of the discussions as a basis for an assignment. Another way to get students more involved in the online activities would be to have them each moderate their own discussion. There are a number of publications that detail strategies for online instruction (Berge & Collins, 1995; Paulsen, 1995; Harasim et al., 1995), but what this study appears to indicate is that whatever strategy is chosen, it must make the

online participation an integral part of the course that is viewed by students as necessary for their successful completion of the course. Anything less will likely only result in token participation by some students.

How participation deadlines are structured is another practical issue that is given some guidance by the results of this study. Mandatory participation is a recommended practice in online instruction and establishing deadlines helps to ensure that students participate on a regular basis (Berge, 1995; Rohfeld & Hiemstra, 1995). However, this study indicates that the timing of deadlines in relation to closing date for the discussion can have an impact on the level of participation. Students in the course that was the focus of this study tended to wait until the deadline to participate and because the deadline was the last day of the discussion, there was not enough time for students to respond to each others contributions. Deadlines, then, should be established near the midpoint of the discussion so that adequate time is allowed for follow-up comments. In addition, instructors should consider establishing two deadlines, one for the initial contribution and a second for a follow-up comment.

The results of this study also have implications for faculty development. Whether or not one subscribes to the view that online instruction is a new paradigm, it is without question a new and different form of instruction for instructors who are used to teaching in a classroom, particularly if they are accustomed to practicing a didactic style of teaching. As has been discussed earlier, the literature suggests clearly that online teaching requires a different role for the instructor and different relationships with the students and the content.

> Unlike traditional classroom activity, in which the teacher directs the instruction, leads the lessons, prompts responses, and paces the class,

online group learning is student-centered and requires a different role for the teacher, of facilitator rather than lecturer."(Harasim et al, 1995, p. 174)

It is unreasonable to expect instructors to shift from the classroom to the online environment without adequate preparation. Without proper training in the principles and practices of online teaching and learning, instructors will likely attempt to transfer their classroom approach to the online environment.

Significance of the Study

Chapter 2 concluded by suggesting that research on the factors associated with various dimensions of participation in computer conferencing was not well-developed and it identified a number of limitations of the literature that this study would attempt to address: a) few studies have examined the qualitative characteristics of computer conferencing participation, b) methodological problems with those studies that have examined critical thinking, c) a scarcity of qualitative research, d) few studies that have examined the reasons for differential levels of participation.

While this study cannot claim to have provided answers to the many questions about participation and critical thinking in computer conferencing, it has provided tentative explanations for some and it has made a first step towards filling the gaps that were identified in chapter 2. This was a case study that examined both quantitative and qualitative characteristics of participation in computer conferencing. By using a case study approach, and by relying heavily on in-depth interviews with the students and the instructor, this study was able to make well-supported suggestions about the factors that facilitate participation and critical thinking in computer conferencing. This study showed that some of the claims about the potential of this technology to transform conventional and distance education may be

overstated. The emergence of a dynamic, interactive, and collaborative educational process that is mentioned frequently in the literature was shown to be contingent on a variety of factors that go far beyond the technology. The results of this study, however, do provide support for Harasim's (1990) conceptualization of computer conferencing as group communication defined by five key atttributes: time-independence, place independence, text-based communication, many-to-many communication and computer-mediated communication. All students mentioned these attributes as being relevant to their online participation.

Clearly, because of the context-specific nature of the inquiry, the conclusions reached are tentative and generalizations are not possible. However, interested readers can transfer the results to different contexts as long as the defining characteristics of the new context resemble this case. To facilitate that process, the key characteristics of this case will be summarized. This was a course in which students were required to discuss, in online asynchronous computer conferences, ethical issues related to the management of computer information systems. Students were in their mid-20s with either high school education or one or two years of college. This was the only distance education course in their program and it was the only required course in their otherwise technically-oriented program that involved the consideration of non-technical issues and multilogical content. None of these students had had any previous experience with online courses and only one had had previous distance education experience. Finally, the students were not used to courses that required active participation and discussion.

The literature indicates that interactive participation is a key to the realization of the potential of this technology. The results of this study

provide the groundwork for the development of theory and research that might test specific hypotheses about the nature of interactive participation and what may hinder or facilitate it. While the study shows that participation is often a complex and idiosyncratic phenomenon with many interconnected factors, it also demonstrates that there are some measures that can be taken that are likely to increase participation and critical thinking.

The reason this study was undertaken was to determine whether or not computer conferencing could be used to address a major shortcoming of traditional distance education: its inability to allow for sustained interaction between and among students and between students and instructor and, by extension, its inability to foster critical thinking. This study suggests that, with appropriate course design, instructor interventions, content, and students, computer conferencing can be used for these purposes and should be given serious consideration by distance educators.

