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ABSTRACT

This study examined the independent effects of six approaches to learning in online computer conferencing: (1) deep learning: (2) comprehension learning; (3) relating ideas; (4) surface learning; (5) syllabus boundness; and (6) achievement motivation. Deep learning, comprehension learning, and relating ideas were combined into a more general index called "meaning orientation" or "deep approach to learning." Syllabus boundness and surface learning were combined into a reproducing orientation index, a surface approach to learning. Online surveys were conducted in 3 school years at a Canadian university using the FirstClass proprietary software, which had been customized into an online conferencing system. The questionnaire was completed by 114, 280, and 679 students in the 3 years. Factor indexes were created of approaches to learning, active use of online conferencing, the subjective valuation of its personal importance to students, and embarrassment or anxieties over posting messages to online course conferences. Seven hypotheses were developed, the main one being that a deep approach to learning would result in greater use and personal importance of registered than unregistered course conferences. Only partial support was found for the hypotheses. The deep approach to learning resulted in a heightened active use of almost all aspects of online conferencing, increased reading and sending of messages, a greater subjective valuation by learners of the importance of participation in conferencing and nonacademic social debates, and a reduction in anxiety about postings. About 15% to 25% of the samples formed a "lost generation" in the e-learning world. These students scored high on a surface approach to learning and low on a deep approach. Implications for educators who want to reach these students are discussed. (Contains 32 tables and 45 references.) (SLD)

The Lost Generation in E-Learning: Deep and Surface Approaches to Online Learning

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Abstract

Does online learning in the form of computer conferencing favor students with specific approaches to learning and studying while disadvantaging others? "Approaches to learning" are derived from a British, Australian, and Scandinavian literature that focuses on the social context and processing of learning. This paper examines the independent effects of six "approaches to learning" in online computer conferencing: deep learning; comprehension learning, relating ideas, surface learning, syllabus boundness, and achievement motivation. Deep learning, comprehension learning, and relating ideas were combined into a more general index called meaning orientation, or the "deep approach to learning." Syllabus boundness and surface learning were combined into a reproducing orientation index, or a surface approach to learning. Online surveys were conducted in 1999, 2000, and 2001 of students across the McMaster University campus using the FirstClass® proprietary software. We customized FirstClass® into an open online conferencing system in which students had equal access to courses in which they were registered and those in which they were not registered. Factor indexes were created of the "approaches to learning", active use of online conferencing, the subjective valuation of its personal importance to students, and embarrassment or anxieties over posting messages to online course conferences to which others have access. We developed seven hypotheses. The main prediction is that a deep approach to learning would result in a greater use and personal importance of unregistered than registered course conferences. We only found partial support for our hypotheses. The deep approach to learning results in a heightened active use of almost all aspects of online conferencing, increased reading and sending of messages and files to registered and unregistered course conferences, a greater subjective valuation by learners of the importance of participating in online registered and unregistered course conferences, a greater subjective valuation by learners of the importance of participating in online non-academic social debates and discussions, and a reduction in the level of anxiety over personal displays of knowledge or ignorance contained in postings to online conferences. The surface approach to learning results in a significantly weak or decreased use of almost all aspects of online conferencing, decreased reading and sending of messages and files to registered course conferences, a greatly enhanced level of anxiety over personal displays of knowledge or ignorance contained in postings to online conferences, and considerable fear in exposing one's opinions to others, especially outside one's registered course conferences. We identified 15% to 25% of our samples that we called the "lost generation" in an e-learning world. They score simultaneously high on a surface approach and low on a deep approach to learning. They are unable to engage in online learning because of anxieties over computer-mediated communications and embarrassment over a lack of knowledge of subject matter. Educators will have to find other ways to accommodate such students, such as increasing their level of deep processing of curricula material, finding traditional methods of instruction, or increasing their comfort level in online conferencing.

Objectives

The objective of this paper is to explore the "approaches to learning and studying" of university students who engage in differing types of computer-mediated communications. Most research in this tradition has been of face-to-face classroom learning. Very little research has been conducted on "approaches to online learning". Does online learning attract students with particular dispositions to learn and study in certain ways? Does online learning encourage or reinforce certain learning processes, while discouraging others? Are certain students with particular predispositions to learn and study in certain ways disadvantaged by computer-based communications? These are critical questions for the design of learning technologies.

