# The Relationship of Perceptions of Interaction and Learning Style to Learner Satisfaction in Distance Education.

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## ABSTRACT

This study consists of two components. The first is a replication of Fulford and Zhang's (1993) Perceptions of Interaction: The Critical Predictor in Distance Education study. In that study student perceptions of overall interaction were found to be the critical predictor of learner satisfaction. The present study was undertaken in the context of a real-time, full-motion, two-way, interactive television delivery of a Child and Youth Care course using fiber optic technology to link classrooms at the University of Victoria and the University College of the Fraser Valley in British Columbia, Canada.

The effect reported by Fulford and Zhang (1993) is not observed in the present study, and difficulties with obtaining adequate numbers of subject responses, similar to those experienced by Fulford and Zhang, were encountered. Changes were made to the statistical analysis methods to better fit with the data that was collected. The analysis indicated that in spite of high levels of perceived interaction, some learners had lower scores for satisfaction.

The second part of the study investigates what relationship Learning-Style, as measured by the Kolb Learning Style Inventory (1984), has to learner satisfaction. The distributions of learning-style types show that the majority of learners in Child and Youth Care programs are likely to be Divergers who appear to have the highest satisfaction levels with an interactive television course delivery. The Accomodators are the second most common learning style type while Assimilators were the third. The Converger learning style was consistently the least represented learning style type. Chi square tests were performed to determine if the observed distributions of learning-style types deviated significantly from the expected distribution. The results were mixed, with some cohorts showing statistically significant deviation while others appeared to be consistent with what was expected.

The results obtained in the study, while not producing results consistent with those obtained in the original Fulford and Zhang (1993) study, are suggestive. Further research is indicated to explore what factors might help explain the differences in learner satisfaction and perceptions of interaction noted.

Key words: Distance Education, Fiber Optic, Interactive Television, Learning Styles, Learner Satisfaction.

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What I know of statistical methods I learned from Susan Winter. This does not imply that I learned a fraction of what she knows about the subject.

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# CHAPTER ONE

## Introduction

Education across Canada is presently undergoing re-evaluation, redefinition and restructuring (Gallagher, 1995). Governments and business are concerned about the relevance of curricula and the public at large appears to be dissatisfied with primary, secondary and post-secondary education. Economic depression has resulted in both a reduction of financial resources and a more intense focus on accountability issues with respect to those resources already committed. Learners are not only becoming more numerous, but the demands they present education providers reflect the complexity of the socio-economic environment. Issues such as equitable access, flexibility in delivery with respect to both time and place, and life-long learning, in particular with respect to continuous upgrading or re-training over the life-span are challenges that must be faced by contemporary education providers (B.C. Ministry of Skills, Training and Labour(MSTL), 1994; B.C. Ministry of Education, Skills and Training (MEST) (1996); Doney, 1995; Gallagher, 1995).

The presenting problems are multi-faceted, meaning that a single solution will be inadequate for solving all the problems. High technology, such as fiber optic delivery of telecourses using full-motion, real-time, two-way, interactive television can provide a partial solution to some of these issues. Incorporating technology into learning environments gives instructors the flexibility to customise the delivery of courses to best meet learners needs. This kind of flexibility is characteristic of the distributed learning environment, described by The Institute for Advanced Technology, University of North

Carolina (1995) as a learner-centred approach to education which integrates a number of technologies to enable opportunities for activities and interaction in both asynchronous and real-time modes. The distributed learning environment is characterised by blending a choice of appropriate technologies with aspects of campus-based delivery, open learning systems and distance education. Distributed learning environments enable institutions to deliver courses to multiple receivers no matter how geographically dispersed they might be. This means that access issues can be addressed. In addition, because any site can be both receiver and transmitter of content, resources available at one institution can become available to any learner at any site. This would help reduce redundancy and enhance the utilisation of resources.

An important consideration in education is learner satisfaction (Hackman & Walker, 1990), and an understanding of the parameters in telecourse delivery that impact on learner satisfaction is particularly important to effective distributed learning. This thesis had its genesis in the Fulford and Zhang (1993) research on learner satisfaction and perceptions of interaction where they found that perceptions of overall interaction was the critical predictor of learner satisfaction. Their suggestion that learners might have their need for interaction met vicariously rather than by overtly participating in the class was an intriguing idea. Understanding why this phenomenon occurs is an important challenge to educators since new technologies are being employed to facilitate interaction in educational settings.

We can create an environment that greatly facilitates interaction among learners and instructors, but understanding why some learners choose not to interact when given

the opportunity to do so, is an important variable that needs further study. Our capacity to research and develop technology out-paces our ability to understand learners. No matter how complex and advanced telecommunications technologies appear, the fundamental physics and engineering principles underlying them are well understood. In the research conducted for this study, it became apparent that controlling human variables in real-world, quasi-experimental designs can be problematic and difficult.

In comparison, the variables encountered in understanding complex technical systems, since they can easily be manipulated and controlled, are more easily managed as is evidenced, for example, by the extraordinary speed of development in computers. The literature reviewed for this thesis provides compelling arguments to suggest that interaction is critical for learning to take place, not only in distance education, but in all educational contexts. New technologies such as fiber optics are embraced by distance education providers because the technologies enable closer approximations of face-to-face interaction, the teaching ideal (Garrison, 1990).

The literature on learning styles, while perhaps not as compelling as one would like, hints at components of learner make-up that seem intuitively to make sense. Given that the historical roots of style emerged in the work of early 20th-century notions of "type", such as those of Jung (Vernon, 1973), it is not surprising that the notion of style strikes a resonant chord in our minds since, in essence, our western cultural context has developed with these notions as an implicit set of constructs in our schemata. In other words, we may believe in learning styles because they are part of our western, individualistic, socio-cultural heritage.

Engineers and technicians continue to develop the technical aspects of fiber optic systems, increasing reliability and capacity while reducing costs. Hardware problems are not likely to significantly impede or delay the implementation of interactive video teleconferencing in distance education. Similarly, line charge rates and equipment costs will drop over time to where they no longer represent a barrier to implementation. Ultimately it is learner satisfaction which will be the critical factor in determining whether full-motion interactive video systems are adopted in distance education. If learners are not satisfied by their educational experiences, they will not choose to attend courses delivered using the technology. Campion and Kelly (1988, p. 31) argued that:

> We need to ask ourselves what arrangement of educational strategies can provide the best access to education (in every sense of the word access) and the best possible use of teaching and learning resources.

Thus, it seems clear that the better we can understand the distance learner, the more appropriate our selection of course delivery modes will be and costly errors in selecting technologies can be avoided.

Recently, Fulford and Zhang (1993) determined that the perception of overall interaction is the critical predictor of learner satisfaction with a course. Their research indicated that personal participation may not have as powerful an impact on learner satisfaction as vicarious interaction within the class as a whole. Fulford & Zhang's (1993) findings are intriguing. It would appear that interaction with others does not necessarily need to be an overt behaviour. Learners may interact covertly or vicariously. It would seem that the interaction critical to learning does occur, but it is simply not visible. This interpretation is congruent with the findings of Kruth and Murphy (1990), who describe

vicarious interaction as a process where learners participate internally, answering questions silently. The "conversation" in which they engage is internal and thus does not manifest itself in directly observable interactions.

Several questions emerge from Fulford and Zhang's (1993) study. First, can their study be replicated and similar results be obtained? Secondly, what are the implications for distance education? Finally, can distance education providers find some indicator that might be useful in categorising learners so that satisfaction levels can be maximised? In the present study, in addition to a replication of Fulford and Zhang's (1993) research, learning-style types were considered as a variable that might help account, at least in part, for learner satisfaction with interactive television course delivery.

In the current socio-economic context, issues of access to education for learners and cost reductions of course delivery for education providers, government and other funding sources have taken a priority in the educational communities agenda. The current educational infrastructure has been based on the "bricks and mortar" approach where demands for access have been met with new buildings (Ferguson, 1990). In order to effectively address these concerns, we must have a number of flexible strategies available to employ. Distance education has demonstrated that it is an effective means for delivering courses to learners, as will be examined in the literature reviewed in Chapter Two. The challenge currently is to develop modes of distance education that can enhance access while keeping costs to reasonable levels. Since the demand for post-secondary education is increasing, given an increasingly complex and technical society, education providers are exploring new technologies and techniques that will more effectively use the resources that are presently available to deliver courses in novel ways. Interactive

television is one of the alternatives being examined. This thesis explores learner satisfaction and learning-style type to see if there is some relationship between these variables that might be useful in future distance education delivery designs.

# CHAPTER TWO

Literature Review

## Overview

In this study, the relationship between learner perceptions of two kinds of interaction (personal and overall), learning style and learner satisfaction in an interactive television classroom were investigated. This chapter reviews the current literature in the field of distance education and makes a case for the importance of understanding the qualities of the learner so that the utility of distance education course delivery can be optimised.

## Education and Learning

Garrison (1990, p.16) points out that "Education is a social, not a private, activity which ultimately demands critical analysis and testing of understanding to avoid ideology and indoctrination." The importance of the interactive quality of the educational experience cannot be over-emphasised. It is clear that content is a necessary component of an educational experience, but interaction with content alone, that is with books and the like, does not necessarily lead to a meaningful learning experience. It is what learners and teachers do with the content that quintessentially defines teaching and learning, the educational process.

The difference between education and learning is that the former reflects the influence of an educational institution in the process. Broadly speaking, it is the distinction between learning on one's own and learning with others. In colloquial discourse we might hear the two phrases "self-educated" or "self-taught" used interchangeably to describe a situation where an individual learns on one's own. A more accurate term is "self-learned". The salient difference between the two concepts is that unlike learning, which is a personal experience that does not require interaction with others, education is an interactive process where a teacher and a learner or learners interact to communicate and between them, create learning.

Interactive-Constructive Perspective

Characterised by a complex internal cycle of iteration and re-iteration, interactionist-constructivist learning theory incorporates two major premises. First, that knowledge is constructed by the learner, not passed on as an "object" or body of facts. And second, that learning is not passive, it is an interactive activity (Holliday, Yore & Alvermann, 1994; Yore, 1995). This conceptualisation of learning diverges from the traditional notion of the learner receiving wisdom from an expert as if an empty vessel waiting to be filled. The interactive-constructive perspective of learning implies that learners generate meaning and understanding from their interactions with ideas and experiences internally held, and also with the experiences, understandings and meanings held by others involved in the educational context, including other learners.

Learning is a process of assimilation and accommodation. New information is assimilated into existing schemas, or schemas themselves are changed to accommodate

new knowledge. In essence, interactionist-constructivist theory is about meaning-making. Learners and instructors engage in an educational interaction where content is reflected, analysed and re-constructed in the context of current experiences and prior knowledge. The learning environment and sociocultural context a learner inhabits can be seen as a kind of organising structure upon and within which experience occurs, prior knowledge is accessed and new ideas are integrated. Thus, learners from divergent sociocultural domains may experience the same phenomenon differently. For some learners an event can be discrepant for others, routine. Learners engage in a process of re-structuring; some might be assimilating a discrepant experience into an existing schema, or model of how things are, while the others may be re-defining their model of how things are, accommodating their schema to incorporate novel experiences which do not fit their pre-existing knowledge structures.

Traditional correspondence-based distance education utilising 19th century technologies was characterised by what appears to be a minimalist approach to interaction. Assignments took several weeks to shuttle from learner to instructor and back again. This delayed feedback model was not optimal for learning, particularly when one considers that often the structures into which knowledge was being constructed were flawed. With limited opportunities for interaction, misunderstandings and misconceptions can become the knowledge structures upon which future learning is to be integrated.

Interactive technologies utilised in contemporary distance education enhance the opportunities for educators to design and deliver interactive-constructive educational experiences. In an interactive-constructive classroom all learners serve as information

sources. Thus, it follows that the scope of referential frames a learner is exposed to is extended and the potential for learning is increased as a result. As indicated earlier, the primary strength of this model of teaching and learning is that knowledge is constructed, tested and contextualised externally as well as internally, which helps to avoid the potential pitfalls of private non-referential learning (Garrison,1990). Non-critical acceptance of ideas, common in rote learning in isolated learning environments, is minimised by socially shared cognition.

Learner Interaction

Education, be it face-to-face or distance, is dependent on two-way communication (Garrison,1990). Passive access to information is not sufficient; there must be active participation in the educational experience for information to become meaningful knowledge. Dede (1991) suggests that as interactivity increases, feedback to learners can be more effective in helping construct knowledge and understanding. The distance education literature describes the critical importance of interaction in the learning process (Anderson 1987, Keegan 1990, Shale & Garrison 1990 ). Garrison (1990) considers interaction, as is found in face-to-face classrooms, to be the educational ideal distance educators hope to achieve. The literature suggests that if learners are not active participants in the instructional process, they tend to become distractible and less motivated. Interaction leads to higher levels of success and more positive attitudes in learners (Flanders, 1970; Garrison, 1990; Hackman & Walker, 1990; McCroskey & Andersen, 1976; Ritchie & Newby 1989).

Garrison (1985, 1990) has long been an advocate of interactive two-way teleconferencing in distance education. The most common systems use either remote switching systems that essentially create conference calls so that learners can interact from their own homes or they employ dedicated teleconferencing sites with microphones and speaker systems the learners must travel to. Other researchers (May, 1993, 1994) question the effectiveness of the "black box" in facilitating interactive learning. May found that women were dissatisfied with the technology and the experience of teleconferencing in general. Lack of the visual component was identified as a problem in several respects, May suggests that native learners for example, often are dependent on visual cues for communication.

Recent developments in computing technology enable learners to interact with each other in "cyberspace" communicating using written language or graphics. In some respects this is a somewhat regressive step, for it is essentially a high-technology form of correspondence, albeit distinctly quicker than traditional postal systems which have earned the derisive title snail-mail. Computer-mediated conferencing does not provide the kind of real-time, interactive video capability that fiber optics can provide.

Three kinds of interaction have been described by Moore (1989). Learner-Content, which is defined as the process in which a learner intellectually interacts with the material to create change in the learner's understanding, perspective or cognitive processes. This kind of interaction is what occurs when we access media such as books or audio-visual materials, without the participation of others.

A second kind of interaction is Learner-Instructor, where motivation, stimulation and explanation or clarification interactions occur. These are the interactions we are familiar with in the traditional teacher-directed classroom setting, where learners and the instructor act together to construct meaning.

The third kind of interaction is Learner-Learner, where interactions occur between learners alone or in group settings with or without the real-time presence of an instructor. Although Moore did not discuss interactions with others outside the educational system of instructors and learners, it seems reasonable to assume that other significant individuals may interact informally with a learner from time to time. The process of constructing knowledge should not, therefore, be seen as being restricted to a single spatial or temporal locality, but as a process that occurs throughout the lifespan.

In addition to Moore's three kinds of interaction, a fourth type of interaction has been proposed for inclusion in the taxonomy; the Learner-Interface interaction (Hillman, Willis & Gunawardena, 1994). Interaction via a technological medium requires that the user be comfortable with the technological interface, be it telephone, computer, or television. The Learner-Interface interaction is described as "...a process of manipulating tools to accomplish a task." (Hillman, Willis & Gunawardena, 1994, p.34). The relevance of this fourth type of interaction is supported by the findings reported by May (1993,1994) where it was suggested that learners did not feel comfortable talking to the "black box".

Distance Education

Distance education has a tradition harkening back at least 150 years to the days of the British correspondence schools. The literature identifies a number of factors which

have led to the development of distance education and its rapid growth in recent years. Dede (1990,1991) describes six of these factors including technological developments, associated cost reductions, demographic factors, economic factors, political forces and changes in pedagogical practices.

The structural attributes of distance education reflect the demands of the learners who access this mode of education. Adult learners demand access to learning with flexibility to meet their needs. Driven by socio-economic factors such as job obsolescence or the prohibitive cost of educational leaves, learners need to access education on their own "turf". This is, in essence, what distance education is all about; access to educational opportunities without the constraints of time and place demanded by a traditional bricks and mortar approaches to education.

Traditional distance education differs from conventional face-to-face instruction in a number of ways. Keegan (1980) examined the various definitions of distance education in the literature, proposed by Holmberg(1977), Moore(1973) and Peters(1973). Summarising their work, he defined distance education as being characterised by:

1. The quasi-permanent separation of teacher and learner.
2. The influence of an educational organisation.
3. The use of technical media.
4. The provision of two-way communication.
5. The quasi-permanent absence of a peer learning group.

Garrison and Shale (1987) pointed out that the above descriptors did not embrace the more recent developments in technology which can support group learning and "real-time" interaction. They focus on the communication dimension of distance education. They propose that distance education is primarily non-contiguous, technologically mediated, two-way communication between learner and instructor. Dede (1990, 1991) defined the process distance education as a technologically mediated, interactive phenomena, where a technological medium is the interface between individuals which allows interaction to occur. He saw technology as a tool which enhanced collective learning with spontaneous (real-time) interactions.

Barker, Frisbie and Patrick (1989) proposed a taxonomy of distance education which organises the field into two major categories; correspondence-based and telecommunications-based systems. They arranged the various approaches to distance education according to level of interaction, starting with the highest and proceeding to progressively less interactivity. In the correspondence-based category (category 1) they rated print materials supported by audiotapes and/or videotapes as highest, print with support from broadcast signals (radio or TV) but without real-time, two-way communication second, and print only methods were rated lowest. The telecommunications category (category 2) was also organised hierarchically from high interactivity to low interactivity:

1. Two-way full-motion video (with audio).
2. Two-way freeze-frame video (with audio).
3. Two-way audio, one-way video (full-motion).

4. Two-way audio, one-way video (freeze-frame).
5. Two-way audio only.

Definitions and descriptions of distance education are often victims of the rapid pace of technological progress. Technologies emerge with bewildering speed so that it appears as though anything written about the "state of the art" is already obsolete by the time it is published. In spite of this, three main concepts emerge which are the core of modern distance education: interaction, communication and technology (Barker, Frisbie & Patrick, 1989; Dede, 1990;1991; Draper, 1987; Garrison, 1985,1990; Garrison & Shale, 1987; Schlosser & Anderson, 1993).

Role of Technology

Distance education is a phenomena that has been dependent on technology since its earliest days. In the mid 1800s, the development of reliable, affordable postal systems such as England's "Penny Post" of 1840, provided an opportunity entrepreneurs such as Isaac Pittman seized, offering instruction in shorthand by correspondence. Pittman went on to take advantage of the new technology of the phonograph just three years later.

Advances in electronic means of communication have been adopted quickly by distance education providers. Buckland and Dye (1991) report that by the 1920s, over 176 radio stations had been built by educational institutions. Just a decade later, experiments in television were conducted at Purdue University, Kansas State University, and the University of Iowa. Television technology was not robust enough until 1951 when Western Reserve University offered the first continuing series of a broadcast television course. During the decades from 1960-1980 satellite technology matured to the point

that since 1985, private networks have been providing course delivery nation-wide in the United States.

The central thrust of development in communications technologies has been to transmit more information, more quickly. The challenge is to achieve a reasonable balance between cost and performance. For example, compared to satellite-based communications, copper cable has the advantage of being inexpensive, but with the disadvantage of narrow bandwidth, which is the capacity to carry signals. The most recent advance in communications technology has been in the area of fiber optics. Not only is glass fiber cheaper than copper, it has a tremendous advantage in bandwidth. If one were to conceptualise bandwidth in terms of roadways, copper cable is analogous to a two lane, narrow path with information being carried in small packages at relatively slow speeds. Fiber optic cable could be thought of as an kind of hyper-expressway consisting of 20,000 lanes with transport trucks carrying huge loads of information at the speed of light.

To gain an appreciation for the bandwidth demand that real-time video presents, one should consider that in order for the human eye to perceive full motion video, images must be presented at a rate of 30 frames-per-second. In a movie theatre, the image appears to be smooth and continuous even though we are actually looking at a dark screen for half the time. On a typical video graphics array (VGA) computer monitor images are coded into discrete picture elements or pixels which are presented in a 640 x 480 matrix. Each pixel represents one discrete point in the image. If that point changes over time, which is the case with full-motion video, then not only do 307, 200 pixels have to be

transmitted 30 times a second, but they may also continuously change. In essence, the problem is that there is too much information.

Some of the data compression schemes used to overcome this problem of too much information and not enough time cut out parts of the signal being transmitted. One method is to send fewer frames-per-second, thus sacrificing smoothness. Another method transmits only those parts of the image which change. Both of these schemes can result in unnatural jerky motions and asynchronous sound tracks, it is like looking at an old foreign movie with a dubbed-over sound track. Because fiber optic has a carrying capacity four orders of magnitude ($10^4$ = 10,000x) greater than copper wires (Tsang, 1991), data compression strategies such as these above are unnecessary.

Since the progress of distance education has been towards real-time interactive communication which will replace passive reception of information, bandwidth capacity is a pivotal factor. The information carrying capacity of fiber optic cable allows real-time, two-way, full-motion, interactive video, meaning that older compressed video or one-way video technology is obsolete. Fiber optic frees learners from need to endure the unnatural and distracting qualities of the various data compression techniques discussed above. In essence, it is now possible to create a more satisfactory learning experience for distance learners.

Learner Satisfaction

Hackman and Walker (1990), investigating course effectiveness, concluded that learner satisfaction ultimately determines the effectiveness of distance education. They argue that in the final analysis, it is the learner who decides if the program or course was

worth the inevitable trade-offs distance education demands. Learner satisfaction is a subjective measure and as such eludes meaningful quantification. If one were to subject two different learners to the same stimulus, they may each have different responses to that stimulus, in the same way that any two people might have different subjective opinions about a movie or a book for example. One may have a positive experience, and thus will have a positive attitude regarding the experience, while the other may have completely the opposite experience and attitude.

Studies exploring the attitudinal dimension have not been as prominent in the evaluation literature as have studies that focused on outcomes such as persistence (students who complete the course in question), motivation, and student achievement as measured by grades (Biner, Dean & Mellinger, 1994). This is somewhat surprising considering that Kirkpatrick (1979) articulated a model for evaluation comprised of four levels: first measurement of the participants' attitudes or reactions, second, assessment of learning, third, evaluation of changes in learners' behaviours, and fourth, assessment of desired impacts and outcomes. Kirkpatrick (1979) is clear in stating that positive learner attitudes result in learners being more likely to pay attention and learn, and that the benefits of the program will be maximised if the learners like the program. Adult learners are likely to "vote with their feet", withdrawing from programs that do not meet their needs. This has implications for post-secondary institutions as funding dollars become increasingly harder to come by. One would expect that the state of the art would advance somewhat in 15 years, but measuring grade outcomes persists, in all likelihood, because the information is there, not because it is of any demonstrated utility.