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APPENDIX 1 - INTERVIEW QUESTIONS

The following is a list of the opening questions that were posed to students and the instructor during the semi-structured, open-ended interviews. After each question, or series of questions, is an explanation of the reason(s) for asking the question.

1. I am trying to get an idea of what things might have made it easier for you to participate in the computer conferences and what things might have prevented or inhibited you. First of all, can you think of anything that you felt encouraged you to participate or made it easier for you to participate?

2. Can you think of anything that prevented or inhibited you from participating? *Depending on responses, subjects will prompted with more specific questions relating to different components in the conceptual framework as follows:*

3(a) Was there anything about the way the computer conference activities were designed or organized that you felt helped or hindered your participation?

3(b) Was there anything about computer conferencing itself that you felt helped or hindered your participation? *Depending on responses, prompt with examples such as the text-based nature, the ability to log in any time, information overload etc.*

3(c) What about your own personal situation? Was there anything related to this that helped or hindered? I'm thinking of things like your study environment at home, your other responsibilities interfering with studies and so on.

All of the initial interview questions are based on the conceptual framework in which four main factors are identified: the attributes of the medium, the design of the learning activities, student situational factors and

student dispositional factors. The first two questions are broad, opening questions that do not relate to any specific factor. They are intended to be conversation starters and to get the subject thinking about what may have hindered or facilitated his or her participation without influencing him or her with the preconceived factors of the conceptual framework.

Question 3 (a) (b) and (c) stem directly from the conceptual framework and relate to the design of the conference activities, the attributes of the medium and the student situational factors respectively. They will only be asked if the subjects do not raise these issues themselves in response to the broad opening questions (1, 2).

4. Finally I would like to get an idea of how you felt about this course before you took it and whether that changed. To start with, would you say you were looking forward to taking this course?

4(a) Did this attitude change over the duration of the course? Why?

4(b) What was your attitude towards computers in general before you took this course?

4(c) Did that change over the duration of the course? Why?

4(d) Now I would like you to think about your attitude towards the use of computer conferencing to take a course. What was that like before you took the course?

4(e) Did that change over the duration of the course? Why?

4(f) Do you feel that any of these attitudes you had at the outset had any effect on your participation? Why?

This series of questions relates to the dispositional factors in the conceptual framework. The purpose here is to probe the subject's attitudes towards computers and computer conferencing and to see if this changed over the duration of the course.

5. I am also trying to get some idea of what may have helped or hindered you in thinking critically about the questions that were posed in the seminars. First of all, I will explain what I mean by "critical thinking". Does that explanation make sense? Okay, now that you understand what I'm talking about, I would like you to think back over the course and try to remember if there was anything that helped you to use critical thinking.

6. Now, what about things that made it difficult for you to think critically. Can you think of anything? *Depending on responses, subjects will be prompted with more specific questions relating to different components in the conceptual framework. See questions 3(a), (b), (c) and 4(f).*

As with the first two questions, questions 5 and 6 are designed as broad conversation starters. In this case they deal with critical thinking rather than participation as in questions 1 and 2. Again, the purpose is to get the subject thinking about the issue without influencing him or her with the preconceived categories of the conceptual framework. Follow-up questions based on the four factors of the conceptual framework will be asked only if the subjects do not raise the factors in their responses to questions 5 and 6.