Theoretical Framework

The theoretical framework for this paper is broadly set in the "approaches to learning and studying" literature. This is somewhat different from the learning styles literature. "Approaches" are more social, process-oriented, and context-situated; "styles" are more psychological and individual (Biggs, 1993). There have been a number of attempts to examine the relation between learning styles and computer-mediated learning (Ross and Schulz, 1999; Loomis, 2000). These attempts are set within the broader context of research on computer-mediated communications (e.g., Rafaeli and Sudweeks, 1997; Sproull and Kiesler, 1986; Rice and Love, 1987; Walther, 1992). There have also been attempts to conduct fine analyses of text in computer-mediated communications (Gunawardena, Lowe and Anderson, 1997). The particular sub-tradition selected for our study is the work on "approaches to learning and studying" conducted in the United Kingdom, Scandinavia, Australia, and Hong Kong. The research literature extends back to the late 1970s, and is continuing today. Approximately 100 research articles and book chapters have been written in this theoretical tradition (e.g. Kember, 1990; Marton and Säljö, 1976; Ramsden, 1983; Richardson, 1992; 1995a; 1995b; Entwistle, 1981; 1988; 1995; Harper and Kember, 1989; O'Neil and Child, 1984; Biggs, 1978; Watkins, Hattie, Astilla, 1983; 1986). Its basic argument is that students have distinctive "approaches to learning and studying" which are highly influenced by the expectations of their academic programs, assessment procedures, and instructors (Marchetti, 1997). The "approaches" have many dimensions, such as deep and surface learning, intrinsic and extrinsic motivation, organized/disorganized studying, syllabus boundness, comprehension, relating ideas, and strategic or achievement motivation. Some of these conceptual dimensions have been arranged in a more generic construct called "meaning orientation" (deep learning, intrinsic motivation, and relating ideas), and a second construct called "reproducing orientation" (surface learning, syllabus boundness, disorganized studying, and fear of failure). The most widely known and understood constructs are "deep learning" and "surface learning". Ramsden (1979: 422) defines deep learning as "a tendency on the part of the student to relate the task to personal experience", "a desire to make active attempts to relate the different parts of a task to each other or to other tasks", and "an intention to impose a structure on the whole task and think about its meaning". In surface learning, "students...try to memorize parts of the text and treat it as a phenomenon isolated from themselves" (Ramsden, 1979: 415). Ramsden found three aspects of surface level processing of texts by students: "the student indicates an intention to treat the learning material as an isolated, elemental phenomenon;" "approaches the task unreflectively or passively;" and, "may try to memorize the material" (Ramsden, 1979: 422-3). These and other "approaches to learning" will be explored below.

"Approaches to learning" have systematic correlates, such as age, gender, national culture, academic program, and academic performance. Although there are some deviations, women generally score higher than males on meaning orientation and deep learning, especially in programs with a significant number of other women (Hayes and Richardson, 1995; Watkins, and Hattie, 1981). Older and more "mature" students score higher on deep learning; younger and day students score higher on reproducing orientation or surface learning (Richardson, 1994; 1995a; Hayes, King, and Richardson, 1997). High academic achievers score higher on deep learning, organized study methods, intrinsic motivation, and achievement motivation; low academic achievers score higher on surface learning and syllabus boundness (Richardson, 1995a: 14-15; Entwistle, Hanley and Hounsell, 1979). Cuneo et al (2001) found that the effects of deep learning (positive) and surface learning (negative) on academic achievement were mediated by in-class writing activities around creating good inquiry research questions and assessing good and poor evidence, while organized study methods and intrinsic motivation had unmediated direct effects on academic achievement. Since approaches to learning are process-oriented and highly situational, sensitive to changes in context, teaching goals of programs, organizational factors, it should not be surprising that different factor structures emerge in different national and organizational settings (Richardson, 1995). The structure of meaning and reproducing orientation is different in the United States and the United Kingdom. Nevertheless, the fundamental distinction between meaning and reproducing orientation holds in both countries.