Recently, Fulford and Zhang (1993) developed an instrument for assessing learner satisfaction with a distance education telecourse offered to elementary teachers in Hawaii using the Hawaiian Interactive Television System (HITS). The instrument measures learner perceptions of personal interaction and overall interaction and how satisfied they were with the course. The study determined that the perception of interaction is a critical predictor of learner satisfaction with a distance telecourse. Their research indicated that actual personal participation may not have as powerful an impact on learner satisfaction as vicarious interaction within the class as a whole. The notion of vicarious interaction has been described as the process of learners participating internally, silently responding to questions (Kruh & Murphy, 1990).

Fulford and Zhang's (1993) findings are intriguing as they suggest that interaction with others does not necessarily need to be an overt behaviour. Learners may interact covertly or vicariously. It would seem that the interaction critical to learning does occur, but it is simply not visible. This interpretation is congruent with the findings of Kruh and Murphy (1990). They describe vicarious interaction as a process where learners participate internally, answering questions silently. The conversation they engage in is internal and thus does not manifest itself in directly observable interactions.

One may speculate why it is that some learners participate overtly in classrooms, while others do not. Fulford and Zhang's (1993) research indicates that both kinds of learner, the overt and the covert participant, are satisfied with their learning experiences. So with respect to learner satisfaction there would not, on the surface at least, appear to be any difference between the two kinds of learner.

Biner, Dean and Mellinger (1994) argue that assessing student satisfaction is useful for teasing out those program areas requiring improvement. As predictors of learner academic success and program effectiveness, Kifer (1992) argues that the affective domain is the core component of his three-dimensional (affective, cognitive, behavioural intent) model. Perhaps differences in learning style might explain the different approaches to participation discussed above.

Learning Styles

It is possible that the differences between learners' satisfaction and participation rates could be explained by differences in learning style. Kolb (1976,1984) explains that he has adopted both Piaget's ideas about cognitive development (assimilation and accommodation) and Guilford's structure of intellect model (convergence and divergence) in creating his model of learning styles which identifies four modes of learning: Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualisation (AC), and Active Experimentation (AE). These modes are present to some degree in all learners, but in most cases, an individual prefers some modes more than others. Kolb's learning-style inventory (LSI) describes and characterises four kinds of learners:

1. Concrete experiential learners learn more by relying on their feelings, they are adaptable and open to change. They generally find theoretical approaches unsatisfying, and learn best from specific examples in which they can become involved.
2. Reflective observers are more likely to learn by watching and listening. They find it easy to approach problems from multiple perspectives. Objective and careful, reflective observers are more likely to prefer lectures to active participation in learning situations.
3. Abstract conceptualisers, in contrast to concrete experiential learners, are more oriented towards the use of logic and reason in learning. Typically they rely on

theoretical understanding and are generally more intellectual in their approach to situations.

4. Active experimenters learn by doing. They prefer engaging in projects to passive learning situations such as lectures.

Building on these constructs, Kolb has identified four learning style types, the accommodator, the diverger, the Converger and the assimilator. These types are amalgams of the learning modes discussed above. The Converger combines the modes of abstract conceptualisation and active experimentation. Skilled at the practical application of ideas, this learning style is characteristic of those who specialise in the physical sciences. The Diverger combines concrete experiential and reflective observation and is generally imaginative and emotional. Kolb describes this type of learner as one who enjoys brainstorming, but approaches problems by observing rather than acting. The Assimilator combines abstract conceptualisation and reflective observation. This learning style is found in those whose strength is in creating models and theories. Typically Assimilators are concerned more with abstraction than with concrete ideas and practical uses for the theories they generate. Finally, the Accomodator combines concrete experience and active experimentation. This kind of learner enjoys experimenting and other "hands on" experiential situations. Accomodators tend to be intuitive and highly adaptable, but depend on interaction with others for information and their analytic abilities.

Kolb's model of learning styles emerged from his study of experiential learning theory. He writes that he has drawn on the works of Dewey, Lewin, Vygotsky and Piaget whose work in pedagogy, psychology and philosophy helped shape and define the

fundamental underlying structure of experiential learning theory, including the contemporary interactive-constructionist model. Kolb argues that there are two basic structural dimensions underlying the learning process: the first is the dialectical tension between polar opposites in modes of experiencing, concrete experience and symbolic interpretation; the second is the transformation of experience either by reflection or by action. From these theoretical constructs, his notions of concrete experiential and abstract conceptualisation (CE-AC) representing the former dimension, and the latter represented by reflective observation and active experimentation (RO-AE).

Kolb has incorporated Jung's psychological typology into his Learning Style Inventory. Jung distinguished four elemental psychological functions: thinking, which is the intellectual domain; feeling, which is the evaluative domain; sensing which is the reality-based perceptual domain; and intuiting, the unconscious perceptions and processes (Jung, 1931). These functions are manifestations of essentially the same two constructs described above; that is, sensing and intuiting are the opposites in how we perceive the world while thinking and feeling are the polar opposites on the transformation dimension, or how we make sense of what we perceive.

Other authors have developed learning style models which also have their roots in the archetypes described by Jung (1921, 1923). Using Jung's work as a foundation, Gregorc (1982) developed an inventory which identifies four learning styles on a two-dimensional perception/processing co-ordinate system:

1. Concrete Sequential learners are practical, structured and organised.
2. Abstract Sequential learners are logical and critical.

3. Abstract Random learners are reflective.

4. Concrete Random learn by experimenting and trying out new ideas.

Gregorc argues that style is a "symptom" of the underlying qualities of one's psychological make-up and inner mental driving forces. As learners, we have preferred modes of managing or mediating the major inner components of our psychology: perception and ordering. Gregorc suggests that perceptual abilities or strengths shape the way we grasp information and ordering abilities guide how we organise information. Thus, perception ranges from abstractness, which is the ability to appreciate art and music and to experience emotion and reason, to concreteness which is the ability to physically interact with the environment. Ordering can be seen as the polar ends of sequencing and randomness. Sequencing is the ability to order our world in a linear (sequential) manner while randomness reflects the ability to think and work in a non-linear manner.

Kolb's model addresses essentially the same dimensions as the Gregorc inventory, and is significantly less expensive to obtain and use. It has the further advantage of being brief, which reduces respondent fatigue and frustration. Kolb's inventory has been used extensively in career planning, which increases the face validity of the instrument in the context of a practice-based research setting.

Dille and Mezack (1991) used the Kolb Learning Style Inventory, among other measures, to explore possible explanations for the attrition rates from telecourses at a community college. They determined that people with higher scores on the CE dimension would be unsatisfied with traditional telecourses because of the lack of interpersonal interaction. Since interactive fiber optic course delivery offers the potential for increased

levels of interaction compared with traditional telecourse delivery modes, one would hypothesise that Assimilators and Divergers would potentially be more successful in telecourse offerings than Convergers and Assimilators since they score higher in the CE domain.

They also found that learning style was not significant in predicting success or non-success in traditional telecourses. Accomodators had the highest success rate at 81.1% and Convergers were second highest at 75.9%. Assimilators were third at a 73% success rate and Divergers were last at a 59.5% success rate. Dille and Mezack (1991) found that the position on the continuum of abstract conceptual and concrete experiential (AC-CE) modes, alone, was the significant predictor of telecourse success rather than the complete learning style which is a combination of both the AC-CE and the AE-RO modes.

Learning Styles and Perceived Interaction

Fulford and Zhang's (1993) research into perceptions of interaction reveals evidence of the three core components of distance education discussed earlier in this paper: communication, technology and interaction. Their focus was on the affective domain in an evaluation of an interactive telecourse system produced in Hawaii. They were interested in learner satisfaction as a dependent variable with perceptions of interaction (overall and personal) being the independent variables.

The instrument used was a 28 item survey using six-point semantic-differential scales and was devised to include several redundant parallel questions to increase reliability. The variables being measured were: (a) personal interaction -the perceived individual involvement of each participant, (b) overall interaction -the perceived

involvement of other members of the class, (c) satisfaction -the perceived value and quality of instruction.

Fulford and Zhang (1993) concentrated on two of Moor's types of interaction discussed earlier, learner-instructor and learner-learner. The instrument asks the learners to rate their interactivity with both the instructor and with their fellow learners. The course offered in the Hawaiian study was a ten session in-service training course on the Developmental Approaches in Science and Health (DASH) program for K-6 teachers using the Hawaiian Interactive Television System (HITS). The classes were held after school at five sites to accommodate the learners' (who were all teachers) schedules. There was no cohort of learners in the classroom at the origination site. The learners at each site met for 60 minutes each session with a DASH facilitator before moving to the HITS classroom. The DASH instructional panel led an introductory check-in activity then presented a 20 minute pre-recorded video. The learners then participated in collaborative activities for 15 minutes after which students from each location presented to the other groups for three minutes each. The facilitators then answered questions the learners faxed to them. Each broadcast session lasted 75 minutes.

Fulford and Zhang (1993) analysed their data by first doing a Pearson's *r* (product-moment) correlation to identify significant correlations among the factors. They found significant positive correlations between personal interaction and overall interaction in the three sessions they tested: $r = 0.61$, $r = 0.66$, $r = 0.71$ ($N = 123$, $p < 0.01$). The mean of the correlations were obtained using Fisher's z transformation; $r = 0.66$. This accounted for 43% of the variance ($r^2$). The correlations between personal interaction and

satisfaction were $r = 0.37$, $r = 0.40$, $r = 0.41$ ($p < 0.01$). The mean of the correlations was found to be $r = 0.39$, accounting for 15% of the variance. For overall interaction and satisfaction, the correlations were $r = 0.67$, $r = 0.64$, and $r = 0.73$ ($p < 0.01$). The mean of the correlations was $r = 0.68$ which accounted for 46% of the variance. They found, after performing multiple correlations in the regression model, that inclusion of personal interaction with overall interaction in the predictive model had little appreciable effect. They also report that the hierarchical partitioning of the proportion of variance accounted for in the two-predictor model (with perception of overall interaction as the first variable in the regression) was significant in all three cases with $F_{(2,120)} = 48.21$, 41.89, and 76.11 respectively ($p < 0.01$). They found that perceptions of personal interaction accounted for only 3% of the variance in the third session ($r^2 = 0.56$), and that entering the variable first in the regression model had no impact on significance for the variable.

A 2x3 ANOVA using repeated measurements on both independent variables was conducted. The time variable had three levels; beginning, mid-point and end, while perception had two levels; personal and overall. They found that time had a significant effect; perceptions of interaction decreased over the ten week course period. A second finding is interesting. Learners tended to rate overall interaction significantly higher than their own personal interaction. This finding suggests that it is not necessary to attempt to engage all learners with interactive activities. It would appear that learners will have satisfactory experiences if they perceive interaction occurring overall. A summary of Fulford and Zhang's findings follows:

1. Perception of overall interaction may serve as an indicator of "vicarious" interaction.
2. Perception of personal interaction seems to be a moderate predictor of satisfaction.
3. Perceptions of overall interaction account for more of the variance in satisfaction than perceptions of personal interaction.
4. Although combining the two kinds of perceptions added very little to the predictive power of the model, it is clear that perceptions of high interaction are correlated with high ratings of learner satisfaction.
5. With the passage of time, learner perceptions of both kinds of interaction decrease.

Fulford and Zhang conclude that since perceptions of overall interaction are the critical predictor of learner satisfaction, future research should investigate what specific strategies might be appropriate for enhancing learner perceptions of group interaction.

An interesting question that emerges from their study is what quality in learners leads some to actively participate, while others participate vicariously? The intent of the present study was to first replicate Fulford and Zhang's work, and then add a new variable, learning styles, to see if it might shed some light on the phenomenon they described.

Since the literature reports the importance of learner satisfaction to course effectiveness, understanding learners is important if we are to make informed pedagogical decisions about interactive telecourses. Dille and Mezack (1991) found that Kolb's Learning Style Inventory can be a useful instrument for predicting success in traditional

distance telecourses. Fulford and Zhang (1993) report that learner perceptions of overall interaction, rather than perceptions of personal interaction is the critical predictor of learner satisfaction in interactive telecourses. These reports suggest that learner satisfaction and success in telecourses may be related to their learning style. Perhaps a model of learner satisfaction which incorporates learning styles as a factor for consideration might have utility in optimising the fit between course delivery methods and learners so that learner satisfaction with a telecourse and ultimately success can be ensured.

## Research Questions

The intent of the present study was to first replicate the Fulford and Zhang (1993) study in the context of a full-motion, interactive, two-way television delivery of a telecourse. The second component of the study was to determine what the subjects' learning styles were, using the Kolb LSI (1984) to measure the learning style variable, and then to see if there was a relationship between learning style and learner satisfaction. In their study, Fulford and Zhang (1993) posed five research questions:

1. What is the relationship between learners' perceived personal level of interaction and their perceived level of overall interaction?
2. How well does the perceived level of personal interaction predict learner satisfaction with instruction?
3. How well does the perceived level of overall interaction predict learner satisfaction with instruction?

4. Is there a relationship between learners' perceived levels of both kinds of interaction combined and their satisfaction with instruction?
5. Do the perceptions of interaction change over time?

Since the results obtained by Fulford and Zhang (1993) indicate that perceptions of personal interaction is not a significant predictor of learner satisfaction, question four (Is there a relationship between learners' perceived levels of both kinds of interaction combined and their satisfaction with instruction?) was eliminated from the present study. In addition to the four questions above relating to the replication of the Fulford and Zhang (1993) study, the following five questions refer to the Kolb learning-style inventory:

6. What is the distribution of learning-style types at the University of Victoria (UVIC) and at the University College of the Fraser Valley (UCFV) for both trials of the fiber optic course delivery?
7. What is the learning-style type distribution in the UVIC conventional distance education cohort of learners?
8. What is the learning-style type distribution in the UVIC conventional on-campus cohort of learners?
9. Do the observed distributions deviate significantly from the normative distribution reported by Kolb (1984)?
10. Is there a relationship between learning style as measured on the Kolb LSI and learner satisfaction as measured by the Fulford and Zhang (1993) instrument?

Fulford and Zhang (1993) have shown in their study that perceptions of overall interaction has the strongest relation to learner satisfaction. Since there appear to be two kinds of learners identified in the Fulford and Zhang (1993) study (those who overtly interact and those who vicariously interact), it may be possible to administer the Kolb LSI to learners interested in interactive telecourses to help ensure learner satisfaction, if there is some relationship between learning-style and satisfaction with the telecourses in the present study.

# CHAPTER THREE

## Method

The research undertaken in this study was conceptualised as having of two components. The first component was to replicate Fulford and Zhang's (1993) study which measured three variables: learner perceptions of personal interaction, overall interaction, and personal satisfaction in an interactive television delivery of a course. The second component was to introduce an additional variable, learning style, to see if there was any relationship between learning style and learner satisfaction.

The conceptual model being tested in this research project is shown in Figure 1. Fulford and Zhang (1993) found that learner perceptions of overall and personal interaction were predictors of satisfaction, with overall interaction being the critical predictor. These relationships are shown by the lines pointing from the two independent variables, personal and overall interaction to the dependant variable, satisfaction. The new question being asked in the present research was what relationship does learning style have to learner satisfaction?

In Figure 1 the relationship of the independent variable (learning style) has been shown to be linked with learner satisfaction. It seems reasonable to assume that learning style may also be related to the other two independent variables as indicated by the dashed lines linking learning style and perception of overall interaction and perception of personal interaction. However that question was not included in this study.

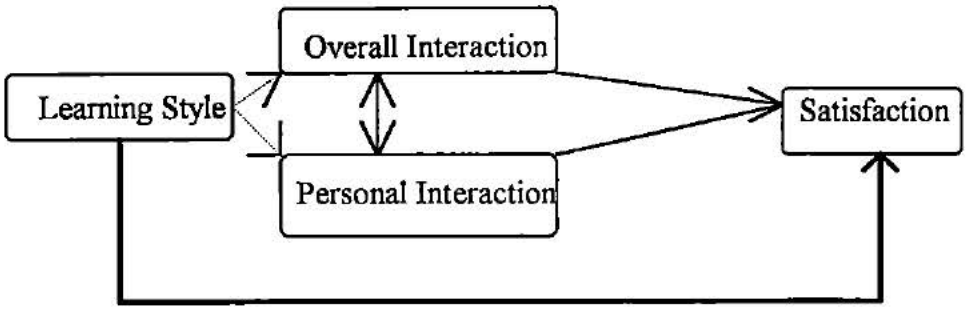


Figure 1

Conceptual model. The hypothesised relationships are indicated by lines joining the variables.

## Instrumentation Overview

### Interaction/Satisfaction Measure

The intent of this research was to replicate Fulford and Zhang's (1993) research on learner perceptions of interaction by administering their instrument with minor editorial modifications to descriptive categories (such as campus and ethnicity) and grammar (Appendix A). The instrument is a 28 item survey using six-point semantic-differential scales. The instrument was devised to include several redundant parallel questions to increase reliability. Of the 28 questions on the questionnaire,18 items were used to measure the three variables:(a) personal interaction - perceived individual involvement of each participant, (b) overall interaction - perceived involvement of other members of the class and (c) satisfaction - perceived value and quality of instruction. Items 4, 5, 6, 7, 8, 10, 14 measure personal interaction. The average of these items is used for the variable "personal interaction." Items 2, 9, 11, 13, 16 measure overall interaction, the variable

"overall interaction" is computed from the average of these scores. Items 3, 20, 21, 24, 27, 28 measure satisfaction. The variable "satisfaction" is the average of the scores on these items.

According to Zhang and Fulford (1994), in a second study where the interaction instrument was used, the instrument was found to have a Chronbach's alpha of 0.78 on the perceptions of personal interaction items and the overall interaction items had a Chronbach's alpha of 0.61. The measures combined had an internal consistency index of 0.82. The instrument was administered at the end of the class sessions on the fourth, eighth and twelfth weeks of the 13 week term by the instructors at their respective sites (see Figure 2).

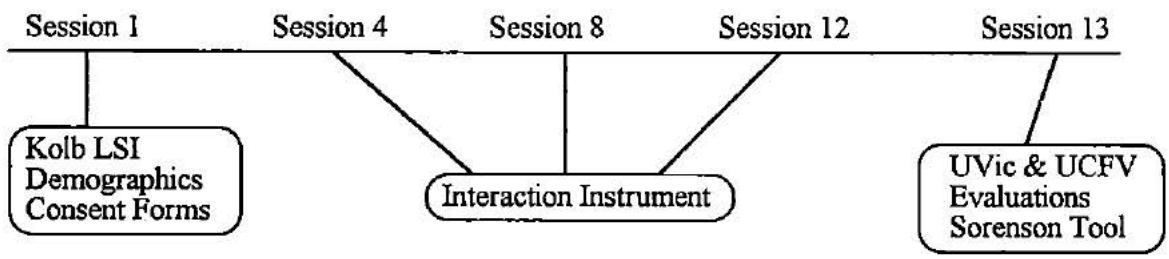


Figure 2

Data collection points: January - April 1995

The instrument required approximately five minutes to complete. Fulford and Zhang (1993) administered the instrument on the second, sixth and tenth sessions of a ten week course. In both the Fulford and Zhang and the first trial of the present study the interval between administrations was the same, while in the second trial of this study the subjects had two additional weeks experience with interactive television prior to their first

exposure to the instrument. It is possible that this extra exposure to an interactive television classroom may have depressed the learners' perceptions of interaction and satisfaction since Fulford and Zhang (1993) reported a decrease in satisfaction and perceptions of interaction over the course of their study. The responses collected were processed according to the procedures outlined above. For each learner a value was obtained which represented his/her score on the three variables, perceptions of personal interaction, perceptions of overall interaction and perceived satisfaction for each of the three sessions.

Learning Style Measure

In addition to replicating the Fulford and Zhang (1993) study, the purpose of this research was to explore the relationship of learning style to learner satisfaction. The instrument (Appendix B) chosen to measure the subject's learning style was the Kolb Learning-Style Inventory (1984). The Kolb inventory provides a perception-processing indicator that suggests what career(s) best match a person's learning style. It has been successfully used for career planning and counselling. Kolb's Learning-Style Inventory appeared to be particularly appropriate in the context of this study since the Child and Youth Care degree is a professional rather than a liberal arts degree. If the inventory correctly predicted learning style based on the subject's career choice, this would be evidence of the basic soundness of its theoretical foundations and would increase confidence that learning style is a valid, reliable construct. A second strength of the Kolb inventory was that it had been shown by Dille and Mezack (1991) to predict learner satisfaction with different modes of course delivery.

In addition to the Kolb inventory, consideration was also given to the well known Gregorc learning style instrument which is frequently cited in the literature. However, Gregorc's is also one of the more expensive inventories to obtain, which made it less attractive in the context of this research. Since Kolb's inventory appears to be both theoretically congruent with the well-known Gregorc scale and is capable of providing essentially the same information, the decision to use the Kolb inventory was judged to be reasonable.

At the first session of the CYC 201 fiber optic delivery project, the 1985 revised edition of the Kolb Learning Style Inventory was administered. The instrument consists of twelve sentences with four endings to each sentence. Respondents were asked to rank the sentence endings according to how well they felt each ending reflected how they would go about learning. They were to assign a 4 to the ending that describes how they learn best and a 1 to the ending that seems least like the way they learn. They were asked to rank all of the endings from 1-4 with no ties permitted.

Following the procedures outlined in the scoring and interpretation booklet, the results from the learning style instrument were summed to obtain scores for each of the four learning modes Kolb identifies; concrete experience (CE), reflective observation (RO), abstract conceptualising (AC) and active experimenting (AE). The CE score is then subtracted from the AC score. The result of this calculation identifies the Y - axis component of the individual's learning style. The RO score is then subtracted from the AE score, the result of this calculation indicates the X - axis component of the learner's learning style. These two values are then used to place the individual on the Kolb

Learning-Style Grid, a four quadrant graph with AC - CE represented on the Y axis and AE - RO on the X axis. Quadrant 1(upper left-hand) is the Accomodator learning style, quadrant 2 (upper right-hand) are Divergers, quadrant 3 (lower left-hand) are the Convergers and quadrant 4 (lower right-hand) are the Assimilators.

## Procedures

### Interactive Television Classrooms

Of the technical advantages of fiber optics over copper wire discussed in Chapter Two, the most relevant advantage is the increase in bandwidth, or the capacity to carry signals provided by fiber optic technology. Fiber optics permits real-time, full-motion, interactive television between two non-contiguous sites. The delivery of CYC 201 (the first trial) was designed to take advantage of the capacity for real-time interaction.

The CYC 201 course is routinely delivered in conventional on-campus classrooms by the each of the two co-instructors involved in this pilot project. The general format of the course is similar at both UCFV and UVIC; guest speakers are brought in to discuss their experiences as front-line practitioners in the various settings where Child and Youth Care is practised. In the interactive telecourse delivery, the instructors arranged to have guest speakers from their respective communities participate in the class presentations. This meant that learners at UVIC and UCFV were afforded the unique opportunity to interact with practitioners from geographically distinct communities rather than only those from their own immediate community on a routine basis.