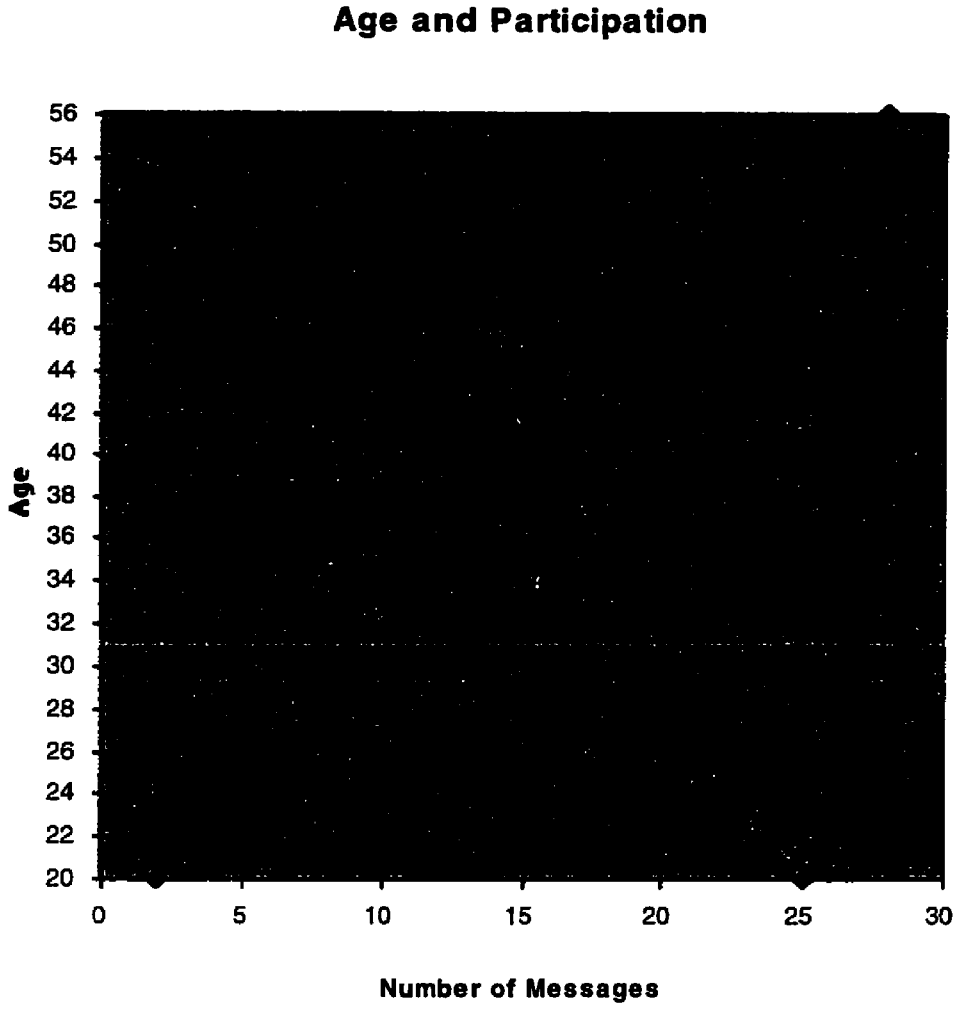

Figure 9: Scatterplot showing age of students and total number of messages posted

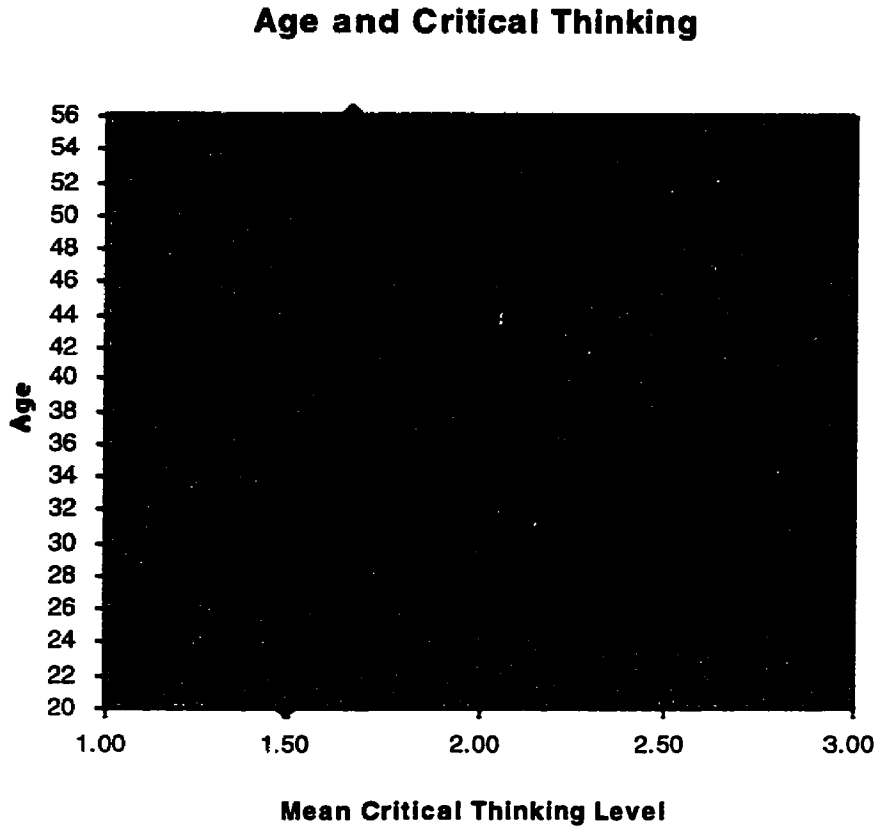

Figure 10: Scatterplot showing student age and mean critical thinking levels.