We consulted Ramsden (1983) to derive the theoretical dimensions and measures of interest to us. We selected the following six subtypes because we thought they would be the most relevant to understanding student approaches to online learning via computer conferencing:

- *Deep Approach to Learning*: "Students are looking for meaning in their studying, interacting actively with what is being learned, and linking what they are studying with real life" (Ramsden, 1983: 5). Students constantly ask critical questions of what they read in books and papers, and hear in lectures, in order to attain a deeper understanding of their subject matter.
- *Relating Ideas*: "Students are actively relating new information to previous knowledge" (Ramsden, 1983: 5). They seek to rationally and logically connect the new ideas they receive, even to the extent of using concept maps.
- *Comprehension Learning*: "Students use illustrations, analogies and intuition to build up a general picture of what they are learning" (Ramsden, 1983: 7). They engage in a free association of ideas, often trying to connect elements that might appear to others as unrelated. Imagination and creative exploration play key roles in comprehension learning.
- *Surface Approach to Learning*: Students rely on rote learning and memorization. The textbook becomes an important tool for memorization. Students tend to skim what they read and only absorb superficially content and meaning. They expect lecturers to give them a simplified version of complex subject areas. Students read material without attaining much understanding of its underlying meaning.
- *Syllabus-Boundness*: Students have the "intention to restrict learning to the defined syllabus and specific tasks" (Ramsden, 1983: 6). They seek to define the boundaries of the curriculum, and stay within those boundaries. These students focus on what is required in course outlines. They very rarely venture beyond the formal bounds of a course unless specifically required to do so by the instructor.
- *Achievement Motivation*: "High scores indicate competitive and self-confident students, driven by hope for success" (Ramsden, 1983: 6) Rather than collaborating

with peers, they compete with their peers to see who can achieve the highest marks in a course. These students "get a high" from competition.

Ramsden created two more generic categories:

- *Meaning Orientation:* Ramsden calls this the "deep approach to studying", and grouped under this designation "deep learning", "relating ideas", "intrinsic motivation", and "use of evidence".
- *Reproducing Orientation*: Calling this the "surface approach to studying", Ramsden grouped under this designation "surface learning", "syllabus-boundness", "fear of failure", and "improvidence".

Most of the research conducted to date on "approaches to learning" has been on traditional face-to-face educational environments in elementary and middle school, colleges, universities, and training centers. There has been an attempt to extend the "approaches to learning" to educational technology, online learning, and distance education (Harper and Kember, 1986; Kember and Harper, 1987; Richardson, Morgan, and Woodley, 1999). Richardson, Morgan and Woodley (1999: 40) argue that the same structure of "approaches to learning" is exhibited by traditional campus-based education and by distance-based education. Distance education students score higher on meaning orientation, but this is attributed to their older ages. However, research in this area has been sparse.

In order to focus our discussion and analysis, we developed the following hypotheses about the potential relationship between "approaches to learning" and online learning via computer conferencing.

Hypothesis 1: Surface Learners: These students learn by rote memorization. Information transfer and staying within the bounds of their registered online course conferences will attract students strong on surface learning; they will prefer file uploads and downloads in order to obtain lecture notes without engaging in collaborative messaging. If possible, they will avoid altogether online computer conferencing, which, by definition, involves active learning. These students will display a high anxiety about posting messages to both registered and unregistered course conferences. Unsure of their knowledge base, they have no wish to display their ignorance before classmates or the general public on the computer conference system. These predictions extend to all students who score high on reproducing orientation.

Hypothesis 2: Syllabus Boundness: We hypothesize that syllabus-bound students, and students strong on reproducing orientation, will either avoid computer conferencing altogether, or stay within the boundaries of their registered online course. They will prefer information transfer only within the context of their registered courses. They will not wander into unregistered courses, nor will they read and send messages to course conferences in which they are not registered. Syllabus bound students will also hesitate to send messages to course conferences because the information or opinions in their messages might be wrong, they are not comfortable voicing their opinion in public, or they are afraid of expressing their opinions for their entire class to read. Like surface learners, syllabus-bound students will shy away from computer conferencing and online learning if they think their subject matter ignorance will be on display before others.