The co-instructors engaged in dialogues, modelling interaction using the television technology. Rather than attempt to ignore the technology, the instructors joked about it, thus acknowledging its presence, while minimising its intrusiveness. To help develop membership in the larger electronic classroom, the learners were partitioned into discussion groups with members from both sites. In addition, the instructors encouraged conversations over the link during break times.

Data were collected using the Fulford and Zhang (1993) interaction instrument and the Kolb LSI in two different university credit courses in Child and Youth Care (CYC). The first trial occurred between January - April 1995 during the interactive television delivery of CYC 201. The second trial occurred between September - December 1995 during the interactive television delivery of CYC 200A. During the second trial, the Kolb LSI was also administered to 37 learners in a conventional, face-to-face, on-campus delivery of CYC 200A and to 32 learners in the conventional (correspondence with telephone contact) distance education delivery section of CYC200A. The intent was to obtain a larger sample of LSI data and to examine whether changing the origination site (UCFV rather than UVIC) for the course had any effect on learner responses.

## The Sites

### UVIC site

The UVIC site was designed and constructed to be fiber optic capable and for a class size of approximately 20 learners (see Figure 3). The classroom was rectangular in shape with blackboards on one long wall and bulletin boards on the other. On the short side furthest from the entrance a 2 x 2.5m(6'x8') retractable projection screen was installed. On the opposite side, a mirror (one-way glass) separated the control room from

the classroom. Two rows of learners desks were generally oriented along the long axis of the room, facing the blackboards unless re-configuration was necessary for small group interaction.

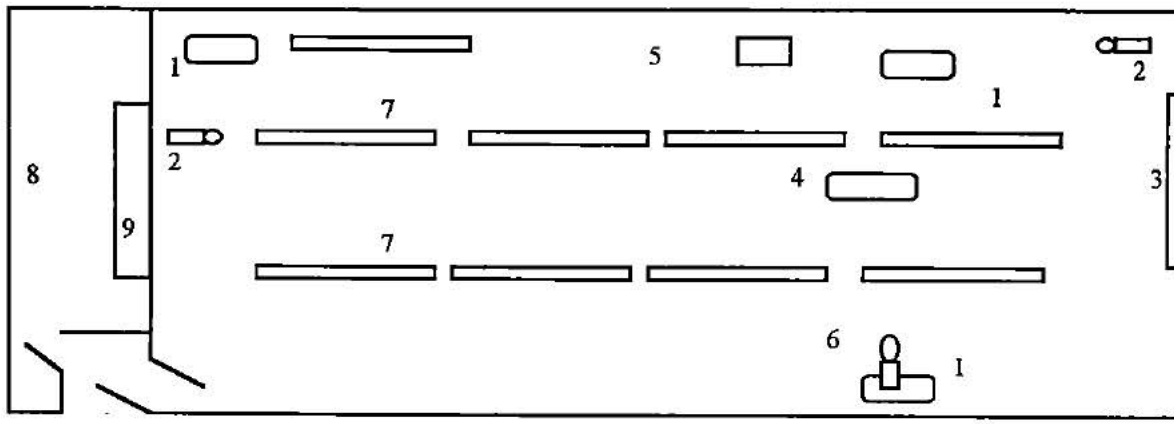


Figure 3

Physical layout of the UVIC classroom.
1= monitor, 2= camera, 3= screen, 4= projector TV, 5= instructor's centre-includes 12" monitor and Elmo Visual presenter, 6= CameraMan, 7= learner desks, 8= control room, 9= one-way glass.

The students were able to view two 80cm (31") Panasonic colour monitors set up at the ends of the room which usually displayed the incoming signal from UCFV and occasionally the outgoing signal from UVIC. The audio signal was routed to several ceiling-mounted loudspeakers so that the volume on the monitors did not have to be turned up for those learners sitting further away from the screen to able to hear.

The instructor was able to see a similar large monitor which was mounted just below the ParkerVision "CameraMan" video camera. The CameraMan is an automatic tracking camera and wireless microphone system which tracks emitters integral with the wireless microphone system worn by the instructor. The system was able to track the

instructor anywhere in the classroom and could be over-ridden by the control room operator to move to certain pre-selected positions such as the blackboard or a table set up for presenters. The instructor also had a small 30 cm (12") monitor at the lecture desk for viewing the outgoing signal from UVIC.

The large screen usually displayed the output from the "Elmo" Visual Presenter 368 which is a video camera overhead projection unit. An Electrohome ECP 3100 projection television mounted in the ceiling was used to display the image. There were two Panasonic operator-controlled, motorised, ceiling-mounted cameras which were able to image the entire classroom. There were eight desk-mounted microphones situated so that up to three learners shared each microphone. When a learner raised a hand to indicate that he/she wished to speak, the operator in the control room would boost the gain on the appropriate microphone and tilt-pan-zoom the appropriate ceiling-mounted camera to image the learner speaking at that time.

The control booth operators controlled all of the signal input from UCFV and UVIC, and also managed the signal processing and output from UVIC. The feeds from the cameras and microphones were switched and mixed using a Panasonic AV5 controller/mixer unit which had picture-in-picture capability. This allowed the operator to present the instructor as a small image within a larger image such as the overhead projection signal from the Visual Presenter. The operators had an array of seven 20cm (8") colour monitors controlled by the controller/mixer. This allowed them to monitor the signal from all the cameras in use and to select the appropriate signal to display on the various classroom monitors. The interface with the Ubiquity system was managed by a

local terminal operated by a Toshiba laptop computer which controlled sign-on, sound levelling and noise cancellation protocols, and sign-off procedures.

UCFV Site

At the UCFV site the classroom was used for multiple purposes and therefore the video equipment systems used were more portable, requiring installation and configuration prior to class time at each session. A computerised, integrated controller was used to manage the audio and video systems. This device monitored the eight press-to-speak microphones arrayed on the learner's desks and displayed, on a touch-sensitive screen, which microphone was active. The instructor or operator then touched the screen which activated a pre-set, motorised video camera which shifted to the appropriate zone in order to image the learner then speaking. The system uses plug-in cards in a central processing unit to control audio and video sources in much the same way that video displays and disk drives are controlled on more common computer systems. The instructor also used an Elmo Visual Presenter and had a 30cm (12") colour monitor showing outgoing signals.

The UCFV site used two large 80cm (31") colour monitors to present both the audio and video signals to the learners. The classroom was arranged so that there were five rows of three desks from the front of the room to the back (see Figure 4). The learners were unevenly distributed throughout the classroom with more students typically in the front and rear than in the middle of the classroom. Since the video monitors were set up about a third of the way back in the classroom near the first row of desks, it is possible that some learners, particularly those in the rear of the classroom, were not positioned for optimal audio or visual perception. If the learners had difficulty hearing

and seeing the remote site (UVIC) instructor and learners, then it is possible that this would have a negative impact on their satisfaction in the telecourse.

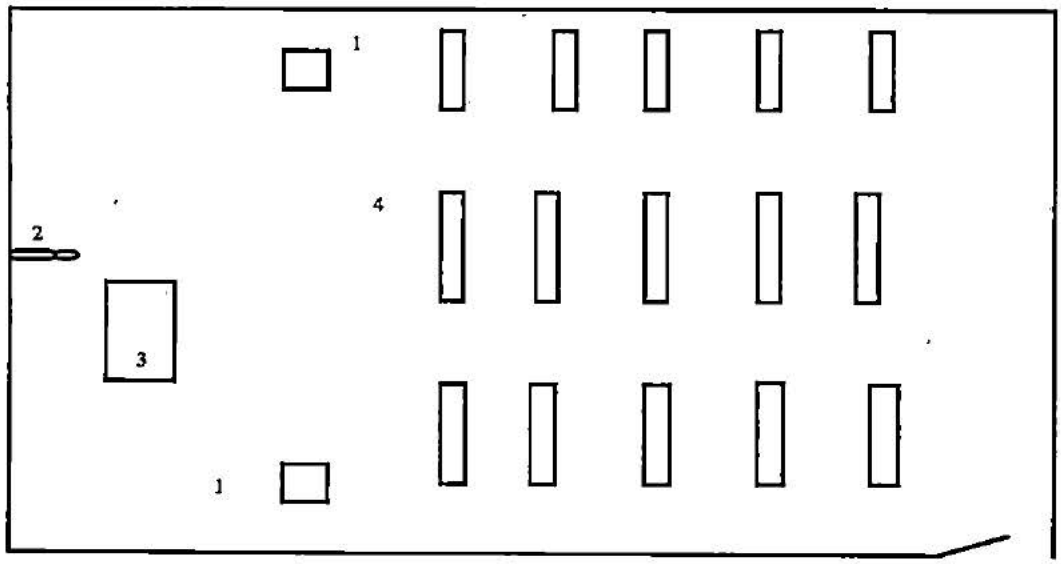


Figure 4

Physical layout of the UCFV classroom.
1= monitor, 2 = motorised camera, 3= instructor centre-includes 12" monitor, computerised controller and Elmo Visual presenter, 4= learner desks

## First Trial

In January, 1995, the University of Victoria (UVIC), in partnership with the University College of the Fraser Valley (UCFV), delivered a first course in a pilot project utilising the B.C. Tel Ubiquity fiber optic system to enable real-time interactivity between two non-contiguous sites. Ubiquity is a system which conforms to the North American

common standard for interactive, two-way, real-time video-conferencing using fiber optic technology.

The research for this thesis was undertaken as a component of the evaluation of the fiber optic course delivery project. Both the formal evaluation and the thesis research proposal had received University of Victoria Research Ethics Committee approval. Subject participation in both the evaluation and the thesis research was completely voluntary. At the first session of the course, the consent to participate form was presented to the learners (Appendices C&D). The consent form described the purposes and procedures to be undertaken, emphasising the voluntary nature of participation and the methods to be undertaken by the researchers to maintain confidentiality and anonymity of the subjects.

CYC 201

Forty-three learners registered to take a 1.5 credit, introductory undergraduate course in Child and Youth Care (CYC 201). The course was offered Wednesday evenings from 7:00 to 10:00 P.M. over a thirteen week period from January 9, 1995 through April 7, 1995. The course taught in trial one, CYC 201, was a thirteen week long (one semester), 1.5 unit, Introduction to Professional Child and Youth Care. The course content is divided into two sections, the first part of the course explores the foundations of CYC practice including a review of the historical context the field and several core concepts and perspectives which define CYC practice. The second part of the course involves investigating the scope of CYC practice by focusing on eight different practice

settings and examining the professional and practice issues unique to each setting and those common to all settings.

According to the instructor's logs, the learners were engaged in interactive activities for more than 70% of the class time, an outcome that was planned for in order to take advantage of the fiber optic link. The classes were designed so that the learners were exposed to guest speakers representing various practice settings for the first part of the class session. The speakers presented for anywhere from 20 - 40 minutes. After the presentations, the panel members then engaged in question and answer sessions involving learners at both the local and remote sites. The instructors planned for the classes to share roles as origin and reception sites. Since both UVIC and UCFV had panel members presenting in the same class session, the distinction between origination site and reception site was blurred and in effect, a single "virtual" classroom was created.

The 19 learners who registered in the course at UVIC were offered the opportunity to choose between a traditional on-campus section or the fiber optic electronic delivery section. What factor(s) influenced their choice to register in the fiber optic delivery section are not known for the learners at UVIC although it is expected that the evening time slot (7:00 - 10:00 P.M.) for the course was a factor for many of the students who had day-time jobs. The 24 learners at UCFV did not have a choice of sections, the fiber delivery was the only section available.

The formal course evaluation was designed to gather information about learner satisfaction with course content and delivery, and also to compare academic achievement (grade) outcomes between sites and among modes of delivery. The evaluation protocol

any class session. Finally, the UCFV site was locked up at 10:00 P.M. by security personnel, meaning that students were often in a rush to leave by 9:50 P.M.. If the class ran overtime to any degree, several learners would leave without completing the evaluation instrument. Inclement weather resulted in one session being cancelled at the UCFV site, and in very high levels of absenteeism at the UVIC site for that same session.

The reduced level of participation by subjects in this study would appear to be similar to that found by Fulford and Zhang (1993) where they reported only 53% (123 / 233) of the subjects completed the instrument at all three sessions. Why the subjects failed to complete the interaction instrument is unknown. Real-world situations introduce confounding and uncontrollable variables which significantly constrain research designs. For example, in Table 1 the number of respondents to the demographics questionnaire at UVIC is larger than the number of learners registered in the course at that site. This might have been due to a learner "shopping" for a course being present at the first session only. In future studies, researchers must make efforts to ensure the acquisition of data, perhaps by controlling distribution and collection of the instrument more carefully than was the case in this study.

The Sample

As part of the formal evaluation of the fiber optic course delivery project, data were collected on learner attributes (see Table 1) from the fiber optic section of the course and also from the conventional on-campus and conventional distance education sections of CYC 201. The same course material, based on a School of Child and Youth Care 201 course package, was covered in all sections. This afforded a unique opportunity to

used the standard University of Victoria course evaluation instrument as a baseline for comparison since the instrument is used for all courses offered in the School of Child and Youth Care. In addition to the UVIC evaluation form, an instrument developed at the University of Iowa (Sorenson, 1994) was used to gather data on learner satisfaction (Appendix E). This instrument had been shown to have reliability (Cronbach's alpha ranging from 0.64 to 0.91) and validity (Factor Analysis using SPSS and stringent review by the Research and Advisory Panel) and had been successfully employed in an earlier interactive television course delivery evaluation (Sorenson, 1994). Course grades for each student were obtained from both of the interactive television classrooms and were also gathered from the conventional distance and on-campus sections of CYC 201 offered from UVIC.

The course instruction was shared between two co-instructors. One of the instructors was located at the UVIC site and the other at UCFV. The instructors worked together to develop lesson plans prior to class sessions and then debriefed the next day. The instructor's intention was to minimise the perception that either site was the identified origin site for the course by sharing the instructional responsibilities between the two instructors and by ensuring that guest speakers were present at both sites.

The Subjects

There were only 43 learners registered in the course between both the sites, however, achieving participation from all the learners for the study was not possible for several reasons. First, the students were free not to participate in the study, and at the UVIC site, several chose not to do so. Second, there were often several learners absent at

compare learners taking the same course material concurrently in three different delivery modes.

The data collected on learner attributes indicated that the cohort of learners who participated in the fiber optic classroom were more like conventional on-campus learners than conventional distance education learners. The literature suggests that distance learners are typically older adults over the age of 22 (Jorgenson, 1986). This finding was confirmed in the present study: 90% of the conventional distance education students were over 25 years of age. By way of contrast, 29% of the learners in the conventional on-campus section were 25 years of age or over, and 38% of the fiber optic section were 25 or over.

The field of Child and Youth Care has been called a women's ghetto (Rose & Innis,1992). The observed gender distribution in this study would tend to confirm this position. Of the total 104 learners registered in CYC 201, 87% were women. The highest proportion of male students was 19% in the conventional on-campus section at UVIC. In the fiber optic section only 5% at UVIC and 14% at UCFV were males, and in the conventional distance education section 10% were males.

Table 1
Subject Age/Gender Distributions: First Trial (CYC 201)

| | UVIC Fiber N | UCFV Fiber N | Conventional On-Campus N | Conventional Distance Ed. N |
|---|---|---|---|---|
| Age | | | | |
| <25 | 11 | 15 | 30 | 2 |
| >25 | 9 | 7 | 12 | 18 |
| Gender | | | | |
| F | 19 | 19 | 34 | 18 |
| M | 1 | 3 | 8 | 2 |

In order to test the relationship between learning style and satisfaction, it would be necessary to be able to track individual learners over the duration of the study. The number of learners registered in CYC 201 (43) in the first trial was limited but was judged to be adequate for statistical analysis. As the data collection progressed, it became apparent that the final number of complete data sets would be significantly smaller than the total number of learners registered in the course. In fact, the number of complete data sets was eventually reduced to 10, which led to the decision to include data collected in a second course, CYC 200A, which was also offered in a fiber optic delivery.

## Second Trial

As was discussed earlier, the intent of the present study was to replicate the Fulford and Zhang (1993) study which measured the effect learner interaction had on learner satisfaction. In the present study data was collected on learning styles to determine if the variable learning style might also be used to explain both learner satisfaction and learner interaction style. In order to test the relationship between learning style and the other variables, it would be necessary to be able to track individual learners over the duration of the study.

As was the case in the first telecourse, the number of learners (40) in CYC 200A was again quite small, but of sufficient size for statistical analysis. However, as the data collection progressed, it became apparent that in spite of more vigorous efforts to control data collection, there were still problems. For example, on the third class session, when

both the learning style instrument (LSI) and interaction instruments were administered 6 of the 40 registered learners were absent, resulting in an N of 34 for the LSI, and 32 for the interaction instrument (due to the failure of two subjects to complete both sides of the interaction instrument, in spite of both oral and written instructions to do so). In addition, the learners at UCFV failed to include their names or fill in the date on the interaction instrument, which meant that it would be impossible to pair the LSI and satisfaction/interaction scores for individual learners.

CYC 200A

The CYC 200A course was offered Monday afternoons from 4:00 to 7:00 P.M. over an 13 week period from September 11, 1995 through December 4, 1995. However, due to statutory holidays and the regularly scheduled reading break, only 11 sessions took place. The course taught in the second trial and in both conventional delivery modes was CYC 200A, which is a 1.5 unit, 13 week (one semester) course. The subject matter was also divided into two general sections, the first being an introduction to three theoretical orientations; behaviourist, psychodynamics and systems, and the second part an introduction to the feminist, normative developmentalist, multiculturalist and humanist perspectives.

In the CYC 200A course delivery (the second trial), there was a single instructor, assisted by a (non-instructional) site facilitator. The instructor delivered the course from the UCFV site for all but two sessions where the origination site was UVIC. The classes were organised so that the learners, at the beginning of the class session, were given questions designed by the instructor to guide the discussion period. Once the topics had

been explained and the learners assigned to discussion groups, the audio channel of the fiber optic link was disengaged for pre-arranged period of time (usually 30 - 60 minutes) to facilitate local site discussion groups. Once the discussion periods were over, the audio channel link was re-established and the findings of the local discussion groups were shared from each site in an alternating fashion. The instructor then summarised the findings and provided additional comments.

The learners who registered in the course at UVIC were offered the opportunity to choose from the traditional on-campus section, the fiber optic electronic delivery section, or the conventional distance education section. What factor(s) influenced their choice to register in the fiber optic delivery section are not known for the learners at UVIC, although it is known that at least two of the learners had transferred from the conventional distance education section. The learners at UCFV did not have a choice of sections as the fiber delivery was the only section available.

The Sites

In the second trial, the telecourse delivery of CYC 200A originated at the UCFV site, with a site facilitator present at the UVIC site for seven of the eleven sessions. For two of the sessions, the instructor came to the UVIC site and the course was delivered from UVIC with assistance at the UCFV site provided by colleagues from UCFV. Data was collected by the author who acted as site facilitator at the UVIC site, and by the course instructor who collected data from the UCFV site and forwarded it to the author.

UCFV Site

During the second trial, the UCFV classroom was a permanent telecourse delivery site. Technicians were no longer obliged to set-up and dismantle the equipment at each

class session as was the case in the first trial. The touch-to-talk microphones were replaced with microphones controlled by the computerised, integrated controller used to manage the audio and video systems. In order to activate a learner's microphone and to image the learner then speaking, the instructor was required to point to a pre-set on a touch-sensitive screen, to direct the motorised video camera to the appropriate zone. The instructor also used an Elmo Visual Presenter and had a 30cm (12") colour monitor showing outgoing signals as was the case in the first trial.

The UCFV site used two 66 cm (26") colour monitors placed at the sides of the classroom about one third of the way back and one large 80 cm (31") placed in the front of the classroom near the instructor's desk to present both the audio and video signals to the learners. The classroom was arranged so that there were five rows of three desks from the front of the room to the back (see Figure 5).

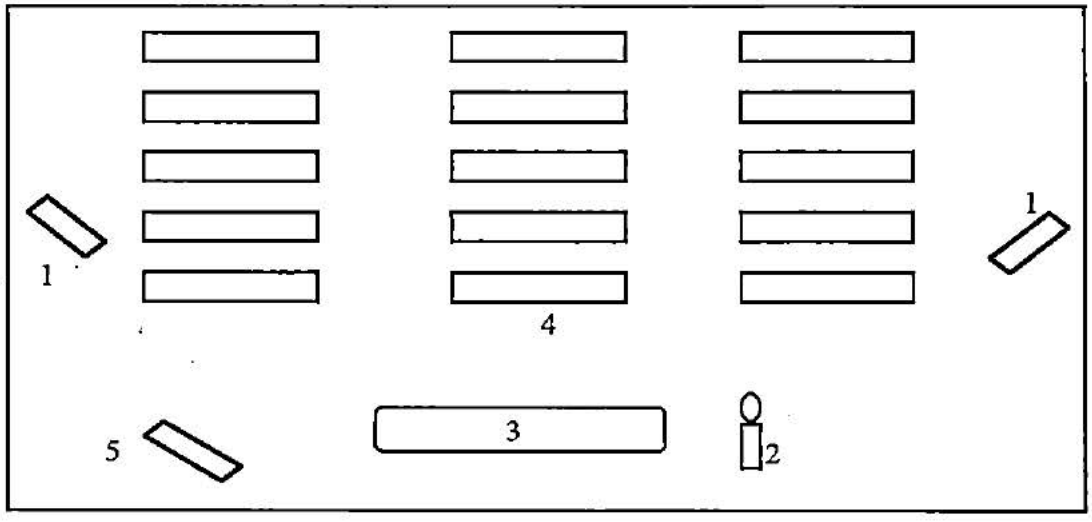


Figure 5

Physical layout of the UCFV classroom: Second Trial
1 = 66 cm monitor, 2 = motorised "CameraMan" camera, 3 = instructor centre - includes 12" monitor, Elmo Visual Presenter and computerised controller unit, 4 = learner desks, 5 = 80 cm monitor.

Since it had been noted in the first trial that a number of the learners tended to sit in the back of the classroom, which may have had an adverse impact on their satisfaction with the technology used to link the classrooms, in the second trial the instructor typically moved chairs from the last row to the front two rows to ensure that the learners would be able to clearly see and hear the television monitors in the front of the classroom.

UVIC Site

The UVIC site (see Figure 3) was essentially unchanged from the configuration used in the first trial except for the replacement of the voice activated microphones used in the first trial with press-to-talk microphones. Except when the instructor was using the visual presenter unit to display overheads, the large overhead projection screen television was used to image the UCFV site during class sessions.

Interaction/Satisfaction Measure

The interaction instrument used in the second trial was the same as that used in the CYC 201 trial, except for heading changes to reflect the course title change to CYC 200A. The interaction instrument was administered on the third, seventh and tenth sessions of the 11 session term (see Figure 6).