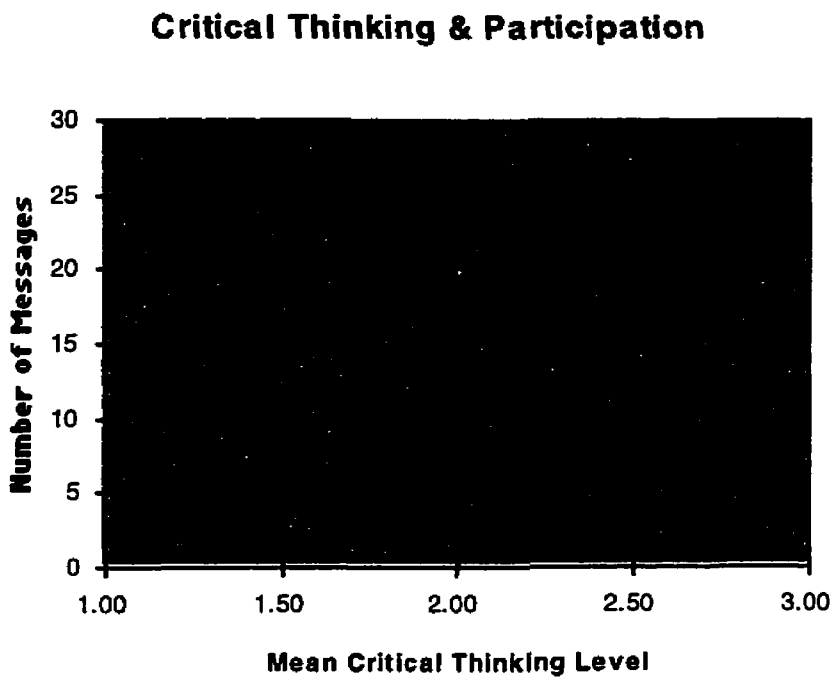

Figure 11: Scatterplot showing number of messages posted and mean critical thinking levels.

APPENDIX 3 - TRANSCRIPT OF CONFERENCE 5A

Message #1
Monday, March 11, 1996 7:22:25 PM
Property/Access Item
From: Instructor
Subject: Property
To: Property/Access

Property

I'm going to combine the readings on property into one E- lecture and then do the same for access.

There are many property issues relating to computers. Three of the text readings and the supplemental readings examine the issue of software ownership. Another of the text readings, the CPSR article on the Internet worm examines the issue of damaging computer property. Finally discussion question one, uploaded previously, examines the issue of intellectual property published on a computer system.

Solomon & O'Brien (no relation) report their findings on students' attitudes towards copying software. Their findings appear to indicate that:
copying is:
- widespread and socially acceptable
- viewed as a necessity because of inadequate resources provided
- not contingent on the availability of shareware alternatives or personal income
- influenced by attitudes of instructors

On the last point. Students are influenced by the negative attitudes of faculty. OTOH, only 2.6% of students indicated that they were positively influenced by a faculty member denouncing software copying. (Ques. 16, appendix).

Not that faculty members can be considered particularly ethical based on the findings of Shim and Taylor. In their study, comparing IS managers to IS faculty, the academic respondents admitted copying software 73% of the time while the IS managers admitted to copying only 9% of the time. Of course the argument could be made that faculty were more honest in responding to the survey. S&T postulate that the difference may be accounted for by economic reasons, faculty members being less organizationally loyal and being less closely supervised.

At any rate both studies indicate a dilemma in protecting the property rights of software creators. Eining & Christensen try to get at the root cause of this through the development of a model. They test five factors; computer attitudes, material consequences,

norms, social-legal and effective. (Read article for clarification of the factors.)

Statistical significance was not found in the social-legal factor indicating that students were unaware of the legal or social implications of copying software. Normative expectations rated highest in statistical significance, that is, students saw nothing wrong with copying and were supported by their peers. It was also found that the more positive students' attitudes were towards computers, the less likely the occurrence of copying software.

In an effort to address the problem, specifically the socio-legal factor, the Software Publishing Association (SPA) endorsed the article CopyRight & Wrong, (Salvador, coursepack). As well the SPA published a sample policy and procedures, a step list and a sample software code of ethics. Although these are directed at academic institutions they can be easily applied to private businesses as well.

In yet another article, [Strikwerda & Ross] the point is made: "It might be said that there isn't any ethical issue here [copying software]. Making or using extra copies of a retail product beyond permission is illegal. Period. One may criticize the law, but it is the law..... A simple argument applies.

1. If something is someone else's property, it should not be used without the owners permission or out of accord with the owner's instructions.