Hypothesis 3: Deep Learners: We hypothesize that deep learners, and students who score high on meaning orientation, will be one of the heaviest users of online conferencing. Collaborative discussions, question and answer activities, and the exploration of registered and unregistered course conferences should attract students strong on deep learning and meaning orientation. They are likely to use online learning conferencing systems to ask questions of their professors, and to engage in academic debate with other students. They are also likely to display a low anxiety over posting messages to conferences. Sure of their knowledge based on deep understanding, they have no reason to hide their confidence in the posting of messages practically anywhere on the online conferencing system, whether in registered or unregistered courses.

Hypothesis 4: Comprehension Learners: These learners like to pursue ideas, no matter where this takes them. Exploration of unregistered course conferences, and collaborative online learning, should attract students strong on comprehension learning and meaning orientation. Like deep learners, they have no reason to be anxious about hiding their knowledge or displaying their ignorance. They have an epistemology in which they are interested in knowledge for the sake of learning. However, they will likely engage in online non-academic social discussions to a greater extent than deep learners. Open exploration knows no boundaries between formal and informal learning.

Hypothesis 5: Relating Ideas: Students who relate ideas like to draw a cognitive map of the connections among issues and concepts. They are more systematic thinkers than comprehension learners. We hypothesize that they will explore non-registered course conferences, chats, and engage in collaborative discussions, especially question and answer sessions. To the extent that this is really the rational and systematic component of meaning orientation, we expect these predictions will be reflected among students who score high on meaning orientation.

Hypothesis 6: Achievement Motivation. These learners will focus on academic grades and "getting through", even to the extent of knocking down fellow students. We hypothesize that they will stay within their registered course conferences, focusing on information transfer. There is no motivation in terms of marks and grades for them to wander into unregistered courses. Online conferencing is only for competitive learners if there are tangible rewards for participation. They will use online conferencing to the extent that their instructors attach marks for online participation. Distance education courses that assign marks for a minimal number of messages likely will encourage such students to participate. Encouragement of voluntary participation will have little effect on such students. They will be one of the least likely of all students to use online conferencing systems to get course information available elsewhere, to ask questions of their professor and other students, and to explore other courses in which they are not registered.

Hypothesis 7: Non-Academic Discussions: Non-academic and social communications should attract students strong on comprehension learning, 'relating ideas', and meaning orientation, but repel students strong on syllabus-boundness, surface learning, reproducing orientation, and achievement motivation. For such students, the boundary between learning and the social does not coincide with the boundary between formal and informal knowledge, or between knowledge and ignorance, or between course curriculum and knowledge. Knowledge knows no boundaries. It can be generated just as easily from social chats with one's friends as from the formal communications between the professor and student in the classroom.

Methods/Techniques

We purchased and installed the FirstClass ® computer conferencing system, and customized it into an open learning environment called LearnLink.® A number of research studies of the role of FirstClass ® in distance education and computer-mediated communications courses have been conducted, but none have examined the role of "approaches to learning and studying" (Shall, 1998; Bures, Abrami, Amundsen, 2000; Jong, 1996; Middleton, 1999; Graham, Scarborough, and Goodwin, 1999; Hawisher and Pemberton, 1997; Morris, Mitchell, and Bell, 1999). We designed FirstClass ® in such a way that the vast majority of courses are open to anyone having an account on the system. This is an open conferencing system in which students are free to explore courses beyond those in which they are registered, including asynchronous and synchronous discussions with students in other courses and in social café areas. There are currently about 110 courses on the system, 8,000 active users, and about 4,000 logins per day.

Survey research was conducted through fixed-choice questionnaires. Reliability, factor, and multiple regression analysis were used to derive conclusions from the data. The questionnaires measured student attitudes towards, and participation in, FirstClass® or LearnLink®.

Currently, we have about 23,000 accounts. Our sample surveys are a selection from the 8,000 active users. In three consecutive academic years, university students primarily in the health sciences, social sciences, and natural sciences at McMaster University in Hamilton, Ontario, Canada, completed a multi-part online questionnaire. The number of completed and usable surveys is as follows: 1999 (114); 2000 (280); and, 2001 (679). The questionnaire was "client-based" in 1999 and 2000, and web-based in 2001.