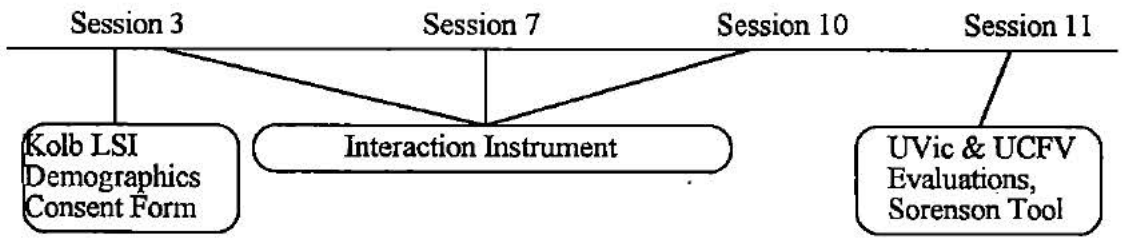


Figure 6

Instrumentation Delivery Timelines: September - December 1995

The four week interval between administrations of the instrument as was the case in the Fulford and Zhang (1993) study and the first trial in this study was changed because of the truncated term and the need to administer the routine course/instructor evaluations and the Sorenson instrument at the last session. It was felt that administering three instruments on the same day might lead to respondents being overwhelmed.

Fifteen minutes was set aside at the end of the class session to ensure adequate time to complete the interaction instrument. The author, located at the UVIC site, explained the purpose of the study at the first administration and how to fill out the instrument at that and each subsequent administration. The course instructor managed instrument administration at the UCFV site. The Kolb (1985) LSI instrument was also administered on the third session of the telecourse. The routine UCFV and UVIC course/instructor evaluations and the Sorenson instrument were administered at the last (11th) class session.

The Subjects

As was indicated earlier, there were 40 learners registered in the CYC 200A telecourse. Of these, 25 were at the UCFV site and 15 were at the UVIC site. As was the case in the 201 trial, a number of subjects did not fill in the Sorenson (1994) questionnaire which was the only source of data on learner ages. At the UVIC site, of the 10/15 subjects who completed the instrument, 7 (46.6%) were age 24 or less, the other three (20%) were 25 or older. At the UCFV site, 13 of the 25 subjects completed the questionnaire. Of these, 5 (38.5%) were less than 25 years of age, 6 (46.2%) were

between 25 - 34 and 2 (15.4%) were over 35 years old. In addition to the telecourse data, the Kolb LSI was administered to learners in both conventional distance and on-campus sections of CYC 200A. Information regarding the age of these learners was unavailable (see Table 2).

Table 2
Age and gender distribution: Second trial (CYC 200A)

| | UVIC Fiber* | UCFV Fiber* | Conventional Distance Ed. | Conventional On-Campus |
|---|---|---|---|---|
| | N | N | N | N |
| Age | | | | |
| ≤25 | 7 | 5 | ** | ** |
| 25-34 | 3 | 6 | ** | ** |
| 35 > | 0 | 2 | ** | ** |
| Gender | | | | |
| F | 13 | 25 | 32 | 42 |
| M | 2 | 0 | 7 | 2 |

*The number of respondents is not equal to the number of registrants.
**Data unavailable.

## Conventional Delivery Cohorts

The Kolb Learning-Style Inventory was administered by the author to the on-campus 200A cohort of 44 learners on the same day as the cohort in the fiber optic delivery section. The instrument was administered during the regular class session, the intent was to use the Kolb data both for the purposes of this study and as a teaching aide.

After the learners were informed how the Kolb data would be incorporated into this study, verbal consent to use the data was obtained.

In addition to the on-campus 200A learners, the Kolb instrument, enclosed with a self-addressed, stamped envelope, was mailed to the conventional distance education 200A learners with a letter (Appendix F) that encouraged them to participate in the study by offering to pay postage for the first assignment they were to mail in. The author also contacted each of the learners by phone to explain the purpose of the study and the consent to participate form. The learners were assured that participation or non-participation would have no bearing on their course mark. Consent was indicated by 32 of 39 learners who chose to complete and mail back the Kolb inventory.

# CHAPTER FOUR

## Results

The intent of the present study was to replicate the Fulford and Zhang (1993) study where they investigated learner satisfaction with interactive television course delivery. An additional variable, learning-style, was included in the study to determine if this variable might be correlated with learner satisfaction.

As was described in Chapter Three, the data for this study were collected using two instruments. The Kolb Learning-Style Inventory (1985) was used to measure the variable learning style, while the variables satisfaction and perceptions of personal and overall interaction were measured using the instrument designed by Fulford and Zhang (1993). Because of the low response rate in the first trial a second course delivery trial was added to provide more data for analysis. The first occurred in conjunction with the delivery of CYC 201 from January - April 1995 and the second with the delivery of CYC 200A from September - December 1995. In addition to the data gathered in the fiber optic telecourses, the Kolb LSI was administered to learners in a conventional on-campus section of CYC 200A and to learners in a conventional distance education section of the same course. This resulted in a pool of 147 participants whose learning style was known. However, as was the case in the first trial, there were problems achieving full participation from the subjects in completing both the Kolb LSI and the Interaction instrument which was presented at three sessions roughly equally distributed over the term (beginning, middle, end).

At the close of Chapter Two, 9 research questions were posed. The first four questions replicate those asked by Fulford and Zhang (1993).

1. What is the relationship between learners' perceived personal level of interaction and their perceived level of overall interaction?
2. How well does the perceived level of personal interaction predict learner satisfaction with instruction?
3. How well does the perceived level of overall interaction predict learner satisfaction with instruction?
4. Do the perceptions of interaction change over time?

The second set of five questions refer to the Kolb learning-style data and will be presented at the beginning of that section. This Chapter will report the results of the present study as responses to those questions.

## Interaction Instrument

### First Trial

As was reported earlier, the perceptions of interaction instrument was administered at the end of the instructional sessions on week 3, week 8 and week 12 of the 13 week CYC 201 course. At the first session, 14 learners from UCFV and 11 from UVIC completed the instrument, a response rate of 56.8% (25/44). For the second session 36.4% (16/44) of the subjects responded, 5 were from UCFV and 11 from UVIC. The final session resulted in 12 responses from UCFV and 11 from UVIC being collected (23/44 or 52.3%). The response rate overall (49%) was consistent with the rate Fulford and Zhang reported, where only 123 (53%) out of the total of 233 participants were present at all three sessions.

Fulford and Zhang (1993) found the means and standard deviations to be relatively stable over time with the mean for overall interaction consistently higher than the mean for personal interaction. In this study, one can see that the means of perceptions of overall interaction are consistently higher than those of personal interaction (see Table 3).

Table 3
Means and Standard Deviations. (First Trial)

| | Interaction | | | | Satisfaction | | |
|---|---|---|---|---|---|---|---|
| | Personal | | Overall | | | | |
| | M | SD | M | SD | M | SD | N |
| Session 1 | | | | | | | |
| UVIC | 3.38 | 0.95 | 4.55 | 0.83 | 4.56 | 1.52 | 11 |
| UCFV | 3.34 | 0.80 | 5.86 | 0.54 | 4.06 | 1.18 | 14 |
| Combined | 3.35 | 0.85 | 5.28 | 0.94 | 4.28 | 1.34 | 25 |
| Session 2 | | | | | | | |
| UVIC | 3.31 | 1.14 | 6.02 | 0.58 | 4.92 | 0.65 | 11 |
| UCFV | 2.57 | 1.22 | 3.87 | 1.54 | 4.50 | 1.26 | 5 |
| Combined | 3.10 | 1.14 | 5.24 | 1.40 | 4.81 | 0.89 | 16 |
| Session 3 | | | | | | | |
| UVIC | 3.16 | 1.08 | 5.80 | 0.67 | 4.83 | 0.74 | 11 |
| UCFV | 3.24 | 0.98 | 4.02 | 0.71 | 3.93 | 1.70 | 12 |
| Combined | 3.20 | 1.00 | 4.87 | 1.13 | 4.36 | 1.38 | 23 |

Student's *t*-tests (two-tailed) were conducted to determine if the observed differences between personal interaction and overall interaction were significant. The

resulting values, -4.63 for session one, -2.64 for session two and -3.71 for the third session were all significant at $p \leq 0.05$. For both the UVIC and UCFV cohorts, there appears to be an increase in satisfaction from the first to the second session, and then a decline from the second to third sessions, with satisfaction increasing overall with respect to the initial session by the end of the course at UVIC, while the satisfaction score is lower in the final session at UCFV. Perceptions of personal interaction decline overall, with an increase from the second to the final session at UCFV. The standard deviations show more variability than Fulford and Zhang (1993) found.

Question 1

What is the relationship between learners' perceived personal level of interaction and their perceived level of overall interaction?

The Pearson's product-moment correlation coefficients were calculated for the data collected in this study using two-tailed tests. Although not specifically reported, it would appear that Fulford and Zhang (1993) used a two-tailed test in the original study since no direction for the hypothesised relationship was specified.

Fulford and Zhang (1993) reported that there was a significant positive correlation between personal and overall interaction. They found the mean of the correlations to be $r = 0.66$ for those two variables. In the present study, the results for the combined groups (UVIC and UCFV) indicate that the correlations were not statistically significant for personal interaction and overall interaction (Table 4) except in the second session where $r = 0.64$ ($N=16$, $p < 0.01$). This value ($r = 0.64$) is similar to the value ( $r = 0.66$) Fulford

and Zhang (1993) report. When the correlation coefficients were calculated for each site independently, the results indicate no statistical significance except for the first session at the UVIC site where $r = 0.74$ ($p < 0.01$).

Table 4
Pearson's Correlation Coefficients. (First Trial)

| | | Personal Interaction X Overall Interaction | |
|---|---|---|---|
| Session 1 | | | |
| | N | | |
| | UVIC | 11 | $r = 0.74$ | $p < 0.01$ |
| | UCFV | 14 | $r = 0.29$ | $p > 0.3$ |
| | Combined | 25 | $r = 0.37$ | $p < 0.1$ |
| Session 2 | | | |
| | UVIC | 11 | $r = 0.49$ | $p > 0.1$ |
| | UCFV | 5 | $r = 0.95$ | $p < 0.1$ |
| | Combined | 16 | $r = 0.64$ | $p < 0.01$ |
| Session 3 | | | |
| | UVIC | 11 | $r = 0.19$ | $p > 0.5$ |
| | UCFV | 12 | $r = 0.25$ | $p > 0.4$ |
| | Combined | 23 | $r = 0.10$ | $p > 0.1$ |

Question 2

How well does the perceived level of personal interaction predict learner satisfaction with instruction?

For the relationship between personal interaction and satisfaction, Fulford and Zhang (1993) found the mean of the correlations to be $r = 0.39$. In the present study, the

correlations for personal interaction and satisfaction for the combined groups were found to be significant in the second and third sessions with coefficients calculated to be $r =$ 0.74 and $r = 0.54$, $p < 0.01$ respectively (see Table 5). When the correlation coefficients were calculated for each site independently, there was statistical significance in sessions two and three for both UVIC ($r = 0.61$ and $r = 0.68$) and UCFV ($r = 0.92$ and $r = 0.63$) ($p < 0.05$).

Table 5
Pearson's Correlation Coefficients. (First Trial)

| | | Personal Interaction X Satisfaction | | |
|---|---|---|---|---|
| Session 1 | | | | |
| | UVIC | 11 | r = 0.41 | p > 0.2 |
| | UCFV | 14 | r = 0.36 | p > 0.2 |
| | Combined | 25 | r = 0.39 | p < 0.1 |
| Session 2 | | | | |
| | UVIC | 11 | r = 0.61 | p < 0.05 |
| | UCFV | 5 | r = 0.92 | p < 0.05 |
| | Combined | 16 | r = 0.74 | p < 0.001 |
| Session 3 | | | | |
| | UVIC | 11 | r = 0.68 | p < 0.05 |
| | UCFV | 12 | r = 0.63 | p < 0.05 |
| | Combined | 23 | r = 0.54 | p < 0.01 |

Question 3

How well does the perceived level of overall interaction predict learner satisfaction with instruction?

Fulford and Zhang (1993) reported that for the relationship between overall interaction and satisfaction the mean of the correlations was $r = 0.73$, $p < 0.01$. In the present study, for the UCFV and UVIC cohorts combined, the correlations between overall interaction and satisfaction (Table 6) were significant in the second session ( $r = 0.69$, $p < 0.01$) and in the third session ($r = 0.42$, $p < 0.05$). The only statistically significant relationship between overall interaction and satisfaction when the sites were considered separately was found in the second session at UCFV ( $r = 0.98$, $p < 0.001$).

Table 6
Pearson's Correlation Coefficients. (First Trial)

| | | Overall Interaction X Satisfaction | |
|---|---|---|---|
| Session 1 | | | |
| | UVIC | 11 | r = 0.51 | p > 0.1 |
| | UCFV | 14 | r = 0.17 | p > 0.5 |
| | Combined | 25 | r = 0.12 | p > 0.5 |
| Session 2 | | | |
| | UVIC | 11 | r = 0.41 | p > 0.2 |
| | UCFV | 5 | r = 0.98 | p < 0.001 |
| | Combined | 16 | r = 0.69 | p < 0.01 |
| Session 3 | | | |
| | UVIC | 11 | r = 0.41 | p > 0.2 |
| | UCFV | 12 | r = 0.24 | p > 0.4 |
| | Combined | 23 | r = 0.42 | p < 0.05 |

An inspection of the results show that in spite of a higher score for overall interaction, 5.86 at UCFV as opposed to 4.55 at UVIC, the UCFV cohort rated their satisfaction lower (4.06) compared to than the UVIC cohort (4.56) in session one. When the correlation coefficients were calculated for each site independently, the results show no statistical significance except in the following cases: The relationship between personal and overall interaction was significant for the UVIC site the first session $r = 0.74$, $p < 0.01$, personal interaction and satisfaction was significant at a $p < 0.05$ level for sessions two and three for both UVIC ($r = 0.61$ and $r = 0.68$) and UCFV ($r = 0.92$ and $r = 0.63$).

Question 4

Do the perceptions of interaction change over time?

The results in this study show a decrease in perceptions of personal interaction from the first to the second session, and then an increase from the second to the final session, with the final value being lower than that obtained in the first session when both cohorts are grouped together. For perceptions of overall interaction, the ratings appear to decline over time as was the case in the Fulford and Zhang (1993) study. However, if one looks at the ratings for the two cohorts independently, a different pattern emerges.

For the UVIC cohort, perceptions of personal interaction show a decline over the three sessions( 3.38, 3.31, 3.16 respectively). For the UCFV cohort, there is a decline in the second session and increase in the final session, with the final value being somewhat lower than in the first session (3.34, 2.57, 3.24 respectively). For perceptions of overall interaction, the UVIC cohort shows an increase from the first to second sessions (4.55 -

6.02), then a decline in the final session (5.80) with the final value higher that that obtained in the first session. For the UCFV cohort, the value decreases from 5.86 in the first session to 3.87 in the second session, and then increases to 4.02 in the final session.

Three separate, one-way, repeated measures ANOVA tests were run on the data from the present study. The variables used were satisfaction, perceptions of personal interaction and perceptions of overall interaction with time as the dependent variable. Table 7 reports the results obtained. It should be noted that there were only 10 subjects who completed the instrument at all three data collection points.

Table 7
Repeated measures ANOVA (First Trial,N=10)

| Source | SS | DF | MS | F | p-value |
|---|---|---|---|---|---|
| Satisfaction | 1.47 | 2 | 0.74 | 0.69 | <0.05 |
| Interaction | | | | | |
| Personal | 0.12 | 2 | 0.06 | 0.15 | <0.05 |
| Overall | 9.41 | 2 | 4.71 | 9.28 | <0.05 |

The only significant effect of time was with respect to the variable overall interaction where F = 9.28.

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Second Trial

The perceptions of interaction instrument was administered at the end of the instructional sessions on week 3, week 6 and week 10 of the 11 week CYC 200A course. At the first session, 22 learners from UCFV and 10 from UVIC completed the instrument (32/40). For the second session, there were 14 responses from UCFV and 12 from UVIC (26/40). The final session resulted in 16 responses from UCFV and 10 from UVIC being

collected (26/40). Although the overall response rate (70%) was somewhat skewed by the high rate at the first session (80%), the 65% response rate for the other two sessions was consistently much higher than that achieved in the first trial. Table 8 reports the descriptive statistics of the second trial.

Table 8
Means and Standard Deviations. (Second Trial)

| | | Personal Interaction | | Overall Interaction | | Satisfaction | |
|---|---|---|---|---|---|---|---|
| | N | Mean | SD | Mean | SD | Mean | SD |
| Session 1 | | | | | | | |
| UVIC | 10 | 3.79 | 0.82 | 4.48 | 0.78 | 4.89 | 0.72 |
| UCFV | 22 | 3.03 | 1.14 | 4.51 | 0.81 | 3.76 | 0.67 |
| Combined | 32 | 3.26 | 1.10 | 4.50 | 0.79 | 4.11 | 0.86 |
| Session 2 | | | | | | | |
| UVIC | 12 | 3.77 | 1.02 | 4.22 | 1.07 | 4.22 | 0.83 |
| UCFV | 14 | 3.65 | 1.10 | 4.46 | 0.81 | 4.13 | 1.00 |
| Combined | 26 | 3.70 | 1.04 | 4.35 | 0.93 | 34.17 | 0.91 |
| Session 3 | | | | | | | |
| UVIC | 10 | 3.06 | 0.93 | 4.00 | 1.14 | 4.12 | 1.23 |
| UCFV | 16 | 2.93 | 1.13 | 3.81 | 0.97 | 3.64 | 1.15 |
| Combined | 26 | 2.98 | 1.04 | 3.88 | 1.02 | 3.82 | 1. 18 |

As was found both in the first trial (CYC 201) in this study and in Fulford and Zhang's (1993) research, the means for overall interaction were consistently higher than those for personal interaction. Student's t-tests confirmed that the observed differences were significant at $p > 0.95$. It is interesting to note that while the scores for personal interaction appear similar to those reported in the Fulford and Zhang (1993) study and in

the present research, the means for overall interaction appear to be higher in both trials of the present study, except in the third session of the second trial.

It also appears that the level of perceived overall interaction was higher in the first trial than in the second (CYC 200A) trial. The variable satisfaction appears to have increased in the second session before decreasing in the final session. The final satisfaction measure shows a decline similar to that found by Fulford and Zhang (1993). The standard deviations for personal interaction show very little variability and the deviations for the other two variables appear to be more stable than in the first trial.

As was the case in the first trial, while the UCFV cohort scored higher on overall interaction than the UVIC cohort in the first and second sessions, they scored lower on satisfaction. This finding is not consistent with that reported by Fulford and Zhang (1993), where they suggest that perception of overall interaction is the critical predictor of learner satisfaction.

Question 1

What is the relationship between learners' perceived personal level of interaction and their perceived level of overall interaction?

Pearson's $r$ correlations were calculated as before. The only statistically significant relationship between the two variables when the cohorts were analysed independently occurred in the third session where for the UVIC cohort $r = 0.85$, $p < 0.01$. When the two cohorts were combined there was a statistically significant relationship between personal and overall interaction ($r = 0.68$, $p < 0.001$) in the third session only (see Table 9).

Table 9
Pearson's Correlation Coefficients (Second Trial)

| | Personal Interaction | X | Overall Interaction | |
|---|---|---|---|---|
| Session 1 | | | | |
| | UVIC | (N=10) | $r = 0.36$ | $p > 0.1$ |
| | UCFV | (N=22) | $r = -0.16$ | $p > 0.1$ |
| | Combined | (N=32) | $r = -0.05$ | $p > 0.1$ |
| Session 2 | | | | |
| | UVIC | (N=12) | $r = -0.14$ | $p > 0.1$ |
| | UCFV | (N=14) | $r = 0.31$ | $p > 0.1$ |
| | Combined | (N=26) | $r = 0.07$ | $p > 0.1$ |
| Session 3 | | | | |
| | UVIC | (N=10) | $r = 0.85$ | $p < 0.01$ |
| | UCFV | (N=16) | $r = 0.60$ | $p < 0.1$ |
| | Combined | (N=26) | $r = 0.68$ | $p < 0.001$ |

Question 2

How well does the perceived level of personal interaction predict learner satisfaction with instruction?

The results of the Pearson's correlation calculations indicate that when the two cohorts were combined, there was a significant relationship between personal interaction and satisfaction $r = 0.61$, $p < 0.001$ in the third session only. The analysis indicated that when the two cohorts were considered independently, the only statistically relationship was at the UCFV site where $r = 0.70$, $p < 0.01$(see Table 10).

Table 10
Pearson's Correlation Coefficients (Second Trial)

| | Personal Interaction X Satisfaction | | |
|---|---|---|---|
| Session 1 | | | |
| UVIC | (N=10) | $r = 0.36$ | $p > 0.1$ |
| UCFV | (N=22) | $r = -0.16$ | $p > 0.1$ |
| Combined | (N=32) | $r = 0.18$ | $p > 0.1$ |
| Session 2 | | | |
| UVIC | (N=12) | $r = 0.15$ | $p > 0.1$ |
| UCFV | (N=14) | $r = 0.37$ | $p > 0.1$ |
| Combined | (N=26) | $r = 0.28$ | $p > 0.1$ |
| Session 3 | | | |
| VIC | (N=10) | $r = 0.47$ | $p > 0.1$ |
| UCFV | (N=16) | $r = 0.70$ | $p < 0.01$ |
| Combined | (N=26) | $r = 0.61$ | $p < 0.001$ |

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Question 3

How well does the perceived level of overall interaction predict learner satisfaction with instruction?

The results of the correlation coefficient calculations for the combined groups, shown in Table 11, indicate that there was a statistically significant relationship between overall interaction and satisfaction in all three sessions ($r = 0.71$, $r = 0.64$, $r = 0.72$) respectively, at the $p < 0.001$ level.

Table 11
Pearson's Correlation Coefficients (Second Trial)

| | | Overall Interaction X Satisfaction | | |
|---|---|---|---|---|
| Session 1 | | | | |
| | UVIC | (N=10) | $r = 0.72$ | $p > 0.1$ |
| | UCFV | (N=22) | $r = 1.00$ | $p < 0.001$ |
| | Combined | (N=32) | $r = 0.71$ | $p < 0.001$ |
| Session 2 | | | | |
| | UVIC | (N=12) | $r = 0.45$ | $p > 0.1$ |
| | UCFV | (N=14) | $r = 0.87$ | $p < 0.001$ |
| | Combined | (N=26) | $r = 0.64$ | $p < 0.001$ |
| Session 3 | | | | |
| | UVIC | (N=10) | $r = 0.80$ | $p < 0.01$ |
| | UCFV | (N=16) | $r = 0.66$ | $p < 0.01$ |
| | Combined | (N=26) | $r = 0.72$ | $p < 0.001$ |

Question 4

Do the perceptions of interaction change over time?