2. Copyrighted software is property.

3. Therefore, it is ethically wrong to use software without the owner's permission or in accord with the owner's instructions.

This argument might seem to be enough. But, since it does not appear to be working in the real world, we believe the issues bear further examination." **

** Strikwerda & Ross, (1992). Software and Ethical Softness, COLLEGIATE MICROCOMPUTER, August.---

DISCUSSION QUESTION:
Earlier in the course I stated something to the extent that when ethics fail, laws are made. From the above one may gather that the LAWS have failed to protect the ownership of software. How do you feel ethics can be applied to the situation? Go back in the readings to gather ideas. Try to build a case for your solution.

Message #2
Monday, March 11, 1996 7:26:03 PM
Property/Access Item
From: Instructor
Subject: Access
To: Property/Access

Access:

Access means being able to get at any records anyone has on you. It ALSO means being able to have control in who has access to your records. There is an interesting booklet in the library (ours, Abbotsford) put together by the B.C. Freedom of Information and Privacy Association. Their name says it all. Do you find it paradoxical that they want to protect both FREEDOM and PRIVACY?

TEXT:
Ladner informs us of the legal responsibilities for providing access to computing facilities for users with disabilities. Some interesting points made by Ladner:

software producers are not required to retool their product for "unique" markets [I use unique here in the sense that there is a wide range of disabilities, all that require a unique software solution] but are required to provide "hooks" to which third party software modules can be attached, specifically interface functions (Rehabilitation Engineering)

"new technologies can be more or less disabling depending on the technology and the individual"

"a particular computer system may require too many senses and abilities" (I like this one. It's ammunition in my argument against multi-media in instruction.)

Johnson published her article 10 years ago. She predicts that in the future (read now) access to computers is necessary to achieve other rights.

"In these futuristic visions, people stay at home and use computers in their homes to earn a living, shop, GO TO SCHOOL, vote, bank, etc." [capitals mine]

As I sell the idea of on-line learning to this institution and the provincial ministry that funds this project, I am constantly confronted with the issue of advancing the technologically elite, catering only to those who have the technology and the expertise. Taken to the extreme, the argument appears to be that until everyone has access to on- line learning, no one should. Paradoxically (I seem to be finding paradoxes everywhere tonight) I see on-line learning primarily SOLVING access issues. Your time. Your place. BUT the admission is a computer, modem, telephone and the where-with-all to use them.

The cost accounting of computing facilities has flip flopped over the last 10 - 15 years. Hardware was expensive in comparison to personnel, 100 million new users later, hardware is cheap, people are expensive. I predict that the cost of training and support, human costs, will continue to grow as a percentage of the IS budget. (I know this flies in the face of the credence that software is getting more user friendly). See the notes on Access to Computer Skills found in Johnson.

In the section on Access to Computer Professionals, Johnson ponders whether the public has a right to free services of a computer professional. Not so? Explain the popularity of User Groups, most BBS's and the Valley FreeNet Society.

Finally, an extremely important issue from my vantage point of someone who is trying to evoke technological change, is the access to the decision making process. This means having the technological confidence to make informed decisions. Many people don't have this confidence and therefore feel "out of the loop" in the decision making process. We (computing professionals) leave them out at our peril.

Discussion:
Open. Comment on whatever peaks your interest.---

* Tagline * A procrastinator's work is never done.

Message #3
Saturday, March 16, 1996 10:57:16 PM
Property/Access Item
From: Student #8
Subject: Property Discussion
To: Property/Access

DISCUSSION QUESTION:
Earlier in the course I stated something to the extent that when ethics fail, laws are made. From the above one may gather that the LAWS have failed to protect the ownership of software. How do you feel ethics can be applied to the situation? Go back in the readings to gather ideas. Try to build a case for your solution.

I think the way to apply ethics to solve this problem (if indeed it is solvable) is for educational facilities to instantiate an ethics policy dealing with the matter. However it would need to be accepted by the instructors to be effective.

A point made in the e-lecture was that

"... the academic respondents admitted copying software 73% of the time while the IS managers admitted to copying only 9% of the time." The instructor stated that maybe it was because the faculty were more honest but I would like to submit that maybe it was the

software policing done in corporations like BC Hydro that kept the IS managers "clean"..

I worked as a co-op student with BC Hydro last year. They have a good system that deals with illegal software. Being a large organization under constant public scrutiny they cannot afford to have illegal software on machines. They have a strict policy against illegal software which they send reminders out to their departments about frequently. They also have auditing software which checks computers for illegal software. "Surprise" audits are done on random departments. The fear of these "surprise" audits are enough to keep "most" computers clean. The results of the audits are also published in memos to the departments which gives a sense of legitimacy to the threat of being caught.