"Approaches to Learning"

We selected 24 items from the Lancaster Approaches to Studying and Course Perceptions Questionnaire (Ramsden, 1983; Entwistle, 1981). The questionnaire bank has 105 questions divided into 24 categories or subtypes of questions. For our study, we selected all questions in Ramsden's deep learning, relating ideas, comprehension learning, surface learning, syllabus boundness, and achievement motivation.

We constructed both additive and factor indexes. Our factor indexes captured underlying theoretical dimensions better than the additive indexes. They relied on somewhat different combination of items than the additive indexes.

In Table 1, we compare the Cronbach alpha reliability coefficients between our three surveys and Ramsden's 1983 data. Our coefficients for the 2000 and 2001 surveys appear somewhat similar to Ramsden's; those for the 1999 survey appear somewhat higher. Given the national contexts, cultural diversity, institutional and organizational differences, as well as differences in student samples, it is difficult to draw any definitive conclusions. The data do suggest that our data have as much internal reliability as Ramsden's original data.

Since our additive indexes had weaker relationships with measures of online participation, we turned our attention to factor indexes that provide a more sensitive measure of underlying theoretical dimensions. The 24 "approaches to learning" questionnaire items utilized in this paper are listed in Tables 2 to 7. We subjected all 24 items to a principal axis factor analysis

using a Varimax rotation with Kaiser normalization. We attained stronger relationships with our variables of interest using this method than utilizing additive indexes within each subtype. We also tried principal component factor analyses, and achieved approximately the same results. This attests to the assumption of theoretical dimensions underlying our questionnaire items. We were able to derive the same generic factors as those found in other international studies, though some of our factor loadings were somewhat unique or different from those predicted in the research literature (Entwistle and Waterston, 1988; Meyer and Parsons, 1989; Andrews, Violato, Rabb, and Hollingsworth, 1994). On the whole, our items explained a smaller percentage of the variance along various dimensions than what we would have expected from the research literature from other countries. We are not certain whether this is due to national and cultural differences, or to institutional or organization settings, or to measurement differences. Nevertheless, we have confidence in the stability of our measurements since we were able to repeat the same generic factor measurements at three points in time across three surveys on quite different student samples.

- *Deep Approach to Learning:* Ramsden (1983: 20) locates questions 1, 6, 13, and 18 in our Table 2 in his additive deep learning index with a Cronbach Alpha coefficient of 0.56 (see Table 1). When we applied a principal axis factor analysis to all 24 items, we were able to derive a "deep learning" factor in which item 13 ("I usually set out to understand thoroughly the meaning of what I am asked to read") loads between +.545 and +.601 in all three annual surveys. His item 1 ("I generally put a lot of effort into trying to understand things which initially seem difficult.") also loads positively on all three surveys, though with smaller weights (between +.436 and +.471). Ramsden's other two items (# 6: "I often find myself questioning things that I hear in lectures or read in books", and # 18: "When I'm tackling a new topic, I often ask myself questions about it which new information should answer") load moderately only in 1999 and 2001. In these two years, there appears to be somewhat of a merging of the "relating ideas" factor and the "deep learning" factor. Two "relating ideas" items (#2: "I try to relate ideas in one subject to those in others, whenever possible" and # 14: "I find it helpful to 'map out' a new topic for myself by seeking out the ideas fit together") load fairly positively on the deep learning factor in 1999 and 2001. This implies somewhat of a convergence between "deep learning" and "relating ideas", both subtypes of "meaning orientation." John Richardson (1995: 304), in his comparison of the United Kingdom and the United States, also found that "relating ideas" items loaded moderately high on the "deep learning" factor".