Looking at the data from the combined groups (see Table 6), perceptions of personal interaction increased from 3.26 in the first session to 3.70 in the second session and then decreased to 2.98 in the final session. Perceptions of overall interaction showed a decline in each session with values of 4.50, 4.35, and 3.88 for the three sessions respectively. When data from the two cohorts was examined individually, the UVIC cohort shows the perceptions of personal interaction values decreasing from 3.79 in the first session to 3.77 in the second, to 3.06 in the final session. The UCFV cohort shows an increase from the first (3.03) to the second sessions (3.65) and a decline in the final

session to a value of 2.93. The UVIC and UCFV cohorts reveal a decline in perceptions of overall interaction over the three sessions, from a value of 4.48 in the first, to 4.22 in the second, and 4.00 in the final session for UVIC and 4.51, 4.46, 3.81 respectively over the three sessions for the UCFV cohort.

As was the case in the first trial, three separate, one-way, repeated measures ANOVA tests were performed. The results, shown in Table 12, show that the main effect of time was significant for perceptions of overall interaction (F = 3.76) and personal interaction (F = 3.08), but not for satisfaction (F = 0.96). In this trial the number of subjects completing the instrument all three occasions was much higher than was the case in the first trial, with N = 26.

Table 12
Repeated measures ANOVA (Second Trial,N=26)

| Source | SS | DF | MS | F | p-value |
|---|---|---|---|---|---|
| Satisfaction | 1.16 | 2 | 0.81 | 0.96 | <0.05 |
| Interaction | | | | | |
| Personal | 7.04 | 2 | 3.52 | 3.08 | <0.05 |
| Overall | 6.59 | 2 | 3.29 | 3.76 | <0.05 |

## Kolb Learning-Style Inventory

In addition to replicating the Fulford and Zhang (1993) study questions, five new questions regarding learning styles were posed at the end of Chapter Two.

5. What is the distribution of learning-style types at the University of Victoria (UVIC) and at the University College of the Fraser Valley (UCFV) for both trials of the fiber optic course delivery?
6. What is the learning-style type distribution in the UVIC conventional distance education cohort of learners?
7. What is the learning-style type distribution in the UVIC conventional on-campus cohort of learners?
8. Do the observed distributions deviate significantly from the normative distribution reported by Kolb (1984)?
9. Is there a relationship between learning style as measured on the Kolb LSI and learner satisfaction as measured by the Fulford and Zhang (1993) instrument?

The following section presents the results obtained in the present research with reference to those five questions.

Question 5

What was the distribution of learning-style types at UVIC and UCFV?

First Trial

The Kolb instrument was administered at the first class session of the 13 week CYC 201 course to 42 out of the total of 44 learners; 22 were from UCFV, 20 were from UVIC. Figures 7, 8 and 9 are graphical representations of the location of the participating subjects on Kolb's Learning-Style Grid. Figure 7 shows the distribution for the two sites combined, while figures 8 and 9 show the distributions for UVIC and UCFV respectively. The same information is presented in Table 13.

At the UVIC site over half the learners were divergers and about one quarter were Accomodators. At the UCFV site the distribution of learning style types appears to have been more evenly balanced between Accomodators and divergers. At both sites Assimilators appear to be equally distributed while the least frequently observed learning style (3/42) were Convergers.

Table 13
Learning-Style type distribution for each site. (First Trial, N=42)

| | Accomodator | | Diverger | | Converger | | Assimilator | |
|---|---|---|---|---|---|---|---|---|
| | N | % | N | % | N | % | N | % |
| UVIC | 5 | 25 | 11 | 55 | 1 | .5 | 3 | 15 |
| UCFV | 9 | 40.9 | 8 | 36.4 | 2 | 9.1 | 3 | 13.6 |
| Total | 14 | 33.3 | 19 | 45.2 | 3 | 7.1 | 6 | 14.3 |

Note: Percentages are approximate due to rounding.

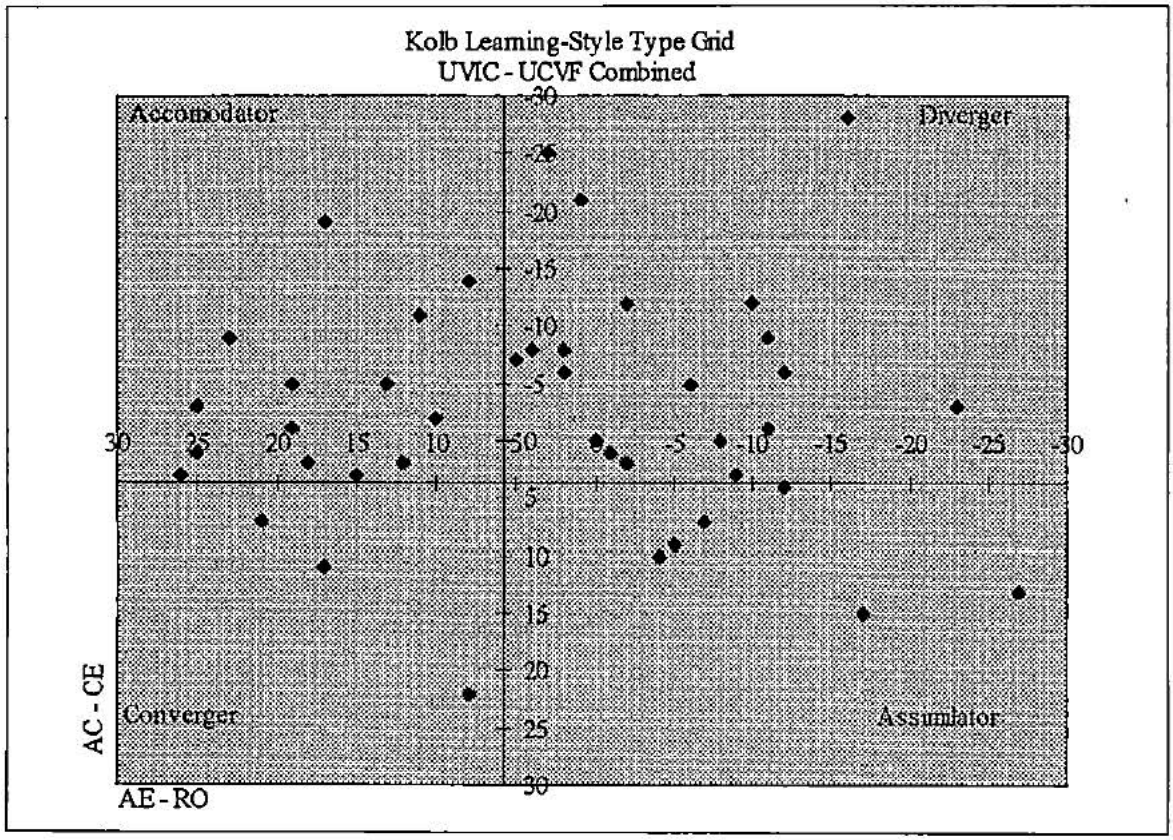


Figure 7

Distribution of Learning-Style types: UCFV and UVIC learners combined. First Trial (N = 42)

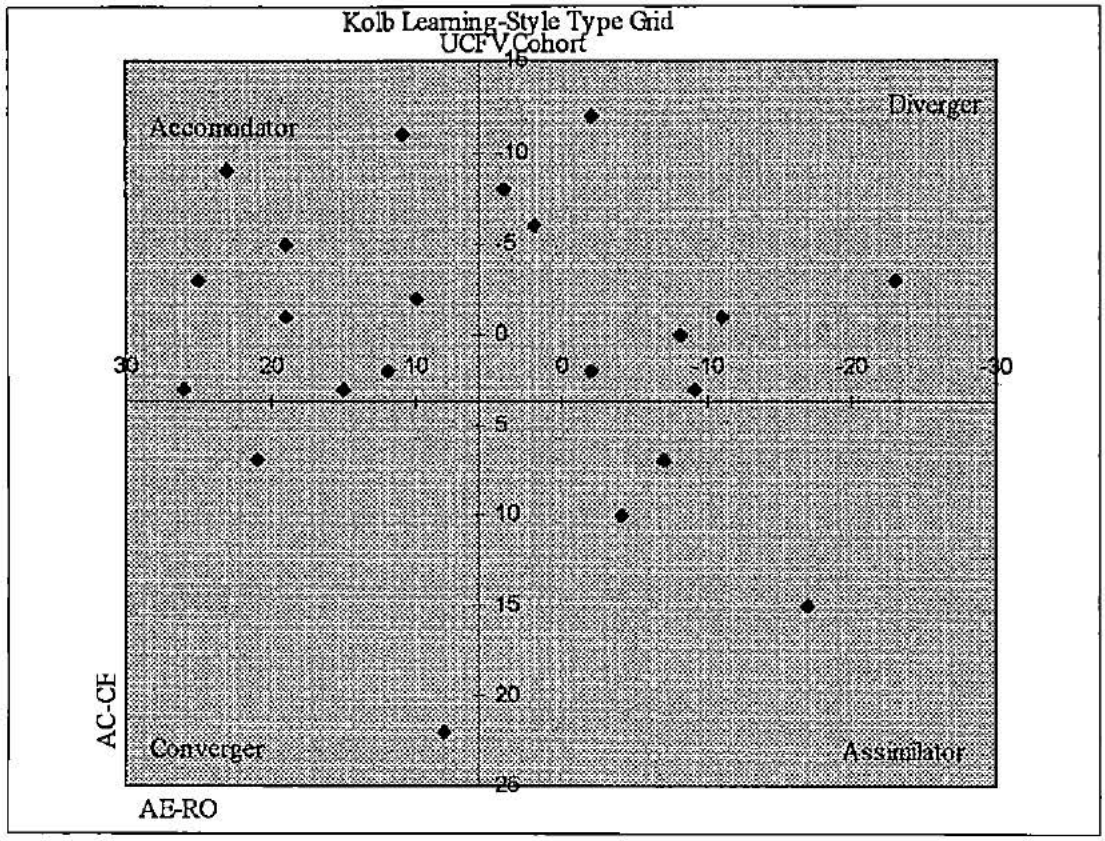


Figure 8

Distribution of Learning-Style types: UCFV cohort (N=22)

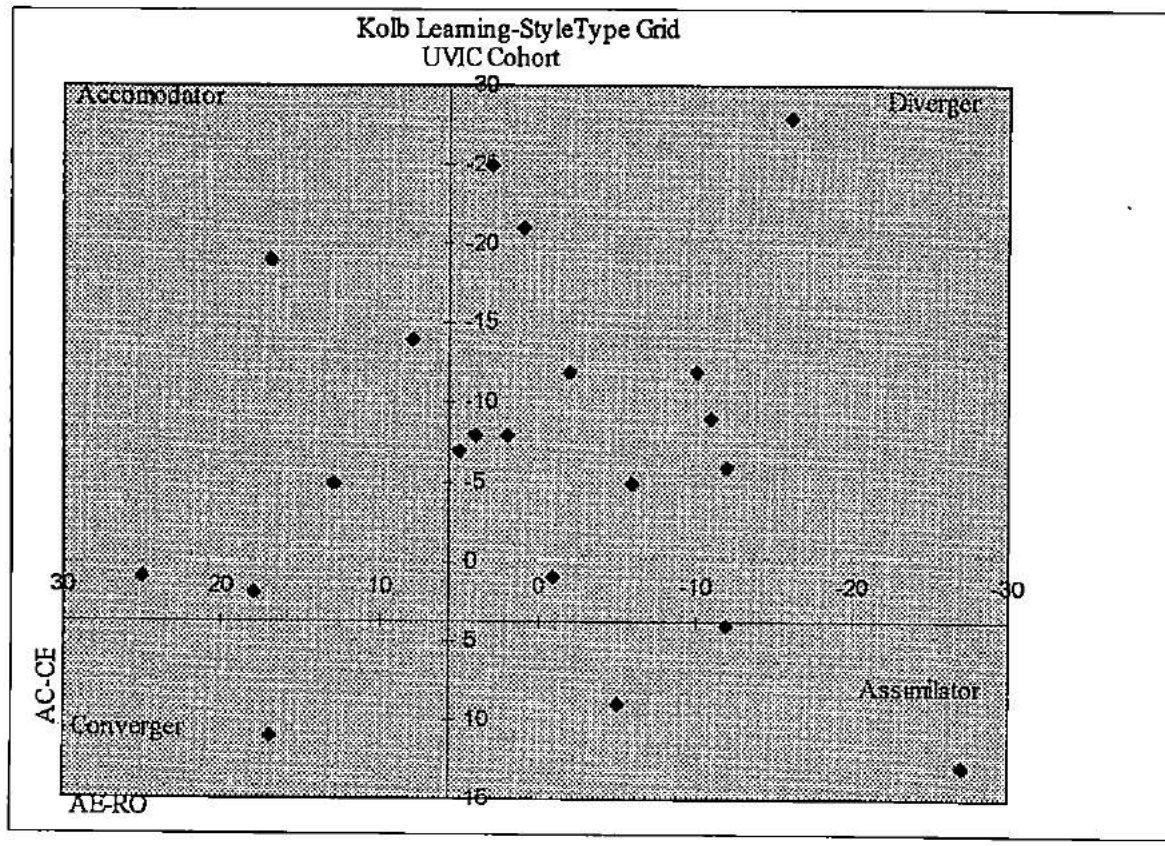


Figure 9

Learning-Style Type distribution: UVIC cohort (N=20)

Second Trial

The Kolb instrument was administered at the third class session of the 11 week CYC 200A course to 34 of the total registration of 40 learners; 22 were from UCFV, 12 were from UVIC. Table 14 shows the distribution of learning styles among the learners at the two sites. Figure 10 shows the same information in graphical form for the two sites combined while Figures 11 and 12 show the distributions at UVIC and UCFV respectively.

Table 14
Learning-Style type distribution. (Second trial, N=34)

| | Accomodator | | Diverger | | Converger | | Assimilator | |
|---|---|---|---|---|---|---|---|---|
| | N | % | N | % | N | % | N | % |
| UVIC | 3 | 25 | 5 | 41.7 | 0 | 0 | 4 | 33.3 |
| UCFV | 8 | 36.4 | 6 | 27.3 | 2 | 9 | 6 | 27.3 |
| Total | 11 | 32.4 | 11 | 32.4 | 2 | 5.8 | 10 | 29.4 |

Note: Percentages are approximate due to rounding.

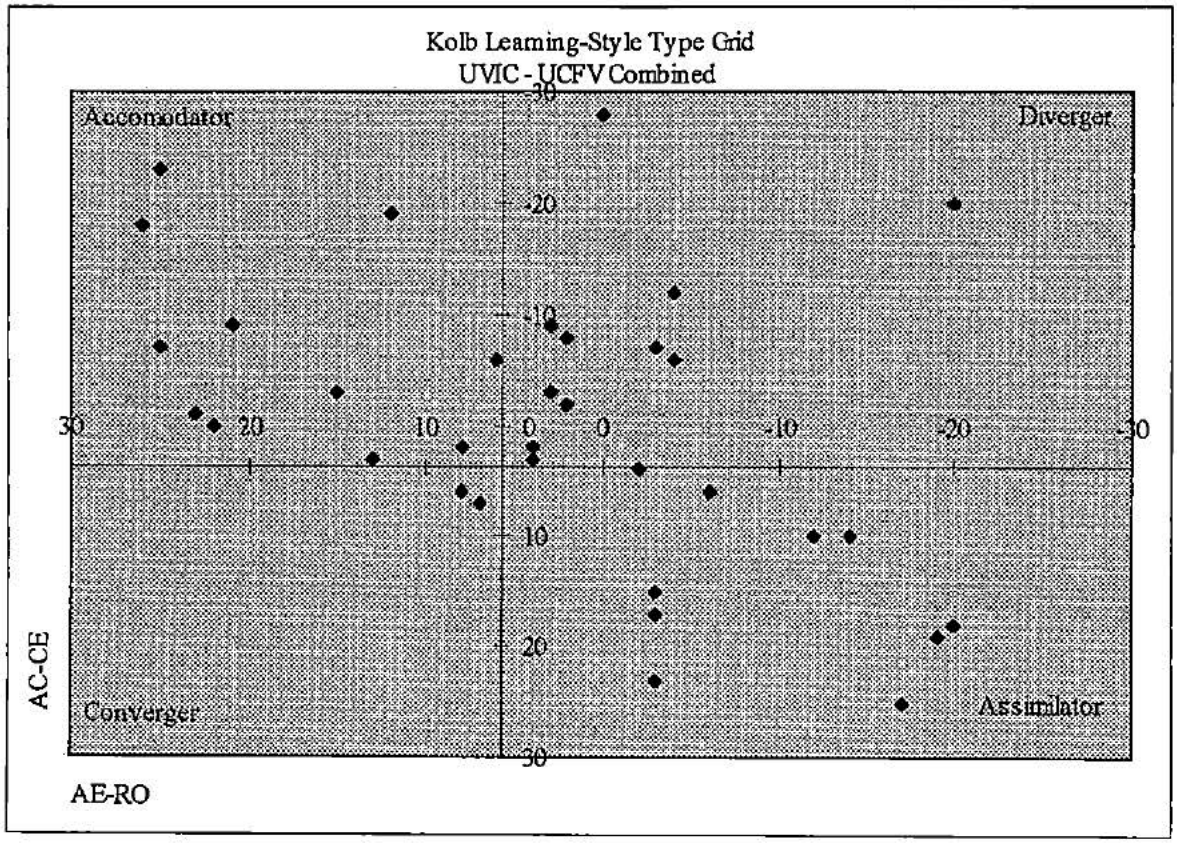


Figure 10

Distribution of Learning-Style types: UCFV and UVIC learners combined. Second Trial (N = 34)

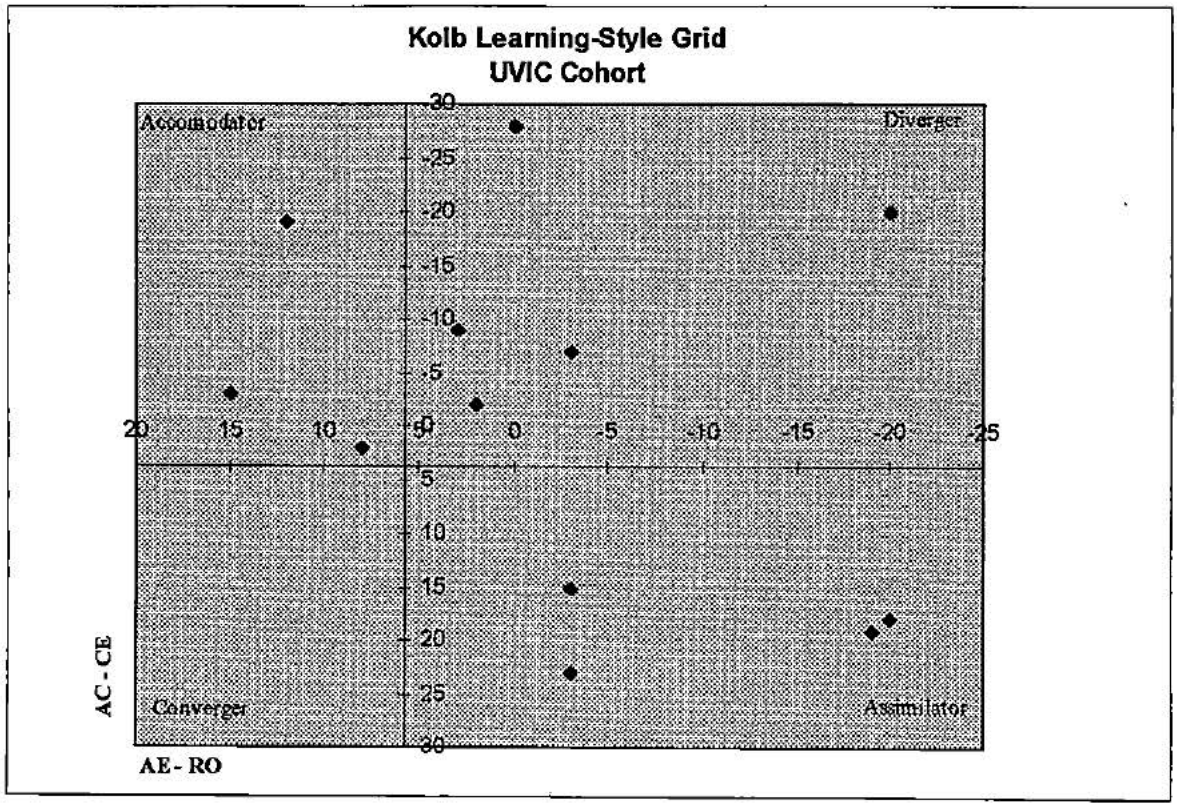


Figure 11

Learning-Style Type distribution: UVIC cohort. Second trial. (N=12)

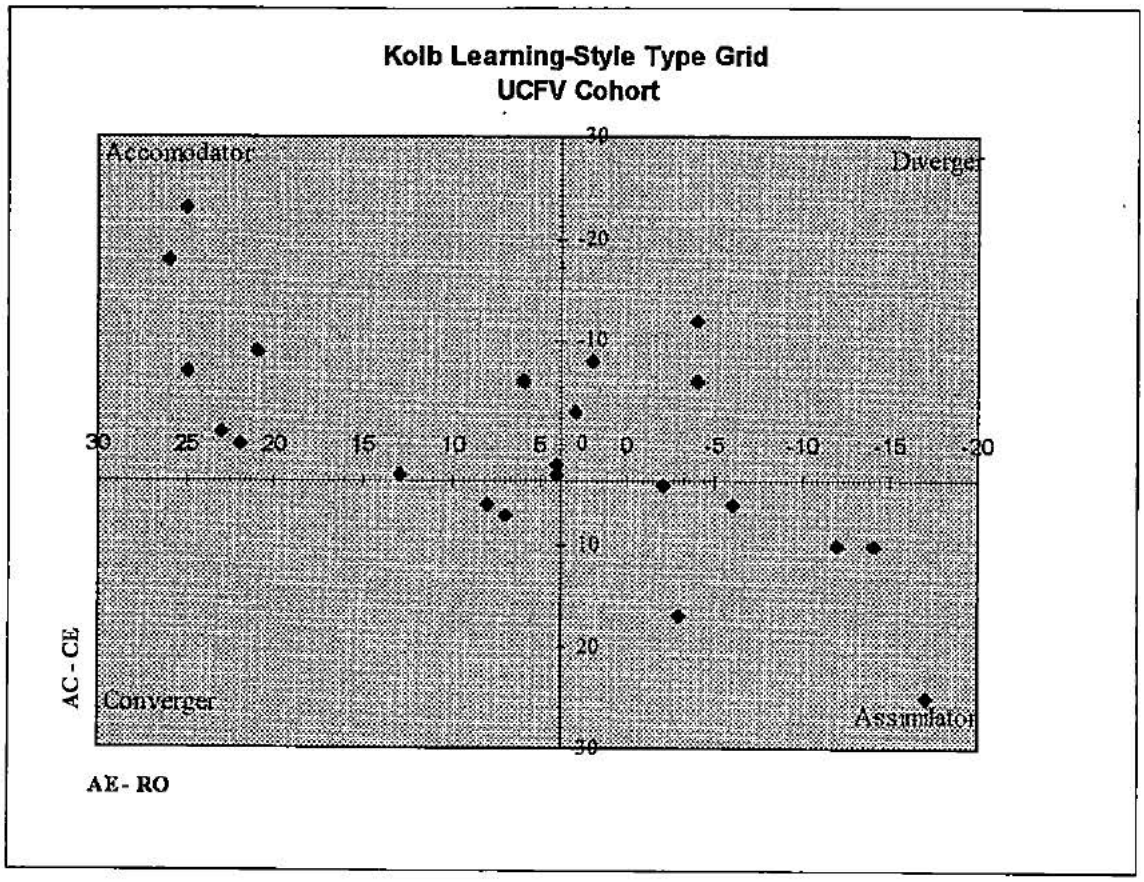


Figure 12

Learning-Style Type distribution: UCFV cohort. Second trial. (N=22)

Question 6

What is the learning-style type distribution in the UVIC conventional distance education cohort of learners?