I have a copy of the Canadian Information Processing Society's Standards of Conduct which also deals with this matter.
P4) I will not seek to acquire, through my position or special knowledge, for my own or others' use, information that is not rightly mine to possess.
P5) I will obey the laws of the country, and will not COUNSEL, aid, or assist any one person to act in any way contrary to these laws.

This organization has standards relating directly to educators as well but nothing that deals directly with this problem. However P5 would seem to relate here. Perhaps if computer instructors had a code of ethics that they agreed to follow they would be more careful with how they advise students to act in this matter. This then would filter positively down to the computer students. It may not work but the alternative (instructors being agreeable to student copying software definitely won't work, so it's worth a try).

Message #4
Monday, March 18, 1996 4:56:21 PM
Property/Access Item
From: Student #9
Subject: Misc. Concerns
To: Property/Access

1.
Do you find it paradoxical that they want to protect both FREEDOM and PRIVACY?

No. Access is pivotal to both freedom and privacy. Having control on who knows what about you , as we determined from previous readings , has the potential of influencing the nature of the relationships that you have with others and they have with you. This ability to control access to personal information or lack thereof directly affects personal freedom and privacy.

2.
DISCUSSION QUESTION:
Earlier in the course I stated something to the extent that when ethics fail, laws are made. From the above one may gather that the LAWS have failed to protect the ownership of software. How do you feel ethics can be applied to the situation? Go back in the readings to gather ideas. Try to build a case for your solution

From the readings to a large extent the attitudes and behaviour re: piracy have come about due to a lack of education in the following areas:

- increase student and professional user awareness of software development costs required to develop/upgrade new programs
- impact of lost revenues due to piracy resulting in increased retail prices -
- although personally I have allot of trouble with this rationale namely:
    - the software industry punishes the people who abide by the copyright law by charging them higher prices - ah! some thing wrong with the logic here ?? Note: Some mechanism for charging software users less e.g. based on their track record of copywritten software purchases, in other words an incentive to buy copywritten software rather than a punishment.
    - the industry usually sets retail prices on the basis of " what the traffic will bear" if this is not above their costs + profit they get out.
- discussion of piracy scenarios and consequences thereof from the software developers point of view.
-

Message #5
Tuesday, March 19, 1996 5:01:08 PM
Property/Access Item
From: Student #9
Subject: Piracy & Such
To: Property/Access

Re: Demographic Factors:
I find it more than coincidence that while 52.8% admitted to piracy the following prerequisites for piracy to occur were approximately 50% higher:

- 67% of the respondents were offered copies to pirate (conversely the 67% who offered would have no problem copying others software given the opportunity)
- 70.4% were confident that there was little chance of being caught (if no negative consequences are perceived why not)
- 70% believed that software piracy occurs allot (Maybe this is a better approximation than the actual study itself)

Coincidence I don't think so. The wide spread availability and use of encryption software such as Pretty Good Privacy(PAP) will make the enforcement of the copyright laws all but impossible as a pirate will be able to sell software with out revealing his/her

identity or physical location. While there isn't any cause and effect relationship intend here

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Message #6
Wednesday, March 20, 1996 1:12:35 PM
Property/Access Item
From: 10
Subject: Property
To: Property/Access

THE QUESTION:
Earlier in the course I stated something to the extent that when ethics fail, laws are made. From the above one may gather that the LAWS have failed to protect the ownership of software. How do you feel ethics can be applied to the situation? Go back in the readings to gather ideas. Try to build a case for your solution

THE RESPONSE:
Shin and Taylor ask the question "Can faculty produce ethical future business leaders without themselves acting ethically?". I say no. They need to lead by example. Ethics can play a huge roll in the protection of software. It is true that teachers hint from time to time to students that they should copy software if they can. I have personally seen this happen.

"...nearly half the students had never heard a faculty member speak against illegal copying, or even worse, that 25% of the sampled students had heard a faculty member condone the copying of protected software." Solomon and O'Brien.

Some students really respect some teachers and therefore if the teachers see nothing wrong with copying software then some students will inherit this attitude. Ethics need to be applied to this issue. Teachers need to be pushed not to encourage students to copy software but to discourage them. If students are constantly, over the course of their education, hearing the message that it is wrong to copy software then they will change their behaviour. They will not feel right about copying software. Once this happens then the problem will be reduced.

Message #7
Thursday, March 21, 1996 12:30:01 PM
Property/Access Item
From: Student #12
Subject: Software Piracy/Ethics
To: Property/Access

DISCUSSION QUESTION
From the above (notes) one may gather that the LAWS have failed to protect the ownership of software. How do you feel ethics can be applied to the situation?