- *Relating Ideas:* Ramsden (1983: 20) grouped questions 2, 8 and 14 in our Table 3 under his "relating ideas" additive index with a Cronbach Alpha coefficient of 0.47 (see Table 1). We could not get them to load at +.40 or better in every one of our three annual surveys. Question 14 ("I find it helpful to 'map out' a new topic for myself by seeking out the ideas that fit together") loads the highest between +.693 and +.703 in the 1999 and 2000 surveys. Question 2 ("I try to relate ideas in one subject to those in others, whenever possible") loads positively on these two surveys, but at a weaker level. The third question, #8 ("I need to read around a subject pretty widely before I'm ready to put my ideas down on paper") loads positively but at a much lower level in the 1999 and 2001 surveys, and not at all in the 2000 survey. As previously noted, in 1999 there is some convergence between "relating ideas" and "deep learning". We were a bit unsure what to do with "relating ideas" in the 2000 and 2001 surveys. On its own, it is

a weak factor in these two surveys, explaining no more than two percent of the variance among the 24 items. In the 2001 survey, is it divided between the "deep learning/relating ideas" factor in Table 2 and the "relating ideas" factor in Table 3. The questions that Ramsden places in "relating ideas" (#2, #8, #14) are split between these two tables. Four items (#1, #6, #13, #18) appear to have more in common with "deep learning" than with "relating ideas". This is not fatal since both form part of the overall "meaning orientation" dimension. But it raises questions about the uniqueness of the "relating ideas" factor, at least in the 1999 and 2001 surveys.

- *Comprehension Learning:* Ramsden (1983: 23) places questions 5, 11, 17, and 20 listed in our Table 4 under this subtype. They have a Cronbach Alpha coefficient of 0.65 in his data (see Table 1). This dimension is really about the "free thinker" who can flexibly associate diverse ideas. This is a less systematic or planned type of deep approach to learning than "relating ideas" which smacks of rational concept mapping techniques. However, comprehension learning is a stronger and more unique factor in our data than is "relating ideas", although in 2000 or 2001 some of the "deep learning" items load moderately positively in the comprehension factor (# 6 and # 18). The two comprehension items that load the highest across all three surveys are # 5 ("Ideas in books often set me off on long chains of thought of my own, only tenuously related to what I was reading") and # 11 ("In trying to understand a puzzling idea, I let my imagination wander freely to begin with, even if I don't seem to be much nearer a solution"). Ramsden's other two comprehension items (#17: I like to play around with ideas of my own even if they don't get me very far", and # 20: "Often when I'm reading books, the ideas produce vivid images which sometimes take on a life of their own") also load positively in our three surveys, though at a lower strength. Comprehension learning is strongest as a factor in the 2000 survey where it explains 10% of the variation in the 24 questionnaire items.

- *Meaning Orientation*: In order to keep the questionnaire to a manageable size and to accommodate other types of questions, we did not include "intrinsic motivation", and "use of evidence" in this paper. Instead, we substituted comprehension learning, which we found to be highly correlated with other measures of meaning orientation (see also Richardson, 1995: 302). As shown in Table 1, the inclusion of comprehension learning improves the alpha scores of meaning orientation in each of our three annual surveys. Throughout the rest of this paper, our measure of "meaning orientation" is the summation of the "deep learning", "relating ideas", and "comprehension learning" factors.

- *Surface Learning:* Ramsden (1983: 2) grouped questions 3, 9, 15, 19, 21 and 23 in our Table 5 under his additive "surface" index with a Cronbach Alpha coefficient of 0.49 (see Table 1). In our 1999 survey, all six of these items load at +.311 or better. Five of the items exceed +.515. This is a powerful factor, explaining 38% of the variation among the 24 items. However, two items (#4 and #16) from syllabus boundness also load highly on this factor. The surface learning factor appear weaker in the 2000 and 2001 surveys. In 2000, it splits between the 2nd and 7th factors. The item loading highest on the 2nd factor is # 21 ("I usually don't have time to think about the implications of what I have read"). This implies skimming rather than understanding. The item loading highest on the other 7th factor is # 15 ("When I'm reading I try to

memorize important facts which may come in useful later"). This implies a second surface approach to learning – memorization rather than skimming per se, though the two methods of studying are highly related. Yet these factors are not completely unique. Memorization is important in the "skimming factor" (see item #9). We decided to initially analyze these factors separately to determine whether these two sub-dimensions of surface learning have different effects on online learning. Perhaps the weakest surface learning factor occurs in the 2001 survey where it explains only two percent of the variation among all items. It loads above +.300 only on two surface items identified by Ramsden (# 15 and # 19).