Table 15 shows the distribution of learning style types for the conventional distance education cohort of learners taking CYC 200A in the fall of 1995. Almost half the learners (43.8%) are Accomodators with a further 28% being Divergers. The tendency towards the concrete experience (CE) end of the AC - CE is apparent in this cohort. Assimilators account for 21.9 % of the learners. Figure 13 provides a more graphical view of the data.

Table 15

Learning-Style Distribution: Conventional Distance Education Cohort (N=32)

| Accomodator | | Diverger | | Converger | | Assimilator | |
|---|---|---|---|---|---|---|---|
| N | % | N | % | N | % | N | % |
| 14 | 43.8 | 9 | 28.1 | 2 | 6.3 | 7 | 21.9 |

Note: Percentages are approximate due to rounding.

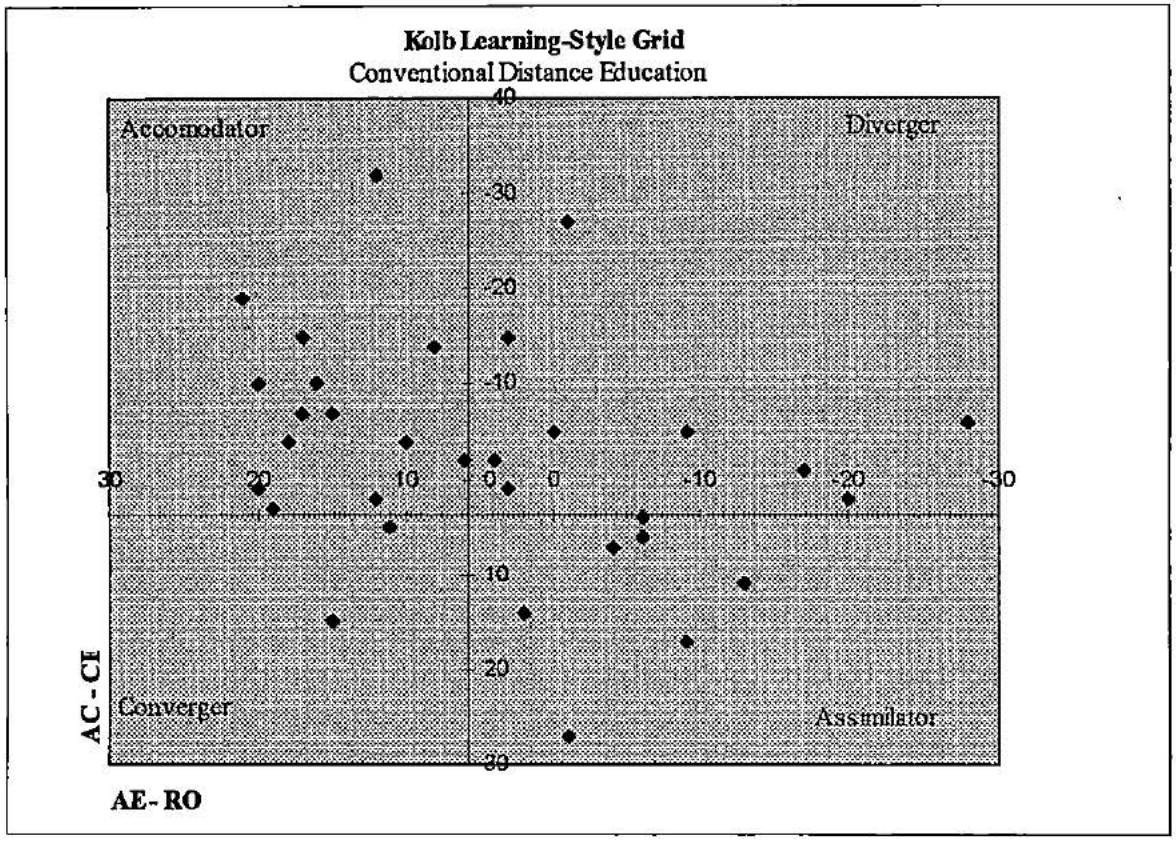


Figure 13

Learning-Style Grid: Conventional DE cohort. (N = 32)

Question 7

What is the learning-style type distribution in the UVIC conventional on-campus cohort of learners?

In Figure 14 we see the tendency towards the reflective observation (RO) end of the AE-RO continuum with 30/37 learners clustered on that side of the chart. The Converger learning style is completely missing in this cohort of learners.

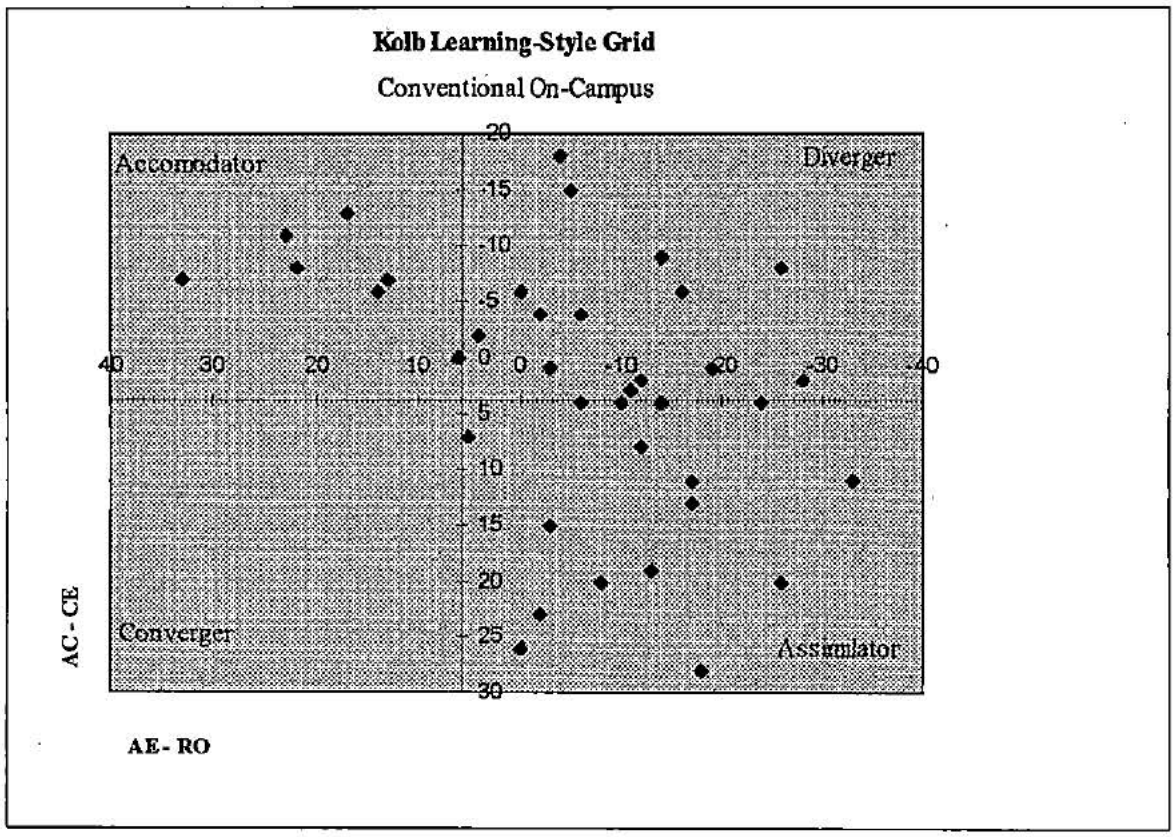


Figure 14

Learning-Style Grid: Conventional On-Campus Cohort (N = 37)

As can be seen in Table 16, the distribution of learning styles in the on-campus cohort differs from that observed in the distance education cohort. In the on-campus section, 43.2 % are Assimilators and only 18.9 % are Accomodators.

Table 16
Learning-Style Distribution: Conventional On-Campus Cohort (N=37)

| Accomodator | | Diverger | | Converger | | Assimilator | |
|---|---|---|---|---|---|---|---|
| N | % | N | % | N | % | N | % |
| 7 | 18.9 | 14 | 37.8 | 0 | 0 | 16 | 43.2 |

Note: Percentages are approximate due to rounding.

Question 8

Do the observed distributions deviate significantly from the normative distribution reported by Kolb (1984)?

The technical specifications for the LSI (1985) indicate that for female subjects, 59% are above the 50th percentile on the AC-CE scale which suggests a preference for concrete experience (Accomodators and divergers) while on the AE-RO scale the distribution is 50/50. The distribution according to age of the sample (both genders) is 51% CE and 53% RO for ages 18-24 and 50% AC-CE, 45% RO for ages 25-32. When grouped according to educational level, those subjects with some college were 50% AC-CE and 48% RO.

Therefore, it would appear that one should expect a relatively equal distribution of learning-style types, with a slight bias towards Accomodators and divergers (59%) over Convergers and Assimilators (41%). Chi-Square tests were performed to evaluate the deviation of the observed distributions from the expected distribution. Table 17 reports the results of the analysis from the first trial data.

Table 17
Chi-Square analysis of learning style distributions (First Trial)

| | Accomodator | | | Diverger | | | Converger | | | Assimilator | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $f_o$ | $f_e$ | $\frac{(f_o-f_e)^2}{f_e}$ | $f_o$ | $f_e$ | $\frac{(f_o-f_e)^2}{f_e}$ | $f_o$ | $f_e$ | $\frac{(f_o-f_e)^2}{f_e}$ | $f_o$ | $f_e$ | $\frac{(f_o-f_e)^2}{f_e}$ |
| UVIC (N=20) $X^2_{obt} = 11.2$ | 5 | 5 | 0 | 11 | 5 | 7.2 | 1 | 5 | 3.2 | 3 | 5 | 0.8 |
| UCFV (N=22) $X^2_{obt} = 6.74$ | 9 | 5.5 | 2.23 | 8 | 5.5 | 1.14 | 2 | 5.5 | 2.23 | 3 | 5.5 | 1.14 |
| $\Sigma$ (N=42) $X^2_{obt} = 8.67$ | 14 | 10.5 | 1.17 | 9 | 10.5 | 0.21 | 3 | 10.5 | 5.36 | 6 | 10.5 | 1.93 |

$X^2_{crit} = 7.815$ ($\alpha = 0.05$) $df = 3$

Based on the above discussion we expect that the distribution of learning style types will be more or less equal. The results show that since $X^2_{obt} > X^2_{crit}$ in the UVIC distribution we reject the null hypothesis, in other words, the deviation from that expected in the observed distribution is not due to chance ($p \leq 0.05$). For the UCFV cohort however, the $X^2_{obt}$ is less than the critical value, therefore the observed deviations from the expected distribution are not significant and the distribution could be due to chance.

Table 18 reports the results from the Chi-Square analysis of the second trial data. In this trial, none of the values calculated indicate a significant deviance from the expected distribution.

Table 18
Chi-Square analysis of learning style distribution (Second Trial)

| | Accomodator | | | Diverger | | | Converger | | | Assimilator | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $f_o$ | $f_e$ | $\frac{(f_o-f_e)^2}{f_e}$ | $f_o$ | $f_e$ | $\frac{(f_o-f_e)^2}{f_e}$ | $f_o$ | $f_e$ | $\frac{(f_o-f_e)^2}{f_e}$ | $f_o$ | $f_e$ | $\frac{(f_o-f_e)^2}{f_e}$ |
| UVIC (N=12) $X^2_{obt} = 4.66$ | 3 | 3 | 0 | 5 | 3 | 1.33 | 0 | 3 | 3 | 4 | 3 | 0.33 |
| UCFV (N=22) $X^2_{obt} = 3.47$ | 8 | 5.5 | 1.14 | 6 | 5.5 | 0.05 | 2 | 5.5 | 2.23 | 6 | 5.5 | 0.05 |
| $\Sigma$ (N=34) $X^2_{obt} = 7.19$ | 11 | 8.5 | 0.74 | 11 | 8.5 | 0.74 | 2 | 8.5 | 4.97 | 6 | 8.5 | 0.74 |
| $X^2_{crit} = 7.815$ ($\alpha = 0.05$) $df = 3$ | | | | | | | | | | | | |

A Chi-Square analysis of the learning style distribution in the conventional delivery modes (on-campus and distance) indicates that for the observed distribution, the deviations from the expected distributions are greater than would be expected due to chance for both the on-campus cohort and the distance education cohort (see Table 19).

Table 19

Chi-Square analysis of learning style type distribution for conventional distance education and conventional on campus learners.

| | Accomodator | | | Diverger | | | Converger | | | Assimilator | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $f_o$ | $f_e$ | $\frac{(f_o-f_e)^2}{f_e}$ | $f_o$ | $f_e$ | $\frac{(f_o-f_e)^2}{f_e}$ | $f_o$ | $f_e$ | $\frac{(f_o-f_e)^2}{f_e}$ | $f_o$ | $f_e$ | $\frac{(f_o-f_e)^2}{f_e}$ |
| O.C.* (N=37) $X^2_{obt} = 17.16$ | 7 | 9.25 | 0.55 | 14 | 9.25 | 2.44 | 0 | 9.25 | 9.25 | 16 | 9.25 | 4.93 |
| D. E.** (N=32) $X^2_{obt} = 9.25$ | 14 | 8 | 4.50 | 9 | 8 | 0.125 | 2 | 8 | 4.50 | 7 | 8 | 0.125 |
| $\Sigma$ (N=69) $X^2_{obt} = 18.14$ | 21 | 17.25 | 0.82 | 23 | 17.25 | 1.92 | 2 | 17.25 | 13.48 | 23 | 17.25 | 1.92 |

$X^2_{crit} = 7.815$ ($\alpha = 0.05$) $df = 3$

* O.C.= On Campus
**D.E.= Conventional Distance Education

Question 9

Is there a relationship between learners' learning style and their satisfaction as measured by the Fulford and Zhang (1993) instrument?

Of the 44 learners registered in CYC 201 (first trial) 42 agreed to complete the Kolb Learning-Style Inventory. Only 10 of these subjects completed the Fulford and Zhang (1993) instrument on all three occasions. Table 20 shows the values of the

dependent variable Satisfaction for each of the learning-style types for the first (CYC 201) trial, Table 21 shows the results from the second (CYC 200A) trial.

Table 20
Learning-Style vs Satisfaction (First Trial)

| Learning-Style | Session 1 | Session 2 | Session 3 |
|---|---|---|---|
| Accomodator | 4.33 | 4.67 | 4.67 |
| Assimilator | 4.17 | 3.67 | 3.67 |
| | 5.00 | 5.83 | 5.83 |
| | 5.00 | 4.17 | 3.33 |
| Mean (Assimilators) | 4.72 | 4.56 | 4.28 |
| SD | 0.48 | 1.13 | 1.36 |
| Converger | 0.67 | 4.83 | 4.83 |
| Diverger | 5.33 | 5.67 | 4.00 |
| | 3.50 | 4.67 | 4.67 |
| | 5.33 | 5.33 | 6.00 |
| | 6.00 | 4.17 | 4.17 |
| | 3.67 | 5.33 | 5.33 |
| Mean (Divergers) | 4.77 | 4.83 | 5.03 |
| SD | 1.11 | 1.13 | 0.60 |
| Mean (Grand) | 4.30 | 4.83 | 4.65 |
| SD | 1.50 | 1.02 | 0.89 |

When the means of the satisfaction scores from the first trial are compared, Divergers show slightly higher scores (4.77) than do Assimilators (4.72). The other two learning styles, Convergers (0.67) and Accomodators (4.33) have only one subject each, therefore the statistic reported is for the observed case, not the mean.. It would appear

that the mean of the perceptions of satisfaction increased over time for the Divergers while decreasing for the Assimilators.

In the second trial, none of the learners at UCFV put their names on the Kolb Learning-Style Inventory. This meant that the only data available was from the learners at UVIC. Of the 12 students who completed the Kolb instrument, only five also completed the interaction instrument on all three occasions, three of these were Assimilators and one each were Accomodators and Divergers. The means of the satisfaction scores over the three sessions for these learners show that the Diverger was highest with a mean score of 5.73, the Assimilators were second with a mean of 4.31, and the Accomodator third with a mean of 4.07.

The satisfaction scores increased over the three sessions (5.50, 5.70, 6.00) for the Diverger, while the means for the Assimilators were 4.67, 4.00, and 4.28 for the three sessions respectively. The Accomodator's score increased slightly from 4.00 to 4.20 in the second session before returning to the value (4.00) obtained in the first session. For the learning style with more than one member (Assimilators) the means and standard deviations are included in Table 21. The other two learning-style types (Acomodators and Divergers) had only one member in each, while the Converger learning-style type had no representatives in this cohort.

Table 21
Learning-Style vs Satisfaction (Second Trial)

| Learning-Style | Session 1 | Session 2 | Session 3 |
|---|---|---|---|
| Accomodator | 4.00 | 4.20 | 4.00 |
| Diverger | 5.50 | 5.70 | 6.00 |
| Converger | N/A | N/A | N/A |
| Assimilator | 4.00 | 3.50 | 2.67 |
| | 5.30 | 4.80 | 5.83 |
| | 4.70 | 3.70 | 4.33 |
| Mean (Assimilators) | 4.67 | 4.00 | 4.28 |
| SD | 1.65 | 0.70 | 1.58 |
| Mean (Grand) | 4.70 | 4.38 | 4.57 |
| SD | 0.70 | 0.89 | 1.38 |

When all of the participants in all the different cohorts in the present study were combined, there were 147 subjects in all. The distribution in the first trial at UVIC and in the two conventional delivery modes deviate significantly from what was expected. Calculating the Chi-Square for the combined groups (N=147) shows that the observed distribution does deviate significantly from the expected distribution ( $X^2_{obt} = 33.54 > X^2_{crit} = 7.82$; $\alpha = 0.05$, $df = 3$). The combined distributions of learning-style types from both the fiber optic telecourses and from the two conventional course delivery modes are presented in Table 22.

Table 22
Combined LSI data from all sources

| | Accomodator | | Diverger | | Converger | | Assimilator | |
|---|---|---|---|---|---|---|---|---|
| | N | % | N | % | N | % | N | % |
| | | | | Fiber Optic Telecourses | | | | |
| Trial One | | | | | | | | |
| UVIC | 5 | 25 | 11 | 55 | 1 | 5 | 3 | 15 |
| UCFV | 9 | 40.9 | 8 | 36.4 | 2 | 9.1 | 3 | 13.6 |
| Trial Two | | | | | | | | |
| UVIC | 3 | 25 | 5 | 41.7 | 0 | 0 | 4 | 33.3 |
| UCFV | 8 | 36.4 | 6 | 27.3 | 2 | 9 | 6 | 27.3 |
| | | | | Conventional Delivery | | | | |
| O.C.* | 7 | 18.9 | 14 | 37.8 | 0 | 0 | 16 | 43.2 |
| D.E.** | 14 | 43.8 | 9 | 28.1 | 2 | 6.3 | 7 | 21.9 |
| Total | 46 | 31.3 | 53 | 36.1 | 7 | 4.7 | 39 | 26.5 |

* On-Campus
** Distance Education

Note: Percentages approximate due to rounding.

# CHAPTER FIVE

Discussion and Conclusions

## Discussion

In Chapter Four the results of this study were presented as responses to nine research questions. In this chapter the results will be discussed using the same nine question format. The first four questions will refer to the replication of the Fulford and Zhang (1993) research and the final five questions will refer to the Learning-Style variable. Following the discussion of the results, the limitations of the present study will be identified followed by discussion of implications, recommendations and conclusions.

### Question 1

What is the relationship between learners' perceived personal level of interaction and their perceived level of overall interaction?

In the first trial, the results for the combined groups (UVIC and UCFV) indicate that the correlations were not statistically significant for personal interaction and overall interaction except in the second data collection point (week 8, N=16) where $r = 0.64$, $p < 0.01$(see Table 4). This value ($r = 0.64$) is, however, similar to the value ( $r = 0.66$) Fulford and Zhang (1993) report. When the correlation coefficients were calculated for each site independently, the results indicate no statistical significance except for the first session at the UVIC site ( $r = 0.74$, $p < 0.01$).

In the second trial, with the two cohorts combined, there was a statistically significant relationship between the two variables only in the third session ($r = 0.68$, $p < 0.001$). The only significant relationship between the two variables when the cohorts were analysed independently also occurred in the third session where, for the UVIC cohort $r = 0.85$, $p < 0.01$.

The results obtained in the present study do not reveal the same constant relationships between perceptions of overall interaction and personal interaction reported by Fulford and Zhang (1993), where they found significant positive relationships on all three occasions ($r = 0.61$, $r = 0.66$, $r = 0.71$). The mean of the correlations ($r = 0.66$) Fulford and Zhang report is, however, similar to the values found in the present study ($r = 0.64$ for the first session and $r = 0.68$ for the second session).

Fulford and Zhang (1993) found that as perceptions of overall interaction increased, so did perceptions of personal interaction. They suggest that a direct relationship between the two variables existed. In the present study no convincing evidence of this relationship was found. For example, between sessions one and two in the first trial, perceptions of personal interaction and overall interaction decreased while satisfaction increased. Between sessions two and three, personal interaction increased while overall interaction and satisfaction decreased. In the second trial, perceptions of personal interaction and satisfaction increased between sessions one and two, while between sessions two and three, the values for all three variables decreased.