I believe that one reason why the laws have failed is because there is very little enforcement of them. There is enforcement of laws to protect private property (land), but enforcement of laws to protect the ownership of software is next to impossible. How do you prevent someone from copying software illegally? According to "The Effect of Demographic Factors on Attitudes Toward Software Piracy" 86.5% of respondents believe that it is unlikely that someone who 'pirates' software will be caught and subjected to penalties.

Because of the lack of, or inability, to enforce copyright laws, ethics must be applied to the situation. Universities is a very good place to start. A COMPARATIVE STUDY OF UNAUTHORIZED COPYING has as its first hypothesis:

- IS managers perceive less unauthorized software copying among their coworkers than IS faculty members perceive among their colleagues.

According to the results, this hypothesis was supported. The discussion in the text gives possible reasons for these findings:

- types of software copied may have been different
- respondents were asked about only work related issues
- levels of supervision are different
- These reasons are all attempting to explain away the findings of the study, but perhaps the findings are legitimate. Are IS faculty more likely to copy software than IS managers?

According to the study by Solomon and O'Brien there is a strong correlation between:

- Attitude on Copying and How Long Working
- Made illegal copies and Computer Literacy level

The survey results indicated that IS managers copied software less frequently than IS faculty.

I think that IS managers more fully realize the effects of software piracy because of the experience and knowledge that they have. I do not think that faculty (some, not all) have as much experience in the field as most IS managers.

Because of the above arguments I believe that there is an ethics problem in universities today. This only spells trouble for the future if the trend continues because at this point software piracy is growing and will continue to grow unless attitudes change.

(Ethics classes are a good place to start.)

Message #8
Thursday, March 21, 1996 2:14:05 PM
Property/Access Item
From: Student #9
Subject: Access Responsibilities
To: Property/Access

Who is responsible for managing society's transition to the information/computer era :
- managing the acquisition of the computer access skills and knowledge necessary to make the transition from a labor intensive to information based industry ? Do we have a throw away generation on the one hand and an elite on the other. It seems to me this is a job for Super Government ;
Set some national objectives, policies and guidelines backed by money and/or tax breaks to retrain within industry and educational institutions. This is in hopes of avoiding the devastating social costs of relegating trades and craftpersons worthless with the coming of the industry revolution.

Message #9
Friday, March 22, 1996 8:44:53 AM
Property/Access Item
From: Student #8
Subject: Access
To: Property/Access

From the instructor's article...

As I sell the idea of on-line learning to this institution and the provincial ministry that funds this project, I am constantly confronted with the issue of advancing the technologically elite, catering only to those who have the technology and the expertise. Taken to the extreme, the argument appears to be that until everyone has access to on- line learning, no one should. Paradoxically (I seem to be finding paradoxes everywhere tonight) I see on-line learning primarily SOLVING access issues. Your time. Your place. BUT the admission is a computer, modem, telephone and the where-with-all to use them.

For me online learning does solve an access issue. Living in Burnaby, the admission price to most courses is a car, money for gas, insurance and a driver's licence. The same could be said for all of the students in Chilliwack who have to come into Abbotsford for some of their courses. I know of one student in particular that does not have a car, and does not know how to drive. However, she has a fast computer, modem and telephone and knows how to use those. I think online courses better serve some students.

Message #10
Monday, March 25, 1996 4:00:00 PM
Property/Access Item
From: Student #1
Subject: RE: property
To: Property/Access

Our ethical standards on copying software are much the same as copying a music cd or photocopying copyright material. Everyone has copied a music cd off a friend so you can listen to the tape without purchasing it. This is the same as copying software to use the free copy at your home. Because we are not stealing the product from the store people tend to ignore the copyright law and even though they know that what they are doing is wrong, they probably will not get caught and it is a much cheaper alternative to buying the software themselves. This is also the case with photocopying copyright materials. Many people such as elementary school teachers for example photocopy material cover-up the copyright message on the material and distribute these copies to their class.(I have a friend that is a Grade 6 teacher and she does do this). Again because you are not physically stealing the merchandise from the store our views on stealing copies of the merchandise are blurry. Although we know it is wrong many of us still do it(copy software).

What can be done? For one ethics can be part of the curriculum in school. Not a elective course but required material in elementary and secondary schools. The only suggestion I can think of is education. If you inform the people of copyrighted material and the legal implications of making copies of them then this is a step in right direction. People are always going to copy software but if you educate more people telling them that it is wrong hopefully the number of people doing this will decrease.