Further research is required to explore this problem. The results obtained in the present study may be an artifact of the small sample size. Why is it that the completion

rates observed in the first trial of the present study and in Fulford and Zhang's (1993) study are only about 50%? Is this due to the characteristics of the subjects participating in the studies? Perhaps learners from the fields of education and child and youth care differ from the population at large. Including learners from other disciplines would control for effects related to learner characteristics. Other possible variables might be the interaction instrument itself or the educational environment (in-service vs. academic study) where the study was undertaken. The subjects in the Fulford and Zhang (1993) study were all practising K-6 teachers attending an in-service training course while the subjects in both trials of the present study were second-year undergraduate students. It is unknown if the participants in the Fulford & Zhang (1993) study were paid to attend the in-service training or if it was an expectation of their schools or the school board. In addition, we know nothing about the distribution of participants in the Fulford and Zhang (1993) study. It is possible that some sites had much lower participation rates than others, or that the individuals missing during the three sessions where the instrument was administered changed, thereby reducing the actual sample size while generally, class sizes remained reasonably stable.

In this study there were differences in participation rates between the two sites in both trials. At the UCFV site, participation was low in both trials of the present study. In the second trial the author acted as a site facilitator at UVIC, providing assistance and feedback to the learners. At the UCFV site, the instructor had very limited access to support staff and materials, which increased the instructors' work-load. For example all photocopying, data collection and forwarding was handled by the instructor. Perhaps

routine contact between subjects and investigator helped develop a sense of participation in the subjects that was not shared by the cohort at UCFV. This would suggest that increasing the commitment of the learners to participating in future studies might be accomplished by ensuring co-researchers or site facilitators at each site.

It would appear that the results obtained in the present study reveal some subtle differences between the learners involved in this study and those who participated in the Fulford and Zhang (1993) study. While there seems to be some evidence that supports the earlier Fulford and Zhang (1993) study, the unexpected effects reported in the present study suggest that the relationship between the two variables is not robust. Perhaps there are some other mediating factors impacting the reported perceptions.

Question 2

How well does the perceived level of personal interaction predict learner satisfaction with instruction?

For the relationship between personal interaction and satisfaction, Fulford and Zhang (1993) found the mean of the correlations for the three sessions ($r = 0.36, 0.40, 0.41$ respectively) to be $r = 0.39$. In the first trial of the present study, the correlations for personal interaction and satisfaction for the combined groups were found to be significant in the second and third sessions with coefficients calculated to be $r = 0.74$ and $r = 0.54$ respectively ($p < 0.01$). When the correlation coefficients were calculated for each site independently, there was statistical significance at a $p < 0.05$ level in sessions two and

three for both UVIC ($r = 0.61$ and $r = 0.68$) and UCFV ($r = 0.92$ and $r = 0.63$). These values suggest that the strength of the relationship between these two variables was stronger in the present study than was the case in the original Fulford and Zhang (1993) research.

In the second trial, there was a statistically significant relationship between personal interaction and satisfaction ($r = 0.61$, $p < 0.001$) in the third session only. The analysis indicated that the relationship was significant at the UCFV site (origination site) where $r = 0.70$, $p < 0.01$. It would appear that in the present study, while the relationships between the two variables are not as stable as was the case in the Fulford and Zhang (1993) study, the strength of the relationship appears to be somewhat stronger than was the case in the earlier study. As was noted in the previous question, this might be accounted for if there are differences in the characteristics of the subjects participating in the study.

The CYC 201 course is an open course, that is, learners need not be registered in the child and youth care program. The CYC 200A course is restricted to learners who are formally registered in the child and youth care program. Since CYC 201 is an open or survey course, learners from different disciplines might respond differently to the course material and the pedagogical techniques used than the learners formally registered in the CYC program.

Question 3

How well does the perceived level of overall interaction predict learner satisfaction with instruction?

Fulford and Zhang (1993) reported that for the relationship between overall interaction and satisfaction the mean of the correlations ($r = 0.67$, $r = 0.64$, $r = 0.73$) for the three sessions was $r = 0.68$, $p < 0.01$. In the present study, for the UCFV and UVIC cohorts combined, the correlations between overall interaction and satisfaction in the second session ($r = 0.69$) and the third session ($r = 0.42$) were significant at $p < 0.01$ and $p < 0.05$ respectively. The only statistically significant relationship between overall interaction and satisfaction when the sites were considered separately was found in the second session at UCFV where $r = 0.98$ ($p < 0.001$). The mean of the correlations ($r = 0.56$) indicates that the percentage of variance in satisfaction accounted for by overall interaction was 31% in the first trial.

The calculation of the correlation coefficients for the combined groups in the second trial show results more congruent with what was expected. As was shown in Table 9, they indicate that there was a statistically significant relationship between overall interaction and satisfaction in all three sessions ($r = 0.71$, $r = 0.64$, $r = 0.72$) respectively, at the $p < 0.001$ level. The mean of the correlations was $r = 0.69$ which is very similar to the value ($r = 0.68$) obtained by Fulford and Zhang (1993). In this trial, perceptions of overall interaction accounted for 48% of the variance in satisfaction.

The relationship between overall interaction and satisfaction Fulford and Zhang (1993) reported does not appear to be present in the first session of the first trial of the present study. An examination of the results (Table 3) shows that in spite of a higher score for overall interaction (5.86 as opposed to 4.55), the UCFV cohort rated their

satisfaction lower (4.06 compared to 4.56) than the UVIC cohort in session one of the first trial.

The results of the second trial (see Tables 7-9) do not appear to support Fulford and Zhang's (1993) suggestion that perceptions of overall interaction are the critical predictors of learner satisfaction. In both the first and second sessions, the UCFV cohort, in spite of higher overall interaction scores, exhibited lower satisfaction scores than the UVIC cohort.

The results from the first three questions above suggest that there were some differences not only between the two cohorts of learners in the present study, but also that they differed from the subjects in the Fulford and Zhang (1993) research. The subjects in the Fulford and Zhang (1993) research were practising K-6 teachers and the DASH course was a two credit, in-service training program. The characteristics of the two cohorts of learners in the present study were described earlier in Chapter Three as were the course characteristics. Perhaps the fact that the CYC learners were registered in an undergraduate, pre-professional program might be an important factor to control for. By using learners registered in elementary education programs as well as learners in the CYC program, the two cohorts might be more similar with respect to orientation as "helping" professionals.

Perhaps an important qualitative difference between the two cohorts in the present study is that the UCFV, formerly a Community College, is now a university-college with degree granting status. UCFV provides the Child and Youth Care program on a part-time, evening-class basis. Neither of the two research universities (Simon Fraser

University and University of British Columbia) on the lower mainland offer the CYC program, it is only offered at the University of Victoria on Vancouver Island. The intent of the program at UCFV is to provide access to a CYC program, in partnership with the University of Victoria, for working students who are unable or unwilling to re-locate to Victoria. Perhaps the orientation of these learners towards education is such that the telecourse environment was less satisfying because the content and approach was not congruent with their experiences as learners. It might be that this general sense of dissatisfaction affected their perceptions so that participation had little impact on their satisfaction. In addition the fact that the learners at UCFV had no choice regarding course delivery mode might have been a factor in their perceptions of satisfaction.

Question 4

Do the perceptions of interaction change over time?

Fulford and Zhang (1993) noted that perceptions of both kinds of interaction and satisfaction appeared to decline over time. They used a 2x3 ANOVA procedure with repeated measures on what they identified as the two independent variables; time and perception. Their argument was that time had three levels: beginning, mid-point, and end. The second variable, perceptions of interaction, was described as having two levels: personal and overall. Since these two variables are not dichotomous; that is, the subjects had perceptions of both kinds of interaction and could not be grouped as having either one or the other kind of interaction, it would appear that a repeated measures ANOVA such as

the one Fulford and Zhang (1993) used would not be an appropriate procedure for analysis.

In the present study, three separate, one-way, repeated measures ANOVAS were run on each of the variables (Satisfaction, Personal Interaction and Overall Interaction) to evaluate the effect of time over the three sessions. The results indicate that for the first trial, the effect of time was significant with respect to overall interaction, but not for the other two variables. It would appear that learner perceptions of overall interaction decreased over time, a finding that is in agreement with what Fulford and Zhang (1993) report.

In the second trial, the effect of time was significant for both independent variables, but not for the dependent variable, satisfaction. The results from the present study suggest that while perceptions of overall interaction do appear to decrease over time, it seems that the differences between the two cohorts of learners is a factor in perceptions of interaction and in satisfaction, and that this effect requires further investigation. A future study that established a base-line of learner attitudes toward education and pedagogy would be useful in evaluating differences between the different educational environments. For example, questions that asked if they, as learners, expected the instructor to lecture, as opposed to facilitating learning. In essence, using questions asking if the educational/learning experience was passive or active. If there are differences in attitudes towards and about both education and instruction among various educational contexts, based on the results obtained in the present study, it appears that this is an important variable to consider.

Question 5

What was the distribution of learning-style types at UVIC and UCFV?

First Trial

At the UVIC site over half the learners were divergers (55%) and about one quarter (25%) were Accomodators. At the UCFV site the distribution of learning style types appears to have been more evenly balanced between Accomodators (41%) and Divergers (36%). At both sites Assimilators appear to be equally distributed, the least frequently observed learning style (3/42) were Convergers. It is interesting to note that the majority of learners (78.5 %) when the sites were combined, were either Accomodators or Divergers which are the two learning style categories that have high concrete experience (CE) scores. Based on Dille and Mezack's (1991) findings, we would expect to find these learners to be more suited to interactive classrooms and would therefore find the experience to be more satisfying than would Convergers or Assimilators who rate higher on the abstract conceptualisation (AC) end of the abstract conceptualisation - concrete experience continuum.

The distribution of learners across the AE-RO (x-axis) indicates a trend towards reflective observation rather than active experimentation among the subjects of this study. This is consistent with Kolb's interpretation of learning style preferences which suggests that individuals in the helping fields are likely to prefer reflective observation and concrete experience (Divergers) over abstract conceptualisation and active experimentation (Convergers). Kolb (1984) suggests that Convergers, who combine active experimentation and abstract conceptualisation, would rather deal with technical tasks and

problems than interpersonal issues, and that Assimilators, who combine abstract conceptualisation with reflective observation, are less focused on people and are more interested in abstract ideas or concepts.

It is interesting to note that, according to Kolb (1985), in the self-scoring LSI package, teachers are likely to be assimilators while in the technical specifications (McBer, 1995) indicates that the validity score for education (95) puts education close to the centre of the AE-RO axis and approximately two thirds of the way towards the concrete experience end of the AC-CE scale (Divergers). Unfortunately, the measure used was not reported so the meaning of the values reported is unclear. The value for teachers (95) appears to be approximately at the midpoint of the values reported for all careers where the range was from the minimum score of 11 (nutrition) to the maximum of 190 (nursing).

One possible interpretation might be that this reflects a possible difference between primary and secondary/post-secondary level teachers. Since college and university professors are also likely to be Assimilators according to the self scoring LSI (1994), it is possible that content-focused educators such as secondary and post-secondary educators are not as relationship focused as primary educators who, like child and youth care practitioners, generally work with younger children. The college and university instructors are not mentioned as a separate career in the technical specifications (1995).

The distribution of Convergers and Assimilators is remarkably similar between the two sites. These two learning styles are not consistent with people who are oriented towards professions such as Child and Youth Care, so we would expect there to be fewer subjects exhibiting these two learning styles. On the other hand, there are interesting

differences in the mix of Accomodators and Divergers that the theory does not predict. The results show that there were more Divergers at the UVIC site than there were at UCFV. Kolb suggests that Accomodators are more action-oriented than Divergers who tend to prefer to observe and reflect. Perhaps UVIC attracts learners who are more oriented towards reflection and observation compared to those who attend UCFV. If this is the case, then course designers would need to take this factor into account. Further research into this area is warranted.

Second Trial

At the UVIC site approximately 42% the learners were divergers and about one quarter (25%) were Accomodators which was similar to the distribution observed in the first trial. At the UCFV site the distribution of Accomodators (36.4 %) was somewhat lower than in the first trial and divergers (27.3 %) were also somewhat less represented. Assimilators made up 27.3 % of the distribution at UCFV, and 33.3 % at UVIC; slightly more than twice as high as was observed in the first trial.

As was seen in the first trial, the UVIC cohort appears to be biased towards the reflective observation end of the *x* axis and the concrete experience end of the *y* axis. The UCFV cohort appears to be more evenly distributed on both the *x* and the *y* axis although when one looks at Figure 12 the cluster of six Accomodators on the left side of the grid shows a strong bias towards active experimentation while the divergers tend to be grouped more to the centre of the grid which shows less polarisation in orientation.

Comparing the distributions at both sites across the two trials reveals some interesting patterns. In the first trial, UVIC had 25% Accomodators while UCFV had

40.9%. In the second trial, UVIC still had 25% Accomodators while at UCFV, the Accomodators dropped a little to 36.4% of the total. For the diverger learning style, UVIC had 55% in the first trial while UCFV had 36.4 %. In the second trial, UVIC had 41.7% divergers while UCFV had 32.4%. In the first trial UVIC had only one Converger while in the second trial none were present. UCFV on the other hand, had two Convergers in both trials. The Assimilator learning style showed the most change. In the first trial at UVIC, Assimilators represented 15% of the learners, at UCFV they represented 13.6%. In the second trial the Assimilators jumped up to 33.3% at UVIC and 27.3% at UCFV. Based on Kolb's (1984) theory, Assimilators are more oriented towards abstract conceptualisation and reflective observation which suggests that lecture style delivery of content with group discussion would be satisfying for this learning style cohort. This tends to confirm the importance of understanding learning-style types to best match learners and pedagogy.

Question 6

What is the learning-style type distribution in the UVIC conventional distance education cohort?

The distribution of learning-style types shows a tendency (71.8%) towards the concrete experience end of the AC-CE axis. This suggests that the distance learners were more oriented towards learning by experiencing rather than by abstract thinking. There appears to be an even split between the AE-RO modes, with a tendency to remain close to the centre of the x-axis. In the author's experience as a distance education instructor, most of the learners taking CYC courses by distance were experienced practitioners who

were studying to upgrade their credentials (BA in CYC) for either personal development or as a requirement of their employers.

Compared to the other cohorts of learners participating in the present study, the conventional distance education cohort had formal contact with other learners in their section only when a telephone teleconference among nine learners and their instructor was scheduled. The other two sections, conventional on-campus and the fiber optic delivery, were similar to each other in that the learners were in contact with each other for three hours a week, either in their own classroom or via the two-way fiber optic link to the other classroom participating in the course. There appears to be evidence that the conventional distance learners differ from their fellow learners in the other cohorts. Further discussion of this distribution is made in question eight.

Question 7

What is the learning-style type distribution in the UVIC conventional on-campus cohort?

The conventional on-campus cohort distribution evidences some of the major differences between the two conventional delivery modes. For example, there is a noticeable shift from a balance between the AE-RO poles to a dominance of the reflective observation end of the x-axis with only 18.9% of the learners being Accomodators, there were no Convergers present in this cohort. This finding is congruent with the tendencies observed in the two UVIC cohorts in the fiber delivery mode where 70.0% (first trial) and 66.6% (second trial) of the learners were on the RO end of the AE-RO axis.

With respect to the AC-CE or y-axis, the UVIC conventional on-campus cohort shows a stronger tendency towards reflective observation (43.2%) than was the case for the other cohorts where the range ran from a low of 20.0% for the UVIC cohort in trial one, 23.0% UCFV in trial one, 28.1% for the conventional distance education cohort, 33.3% for the UVIC cohort in trial two, and 36.3% for the UCFV second trial.

Question 8

Do the observed distributions deviate significantly from the normative distribution reported by Kolb (1984)?

In Chapter Four, it was reported that, based on the technical specifications for the LSI (McBer, 1985), one should expect a relatively equal distribution of learning-style types. Chi-Square tests were performed to evaluate the deviation of the observed distributions from the expected distribution for both trials of the fiber optic delivery and for the two conventional delivery cohorts. In all cases the alpha level ($\alpha$) was set at 0.05. The results from the analysis for the first trial (Table 17) show that since $X^2_{obt} > X^2_{crit}$ in the UVIC (N=20) distribution, we reject the null hypothesis. In other words, the deviation from that expected in the observed distribution is not due to chance, suggesting that some factor or factors are at work here. For the UCFV cohort (N=22) however, the $X^2_{obt}$ is less than the critical value, therefore the observed deviations from the expected distribution are not significant. The most likely explanation for the observed deviation in the UVIC cohort would be the small sample size.

The results of the Chi-Square analysis of the observed distribution of learning styles at both the UVIC (N=12) and the UCFV (N=22) sites in the second trial were reported in Table 18. The results indicate that the observed distribution's deviations do not significantly differ from that which we would expect to have occurred by chance.

A Chi-Square analysis (see Table 19) of the learning style distribution in the conventional delivery modes (on-campus and distance) indicates that for the observed distributions, the deviations from the expected distributions are greater than would be expected due to chance for both the on-campus cohort (N=37) and the distance education cohort (N=32). These learners apparently differ in some way from the general population. It would be interesting to gather more learning-style type data to determine what the norms are for learners in the CYC field. Perhaps the Kolb LSI or some similar tool could be a useful in selecting students that would be better oriented towards the field.

Question 9

Is there a relationship between learning style, as measured on the Kolb LSI and learner satisfaction as measured by the Fulford and Zhang (1993) instrument?

In Chapter Three the conceptual model for the present study was depicted (Figure 1). The bold line linking learning style and satisfaction indicates the relationship proposed for investigation in the present study. As was reported in Chapter Four, 42 out of the 44 learners registered in the first trial (CYC 201) completed the Kolb Learning-Style Inventory, however, only 10 of these subjects also completed the Fulford and Zhang (1993) instrument on all three test occasions. In the second trial (CYC 200A), for some

unknown reason, none of the UCFV cohort put their names on the Kolb inventory and of the 12 learners who completed the Kolb instrument at the UVIC site, only five also completed the interaction instrument on all three test occasions. This resulted in a lower than expected number of data sets (15). Ideally, an ANOVA analysis would be the appropriate statistical tool to answer question 9. However, when a group consists of one or no members, such as in the present study, there can be no variance within those groups so the analysis would be pointless. Clearly, further research where the number of participants completing the required instrumentation is higher will be needed to satisfactorily answer this question. Within the limits imposed by the small N, however, there are indications that there some learning style types were better satisfied.

The observed distributions in the first trial are non-uniform with one each of Accomodators and Convergers, three Assimilators and five Divergers. When the means of the satisfaction scores are compared, Divergers show higher scores than do Assimilators. The other two learning styles, Convergers and Accomodators have only one subject each so the values obtained are difficult to evaluate. The Converger's score for the first session is so low that it is reasonable to question the validity of that score. The Accommodator's satisfaction score appears to be lower than the mean of the Divergers and higher than the mean of the Assimilators. It would appear that the mean of the perceptions of satisfaction increased over time for the Divergers while decreasing for the Assimilators.

In the second trial there were no Convergers, one each of Accommodators and Divergers and three Assimilators. A glance at Table 14 shows a large degree of variation in the scores of the three Assimilators; in addition, such a small sample makes drawing

inferences problematic, if not impossible. With this caution in mind, the average satisfaction score for the Assimilators was 4.31 which fits between the scores for the Diverger (5.73) and the Accommodator (4.07) learning-style types. Based on the results obtained in the present study, the hierarchical ranking of the learning styles with respect to satisfaction would be Divergers as the most satisfied followed by Accommodators and Assimilators with very similar scores and finally the least satisfied would be Convergers.

## Limitations of the Present Study

The small size of the learner registrations in the fiber optic telecourses used in the present study meant that attrition rates similar to those reported by Fulford and Zhang (1993) resulted in samples that are too small for adequate statistical analysis. Fulford and Zhang (1993) had 233 participants in their study, but only 123 provided data on all three occasions. In other words, only 53% of the participants provided complete data. In the present study, the number of participants was much lower; 44 in the first trial and 40 in the second trial. In the first trial similar attrition rates (49%) to those experienced by Fulford and Zhang (1993) occurred. Steps were successfully taken in the second trial to improve the response rate on the interaction instrument. In the second trial data was provided by 70% of the participants, the final number of complete data sets was still too small to ensure reliable statistical analysis.

As was mentioned earlier, not only did some learners in the present study choose not to fill out the interaction instrument, but the individuals who chose not to complete the form changed from session to session. Clearly, those learners who completed the

instrument on all three occasions in the Fulford and Zhang (1993) study were different than the other 110 learners in at least one respect (completing the instrument) and may have differed in other respects, which might have biased the results Fulford and Zhang (1993) obtained. For example, if the 123 learners who participated were all older learners, their perceptions of interaction might differ from those of younger learners as has been suggested by May (1993).

In the first trial of the present study, 26/42 (62%) of the learners were 25 years of age or younger. In the second trial 12/23 (52%) of the learners were <25. In general, the UCFV cohort appeared to have more students > 25 than did UVIC. Perhaps more mature learners were less interested in non-instructional activities than younger students, but this would not explain why the response rate overall was so poor from UCFV.

As has been mentioned earlier, based on Kolb's theory, it is expected that the field of Child and Youth Care would tend to attract individuals with an orientation towards people rather than ideas. There was no control group in the present study, all of the available students were asked to participate. It is possible that because of this, a systematic bias occurred in the results. Those learners who chose to respond to the instruments might be more sensitive towards others, or have more interest in research.

The high ratio of female to male students may also be a factor to consider. Fulford and Zhang (1993) did not report on the gender distribution or any other personal characteristics of the subjects in their study. In the present study the number of males registered in all of the sections of both trials, including conventional on-campus and

delivery sections was 25/147 (17%). Perhaps female learners would be more inclined to co-operate with a female researcher?

The content of the CYC 201 and CYC 200b courses were quite different which may have had an impact on learner satisfaction. In addition, two co-instructors, one at the UVIC site and one at UCFV site, delivered CYC 201, while only one instructor (UCFV site) delivered CYC 200b, employing a more traditional lecture mode. Perhaps the more traditional lecture format of course delivery was more familiar to the learners and might have resulted in higher perceptions of satisfaction.

It would appear that there were differences between the learners at UCFV and UVIC. For example, the learners at UCVF appeared to have been less satisfied in spite of higher participation scores in some sessions. This might reflect the fact that the learners at UCFV had no choice about the course delivery mode, the interactive television delivery was the only mode available. At the UVIC site learners could choose to take the course in a conventional on-campus classroom.

## Implications and Recommendations

As was discussed earlier, there is little argument but that interactive television is an effective means of course delivery. The literature suggests that learning outcomes are similar irrespective of the course delivery mode. The question is not whether interactive television works, but rather, where does the technology best fit?

Since the literature argues for the value of interactivity in education, interactive television would appear to be an appropriate technology to use where interaction is

particularly useful, as was the case in CYC 201. The technology also provides a powerful solution to access issues. Learners, such as those in remote regions who might have insurmountable difficulties accessing courses in the traditional on-campus classroom would be better able to continue their studies if interactive television was available in their local area.

Care must be taken to understand the while interactive television might be an effective means of course delivery, it is not necessarily the preferred mode for all learners, and it might not be required for some courses. Interactive television should not be considered a universal solution but rather as a powerful tool to utilise when appropriate, as in distributed learning environments.

The differences between the first and second trial results are interesting if considered in light of the differences in the content and style of delivery of the two courses. It would appear that the second trial (CYC 200A) was more similar to conventional course deliveries than was the case in the first trial (CYC 201) where the instructors planned for high levels of interaction both within and between sites.

Perhaps learners who are not used to an interactive-constructive learning environment might find the experience less satisfying irrespective of the presence of technologies such as interactive television. As was discussed earlier, learners inexperienced with interactive-constructive learning environments might be uncomfortable with an unfamiliar mode of learning, and may be more dependent on instructor leadership and expertise. Learners in an environment that challenged them to think about what they

were exposed to and then to construct new meaning and learning might find the process both intimidating and frustrating.

As was mentioned earlier, an additional consideration for the UCFV cohort was that they had no alternative to participation in the fiber optic course delivery while the UVIC students had a choice between conventional on-campus delivery or the interactive television delivery. Perhaps being forced into a delivery mode that was unfamiliar increased learner frustration.

In the Fulford and Zhang (1993) study, the learners were practising K-6 teachers who were able to access the DASH course in the convenience of their own school. It seems reasonable to suggest that in areas where access to education is not available, except by some sort of distance delivery, learners might be more positively oriented towards interactive television course delivery (University of Maine, 1992). This was not the case at UCFV because all of the other CYC courses were delivered in the conventional face-to-face manner.

The learner-technology interface discussed by Hillman, Willis and Gunawardena (1994) is also an important dimension to consider in future studies. If learners are not comfortable with or accepting of technology, it is unlikely that they will be satisfied with their experiences of technology. According to the instructors delivering the telecourses in the present study, when the learners were asked in the first class session to talk about their reaction to the presence of the television technology, most learners indicated that they were intimidated or uncomfortable. Some sort of pre-course familiarisation session(s)

would help reduce learner resistance and potentially increase satisfaction (Hillman, Willis & Gunawardena, 1994).

## Conclusions

The results of the present study suggest that the perceptions of overall interaction might not be as good predictor of learner satisfaction as Fulford and Zhang (1993) suggested. In several cases in the present study, higher values for overall interaction were related to lower levels of satisfaction, particularly with the UCFV cohort. This finding indicates a need for further research to determine if the observed effect is due to the instrument, the sample, or some other factor(s).

The observed low rates of participation, especially with respect to the Fulford and Zhang (1993) interaction instrument, suggests that future research in this area must attempt to increase participation levels. While a more rigorous approach to data collection appears to have been helpful in improving response rates in the second trial, the completion ratio experienced both by Fulford and Zhang (1993) and in the first trial of the present study is of concern. Since there seemed to be better response rates from the UVIC cohort in the second trial where the investigator was a familiar person to the learners, perhaps a co-investigator model where an investigator spends time with the subjects at all sites involved in the study might result in better participation levels.

An additional consideration when dealing with problems of subject participation is what kind of steps might be employed to increase participation. A reward or incentive-based approach might increase responses, but may impact the validity of the data. Similarly, if a more coercive approach, such as demanding that the completed instrument

be turned in before leaving the classroom were adopted, it might be possible to obtain 100% participation, but the data obtained may not be valid and such a technique would appear to be in conflict with the principle of voluntary participation. Perhaps a contractual arrangement wherein those who agree to participate in the research undertake to provide complete participation as required by the investigator.

The distribution of learning-style types observed in the present study lends support to the Kolb theoretical model. Convergers represent only 5% of the 147 learners in the study while the majority (67%) were Divergers and Accomodators. The Converger learning style combines active experimentation and abstract conceptualisation. The careers where this learning style are commonly found are the technical trades, engineering, and the physical sciences. The Kolb LSI (McBer,1985) technical specifications suggest that Convergers should represent roughly one quarter of the population. The lack of Convergers in this study was found to be consistent across sites and delivery modes. Apparently individuals in the field of Child and Youth Care are not likely to be Convergers. As was mentioned earlier, it would be interesting to gather data from learners in primary education, child and youth care and other "helping" professions such as social work, nursing and the like to see if this pattern is consistent or is unique to learners in CYC programs.

Although the relatively small sample size suggests caution in interpreting this finding, it appears that Divergers were the most satisfied learning-style type in the present study. If people who are oriented towards "hands on" experiences and reflective observation are more likely to be satisfied by interactive-constructive learning

environments, then incorporating opportunities for both modes of learning would seem to be an important goal for course designers and instructors to keep in mind. The larger samples of learners in the two conventional course delivery modes were not participants in the interaction component of the study. It would be interesting to further explore the linkage between learning-style and satisfaction in future studies. The results of the present study hint that there may be a relationship that could be exploited to better design and implement interactive television course delivery.

A critical factor to understand and control in a future study would be the participation rate. Fulford and Zhang (1993) describe the DASH panel as a group of facilitators present at all the participating sites except origination site. The DASH facilitators met with the learners for an hour prior to convening in the HITS classroom. A panel of DASH staff conducted check-in activities at each site and answered questions posed by the learners participating in the course. Although it appears that there were site facilitators in the Fulford and Zhang (1993) study, this did not appear to effective in securing high participation levels. Further studies need to collect information about the reasons for non-participation or non-compliance.

A consideration that would impact future studies is the amount of time required for collecting data both with quantitative and qualitative measures. The two telecourse deliveries involved in the present study were 13 weeks long. As was indicated by the instructors, planning and managing the telecourse was a challenge unlike those presented in conventional course delivery models. Time becomes a critical factor, and while

instructors are prepared to co-operate with the research process, if it becomes too intrusive and time consuming, understandably support begins to diminish.

Perhaps if the interaction instrument were administered on a different schedule, for example at the first and last sessions, or only the final session, then in spite of losing information about changing perceptions over time, one might be able to get a clearer idea about how learners felt about the interaction and satisfaction perceptions overall, rather than a focus on perceptions of a specific class session.

Since there appears to be evidence of resistance and trepidation towards technology among both learners and instructors, an introductory workshop where participants were given training and an opportunity to "play with the technology" might be of assistance. Both pre-tests and post-test of participant attitudes towards the interactive television technology could be used to gauge the effectiveness of the preliminary workshop.

It seems clear that interactive television has both advantages and disadvantages. Presently, the techniques of interactive television instruction are in a state of constant flux, changing as instructors and learners reflect on their experiences. The results of this study suggest that interactive television has a key role to play in post-secondary education but further research is required to help us better understand how to use the technology for maximum effectiveness. The present study lends support to the notion that one of the key factors to consider is the learning-style of the learners interested in participating in the courses. An additional consideration is the content of the course. There would not appear to be any compelling reason to employ two-way, interactive, full-motion television

for what is an essentially one-way, lecture style of instruction. However, if the price of such systems becomes more affordable, then perhaps the technology could facilitate more wide-spread adoption of interactive-constructive pedagogical techniques whatever the specific curriculum being taught.

The need for alternative modes of course delivery to ensure equitable access for learners described in the literature means that we must invest in research and development of alternative technologies and techniques. The literature reviewed for this thesis is consistent and compelling about the importance of interaction for learning to take place. In the present study, learning-style type was considered as a possible independent variable related to learner satisfaction. The results of this study indicate that learning-style does appear to have some relationship with learner satisfaction. Future studies should attempt to use a larger sample where the distributions of learning-style types would be more normally distributed.

The present study suggests that learner satisfaction is a multi-dimensional phenomenon and one that is not likely to be simply or easily explained by any single factor. It is more likely that a number of different factors contribute to learner satisfaction. It is important to keep in mind that learner satisfaction is critical for effective learning. Information about the affective domain seems to be rich with potential for guiding effective measurement of learner characteristics. It would be interesting to interview all of the subjects to obtain qualitative data that might shed some light on learner attitudes toward participation in research on interactive television course delivery. The better we can understand learners and the complicated dynamics of the interactive television classroom, the more effective our delivery methods will become.

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# APPENDICES

# APPENDIX A

Interaction/Satisfaction Measure
CYC 201 & CYC 200A

CYC 201 Telecourse

Interaction Questionnaire

Please be sure to put your student identification number in this space:_____

Please reads the questions carefully because the scales change.
Please try to answer each question honestly.
Choose only one response for each question. Circle the appropriate number.
The scales range from 1-6.
One and six represent the extremes, two through five allow for degrees in between.
If a question is not applicable, please write N/A next to the scale.

1. How important do you think interaction is in this class?
   unimportant 1 2 3 4 5 6 important

2. What level of interaction do you think occurred today?
   low 1 2 3 4 5 6 high

3. How did the level of interaction make you feel?
   low 1 2 3 4 5 6 high

4. How often did you answer questions asked by the instructor?
   never 1 2 3 4 5 6 often

5. How often did you offer your opinion?
   never 1 2 3 4 5 6 often

6. How often did you ask a question?
   never 1 2 3 4 5 6 often

7. How often did you participate in group activities?
   never 1 2 3 4 5 6 often

8. What level of interaction was there between you and the instructor?
   low 1 2 3 4 5 6 high

9. What level of interaction was there between the instructor and the class?
   low 1 2 3 4 5 6 high

10. What level of interaction was there between you and your classmates?
    low 1 2 3 4 5 6 high

11. What level of interaction was there among all the participants?
    low 1 2 3 4 5 6 high

12. What level of involvement did you feel with the topic(s) discussed?
low 1 2 3 4 5 6 high

13. How well did the instructor motivate interaction in general?
ineffective 1 2 3 4 5 6 effective

14. How well did the instructor motivate interaction with you?
ineffective 1 2 3 4 5 6 effective

15. What % of the time was used in the presentation of topics?
0% 1 2 3 4 5 6 100%

16. What % of the time were the instructor and participants interacting?
0% 1 2 3 4 5 6 100%

17. What % of the time were you working individually?
0% 1 2 3 4 5 6 100%

18. How would you rate the value of the video?
low 1 2 3 4 5 6 high

19. How would you rate the value of the topics presented?
low 1 2 3 4 5 6 high

20. How would you rate the value of the question and answer time?
low 1 2 3 4 5 6 high

21. How would you rate the value of the participant sharing activities?
low 1 2 3 4 5 6 high

22. How would you rate the value of the written activities?
low 1 2 3 4 5 6 high

23. How would you rate the value of the reading activities?
low 1 2 3 4 5 6 high

24. How much of today's session was valuable to you?
none of it 1 2 3 4 5 6 all of it

25. How much of the information gained will you use immediately?
none of it 1 2 3 4 5 6 all of it

26. How would you rate your understanding of the topic(s) before class?
low 1 2 3 4 5 6 high

27. How would you rate your understanding of the topic(s) after the class?

low 1 2 3 4 5 6 high

28. How did you feel about today's lesson as a whole?

negative 1 2 3 4 5 6 positive

Thank you for your participation!

**CYC 200A Interactive Telecourse Questionnaire**

Today's date:_____ Your Name:_____

Please reads the questions carefully because the scales change.
Please try to answer each question honestly.
Choose **only one** response for each question. Circle the appropriate **number.**
The scales range from 1-6.
One and six represent the extremes, two through five allow for degrees in between.
If a question is not applicable, please write N/A next to the scale.

1. How important do you think interaction is in this class?
   unimportant 1 2 3 4 5 6 important

2. What level of interaction do you think occurred today?
   low 1 2 3 4 5 6 high

3. How did the level of interaction make you feel?
   low 1 2 3 4 5 6 high

4. How often did you answer questions asked by the instructor?
   never 1 2 3 4 5 6 often

5. How often did you offer your opinion?
   never 1 2 3 4 5 6 often

6. How often did you ask a question?
   never 1 2 3 4 5 6 often

7. How often did you participate in group activities?
   never 1 2 3 4 5 6 often

8. What level of interaction was there between you and the instructor?
   low 1 2 3 4 5 6 high

9. What level of interaction was there between the instructor and the class?
   low 1 2 3 4 5 6 high

10. What level of interaction was there between you and your classmates?
    low 1 2 3 4 5 6 high

11. What level of interaction was there among all the participants?
    low 1 2 3 4 5 6 high

12. What level of involvement did you feel with the topic(s) discussed?
low 1 2 3 4 5 6 high

13. How well did the instructor motivate interaction in general?
ineffective 1 2 3 4 5 6 effective

14. How well did the instructor motivate interaction with you?
ineffective 1 2 3 4 5 6 effective

15. What % of the time was used in the presentation of topics?
0% 1 2 3 4 5 6 100%

PLEASE TURN THE PAGE OVER>
(Added to this version to reduce failure to fill in the reverse side observed in trial one.)

16. What % of the time were the instructor and participants interacting?
0% 1 2 3 4 5 6 100%

17. What % of the time were you working individually?
0% 1 2 3 4 5 6 100%

18. How would you rate the value of the video?
low 1 2 3 4 5 6 high

19. How would you rate the value of the topics presented?
low 1 2 3 4 5 6 high

20. How would you rate the value of the question and answer time?
low 1 2 3 4 5 6 high

21. How would you rate the value of the participant sharing activities?
low 1 2 3 4 5 6 high

22. How would you rate the value of the written activities?
low 1 2 3 4 5 6 high

23. How would you rate the value of the reading activities?
low 1 2 3 4 5 6 high

24. How much of today's session was valuable to you?
none of it 1 2 3 4 5 6 all of it

25. How much of the information gained will you use immediately?
none of it 1 2 3 4 5 6 all of it

26. How would you rate your understanding of the topic(s) before class?
low 1 2 3 4 5 6 high

27. How would you rate your understanding of the topic(s) after the class?
low 1 2 3 4 5 6 high

28. How did you feel about today's lesson as a whole?
negative 1 2 3 4 5 6 positive

Thank you for your participation!

# APPENDIX B

Kolb Learning Style Inventory

Permission to copy the Kolb Learning-Style Inventory was granted to the author. However, reproduction onto microfiche is not permitted. Therefore, if copies of the inventory are required, they may be obtained from:

**McBer & Company**
**Training Resources Group**
**116 Huntington Avenue**
**Boston, Massachusetts 02116**

Phone: (800) 729-8074
(617) 437-7080 (in Massachusetts)

# APPENDIX C

Consent to Participate Form
CYC 201

CONSENT FORM FOR PARTICIPATION IN THE STUDY ENTITLED
"An Evaluation of a Fiber Optic Interactive Electronic Classroom Course Delivery"

Purpose and procedure of the study

I understand that this research project is studying the effectiveness of an interactive electronic classroom course delivery between the University of Victoria and the University College of the Fraser Valley. I understand that I will be asked about my impressions of the effectiveness of the delivery of the CYC 201 course and my perceptions of the amount and type of interaction occurring in class. I understand that information will also be collected using the regular course/instructor form used in all courses in the School of Child and Youth Care.

Voluntary nature of participation

I understand that my participation is completely voluntary and that I can withdraw from the evaluation at any time, without explanation.

Confidentiality and anonymity

I understand that the data collected in this evaluation will remain confidential and kept in a locked room, that my name will not be attached to any published results and that my anonymity will be protected by using code numbers to identify results obtained from individual subjects.

Videotaping

I understand that some class sessions will be videotaped and that the tape will be erased immediately after content is coded in written form. I understand that if I do not wish to participate in the classes that are videotaped I can participate in the study by completing the questionnaire alone.

Participation/non-participation

I understand that whether I participate or choose not to participate will have no bearing on my grade for the course.

Date .....

Signature .....

Experimenter: .....

# APPENDIX D

Consent to Participate Form
CYC 200A
On-Campus and Interactive Telecourse Cohorts

Consent form for participation in the study entitled:

**"An Evaluation of a Fiber Optic Interactive Electronic Classroom Course Delivery"**

Purpose and procedure of the study

I understand that this research project is studying the effectiveness of an interactive electronic classroom course delivery between the University of Victoria and the University College of the Fraser Valley. I understand that I will be asked about my impressions of the effectiveness of the delivery of the CYC 200A course and my perceptions of the amount and type of interaction occurring in class. I understand that information will also be collected using the regular course/instructor form used in all courses in the School of Child and Youth Care.

Voluntary nature of participation

I understand that my participation is completely voluntary and that I can withdraw from the evaluation at any time, without explanation.

Confidentiality and anonymity

I understand that the data collected in this evaluation will remain confidential and kept in a locked room, that my name will not be attached to any published results and that my anonymity will be protected by using code numbers to identify results obtained from individual subjects.

Videotaping

I understand that some class sessions will be videotaped and that the tape will be erased immediately after content is coded in written form. I understand that if I do not wish to participate in the classes that are videotaped I can participate in the study by completing the questionnaire alone.

Participation/non-participation

I understand that whether I participate or choose not to participate will have no bearing on my grade for the course.

Date .....

Signature .....

Experimenter: .....

# APPENDIX E

Sorensen Instrument
(Formal UVIC Evaluation)

UNIVERSITY OF VICTORIA
SCHOOL OF CHILD AND YOUTH CARE
CYC 201/200A EVALUATION

Thank you for participating in this evaluation of the delivery of (CYC 200A / CYC 201) by interactive television.

The first six items of this questionnaire ask for information describing yourself. The remaining items ask your opinion on different aspects of the experience of participating in an interactive television classroom.

Please circle the category which most closely represents your opinion on that question.

Student Number _____

1. I am Female Male

2. My age is:
under 18 18-24 25-34 35-44 45-54 55 or over

3. Years of post-secondary education:
under 1 yr. 1 yr. 2 yr. 3 yr. 4 yr. or over

4. Years of paid work in CYC related field:
under 1 yr. 1 yr. 2 yr. 3 yr. 4 yr. or over

5. Number of distance education courses taken (including this one):
1-2 3-4 5-6 7-8 9-10 over 10

6. At which location are you taking this class?
UVIC UCFV

7. It is easy to pay attention to the instructor on the TV monitor.
Strongly disagree disagree agree strongly agree

8. I feel encouraged to become involved in class discussions and activities.
Strongly disagree disagree agree strongly agree

9. I Feel like I am part of the class.
Strongly disagree disagree agree strongly agree

10. I am learning as much in the interactive class as I would in a regular class.
Strongly disagree disagree agree strongly agree

11. I would tell my friends to take an interactive television class.
Strongly disagree disagree agree strongly agree

12. I would take another interactive television class.
Strongly disagree disagree agree strongly agree

13. Overall, I am satisfied with my interactive television class.
Strongly disagree disagree agree strongly agree

14. I feel that the instructor is available to answer questions.
Strongly disagree disagree agree strongly agree

15. The instructor pays attention to students at the remote site during class.
Strongly disagree disagree agree strongly agree

16. The class is well organised.
Strongly disagree disagree agree strongly agree

17. I feel the instructor is speaking directly to me.
Strongly disagree disagree agree strongly agree

18. I feel that the students at the other site(s) are very much a part of my class.
Strongly disagree disagree agree strongly agree

19. It is easy to use the microphone.
Strongly disagree disagree agree strongly agree

20. It is easy to see the television monitor.
Strongly disagree disagree agree strongly agree

21. It is easy to hear comments made by students at the other site.
Strongly disagree disagree agree strongly agree

22. Graphics and other visuals are easy to read on the monitors.
Strongly disagree disagree agree strongly agree

23. Technical problems interfere with my learning in the TV classroom.
Strongly disagree disagree agree strongly agree

24. The fact that I am "on TV" inhibits my class participation.
Strongly disagree disagree agree strongly agree

25. I pay as much attention in the interactive TV class as I do in a regular class.
Strongly disagree disagree agree strongly agree

26. The classroom is free of distractions (e.g. people coming in and out, noise from other rooms).

Strongly disagree disagree agree strongly agree

27. Enrolment and registration procedures met my needs.

Strongly disagree disagree agree strongly agree

28. I have adequate access to the resources I need for class, such as the library.

Strongly disagree disagree agree strongly agree

29. Remote site students receive class materials in a timely manner.

Strongly disagree disagree agree strongly agree

30. I have had no problem in getting access to the classroom during regularly scheduled class time (e.g., doors are unlocked)

Strongly disagree disagree agree strongly agree

31. List two things you like best about taking an interactive TV class.

32. List two things about the interactive TV class that you would like to change or improve.

Thank you for taking the time to complete this questionnaire.

# APPENDIX F

Consent to Participate Letter
Distance Education Cohort

September 19, 1995

Dear Students:

**Want a Freebie?**

In this package I have included a short questionnaire for you to fill out: the Kolb Learning-Style Inventory. We at the School of Child and Youth Care are always searching for ways to enhance both the quality of the courses we provide to you as learners, and to ensure that you find the experience as satisfying as possible. One of the characteristics of we all have as individuals is a preferred learning style. We believe that knowing what your learning style is will help us to more effectively deliver courses and enhance your learning.

The Kolb Learning-Style Inventory is a well-respected and quick way to measure learning styles. You are asked to choose endings to 12 sentences from a selection of four alternatives. You are to assign a "4" to the ending that best seems to fit and a "1" to the ending that seems least like the way you learn. I will then do the necessary calculations to determine what your learning style is. The inventory should take you about five minutes to complete. I will discuss this further and answer any questions you may have during our teleconference call.

Please take a few minutes to complete the inventory and mail it back to me at the University with your mid-term exam I the envelope provided (this is the Freebie!). I will let you know what your preferred learning style is and will provide some pointers about how to make best use of your learning style.

Your participation will be much appreciated!

Iain Stuart, Instructor
CYC 200A F50 95W

[Phone number included]

# VITA

Surname: Stuart Given Names: Iain Joseph

Place of Birth: Nottingham, England

Educational Institutions Attended:

| | |
|---|---|
| University of Alberta | 1971 to 1986 |
| University of Alberta | 1989 to 1991 |

Degrees Awarded:

| | | |
|---|---|---|
| B.A. | University of Alberta | 1986 |
| B.Ed. | University of Alberta | 1991 |

Publications:

Stuart, C.A., Stuart, I.J. (1995). Teaching and learning in the black box: Training and two-way interaction using television and technology. In S. LeMah (Ed.), 13th Annual International Conference of the Association of Management Proceedings: Global Health and Ecology Group & Collective Supplement. (pp.243-252 ) Virginia Beach, VA: Maximillian

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Title of Thesis:
The Relationship of Perceptions of Interaction and Learning Style to Learner Satisfaction in Distance Education.

Author 
Iain Joseph Stuart

Date JAN 15/1997