Message #11
Tuesday, March 26, 1996 11:06:44 AM
Property/Access Item
From: Instructor
Subject: Re: Property Discussion
To: Property/Access

Student #8 said:

"... the academic respondents admitted copying software 73% of the time while the IS managers admitted to copying only 9% of the time." The instructor stated that maybe it was because the faculty were more honest but I would like to submit that maybe it was the software policing done in corporations like BC Hydro that kept the IS managers "clean"..

I can't disagree with that. Earlier on in the course we read that enforcement was an important tool in maintaining ethical practice. This goes well too with the idea that most people operate at level 2 ethics.

"Perhaps if computer instructors had a code of ethics that they agreed to follow they would be more careful with how they advise students to act in this matter. "

Well we do & I think we do. The article is rather dated. When I went to computer school (talk about dated) the instructors has a very casual attitude towards software copyright. I don't think that that is the case any longer.

This organization has standards relating directly to educators as well but nothing that deals directly with this problem. However P5 would seem to relate here. Perhaps if computer instructors had a code of ethics that they agreed to follow they would be more careful with how they advise students to act in this matter. This then would filter positively down to the computer students. It may not work but the alternative (instructors being agreeable to student copying software definitely won't work, so it's worth a try).

Message #12
Tuesday, March 26, 1996 11:24:22 AM
Property/Access Item
From: Instructor
Subject: Re: Property
To: Property/Access

Student #10 said:

" Some students really respect some teachers and therefore if the teachers see nothing wrong with copying software then some students will inherit this attitude. Ethics need to be applied to this issue. Teachers need to be pushed not to encourage students to copy software but to discourage them."

I completely agree.

Message #13
Tuesday, March 26, 1996 11:35:36 AM
Property/Access Item
From: Instructor
Subject: Re: Software Piracy/Ethics
To: Property/Access

Student #12 great response.

Your conclusion:

Because of the above arguments I believe that there is an ethics problem in universities today. This only spells trouble for the future if the trend continues because at this point software piracy is growing and will continue to grow unless attitudes change.

(Ethics classes are a good place to start.)

is just the kind of thinking which resulted in this course being put in as part of the CIS degree program when we started planning it about 5 years ago.

Message #14
Tuesday, March 26, 1996 11:40:07 AM
Property/Access Item
From: Instructor
Subject: Re: Access Responsibilities
To: Property/Access

Student #9 said:

"Set some national objectives, policies and guidelines backed by money and/or tax breaks to retrain within industry and educational institutions. This is in hopes of avoiding the devastating social costs of relegating trades and craftpersons worthless with the coming of the industry revolution. "

Well it's here & it's happening and the government(s) (provincial & federal) are trying to address the problem. After almost 20 years being associated with government retraining programs, as far as who is ultimately responsible I personally feel that much is up to the individual

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Message #15
Tuesday, March 26, 1996 11:46:43 AM
Property/Access Item
From: Instructor
Subject: Re: RE: property
To: Property/Access

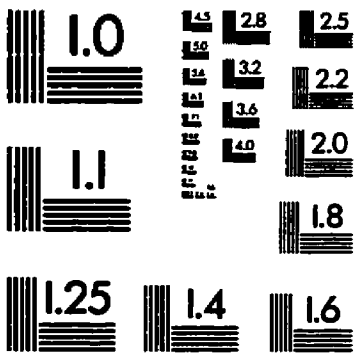
Student #1 made a very good point:

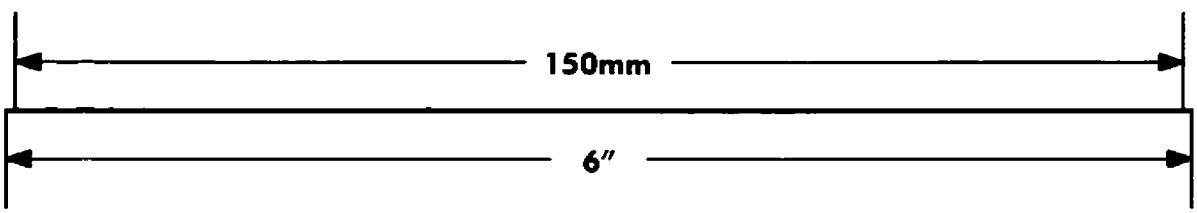
"Because we are not stealing the product from the store people tend to ignore the copyright law and even though they know that what they are doing is wrong, they probably will not get caught and it is a much cheaper alternative to buying the software themselves. "

What is stolen is the opportunity for the software company to obtain the revenue that would come to them with the sale of the

product. And the retailer to take their cut. As you stated this is not readily apparent, certainly not as much so as shoplifting, yet the effects are much the same.

IMAGE EVALUATION
TEST TARGET (QA-3)





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