- *Syllabus Boundness:* Ramsden (1983: 21) grouped questions 4, 10, and 16 in our Table 6 under his additive "syllabus boundness" index with a Cronbach Alpha coefficient of 0.51 (see Table 1). With the same items, we achieved coefficients ranging from .59 and .79. In our factor analyses, we received moderately high loadings in all three surveys only on items # 4 ("I like to be told precisely what to do in essays or other assignments") and # 10 ("I prefer courses to be clearly structured and highly organized"). Item 16 (". I tend to read very little beyond what's required for completing assignments") performed very poorly, exceeding +.300 only in the 2001 survey. There is some evidence that in the 2001 survey, syllabus boundness merges with surface learning, both ingredients of reproducing orientation.

- *Reproducing Orientation:* "High scores indicate that students intend to reproduce what they are studying" (Ramsden, 1983: 6). In this paper, we include only "surface learning"and "syllabus-boundness" as components of reproducing orientation. For the rest of this paper, "reproducing orientation" is the summation of the "surface learning" and "syllabus boundness" factor indexes.

- *Achievement Motivation:* This type lies outside the meaning and reproducing orientation dimensions. Ramsden (1983: 23) grouped questions 7, 12, and 22 in our Table 7 under his "achievement motivation" additive index with a Cronbach Alpha coefficient of 0.58 (see Table 1). We added a new item (#24: "I would do almost anything to get one of the highest marks in my course"). This seemed to work well. It is highly and positively related to the other three items. Our final alpha coefficients are somewhat higher than Ramsden's, varying from .75 to .83. However, it has a relatively low loading in the 1999 and 2000 surveys. Achievement motivation is not a very strong factor; it only explains between 3% and 5% of the variation among the 24 questionnaire items. This factor is shown separately in all the tables examining the relation between "approaches to learning" and measures of online activities and attitudes.

Results

We customized our FirstClass computer conferencing system as LearnLink in order to encourage inquiry, problem-based learning, and critical thinking. We provided the instructional design that would allow students to engage one another across course boundaries. Most course management systems are designed with a default that allows students to access only the courses in which they are officially registered. Examples include WebCT, BlackBoard, and even many configurations of FirstClass at various colleges, universities and middle schools. However, recently there has

been a growing interest in open online learning that provides open access to courses, regardless of a users' or students' registration status. The most well known recent example is "*Open Courseware*" being develop at the Massachusetts Institute of Technology (MIT). Users anywhere in the world will be able to gain access to M.I.T. courses on the web, even though they are not registered in them. They will not receive course credit for them unless they are registered in them. However, they will be able to access the course content, and so can benefit from this open mode of access.

There are two pedagogical and learning questions that naturally flow out of such instructional designs. First, what kinds of learners are most likely to take advantage of such open online opportunities? Second, does open online conferencing increase the effectiveness or efficiency of learning? The second question is more difficult to answer than the first. In this paper, we can hopefully shed light on the first one through an investigation of on open online system which we designed in 1995, and have implemented every year since then.

I. Active Participation in CMC Online Learning (APCMC)

Do "approaches to learning" have any influence on actual participation in online learning measured by computer conferencing? We extracted one factor measuring active online conferencing use. It consists of 10 items dealing with uploading and downloading files attached to messages, accessing LearnLink remotely from off campus, sending e-mail messages, and exchanging messages through conferences. This factor explains 13 percent of the variance in 1999, 11 percent in 2000, and 24 percent in 2001. We also extracted two other minor factors from the same items: one loads highly on public and private chats, and the other loads highly on the single item of web access (as opposed to client access). "Approaches to learning" had no influence on these latter two factors. They are therefore not shown in our subsequent analyses.

We regressed the factor index of active participation in CMC online learning (APCMC) onto the individual "approaches to learning" factors as well as the overall meaning and reproducing orientation factors. We display the resulting multiple standardized beta coefficients in Table 8. The strongest effects appear to occur in the 2001 data. Meaning orientation has a positive and independent effect on CMC use (+.18), while reproducing orientation results in a decrease use (-.33). Both of these are statistically significant at least at the .01 level. When the component factors are examined, it can be seen that this difference between meaning and reproducing orientation is largely accounted for by comprehension learning (+.20) and surface learning (skim reading: -.28). Students who are prone to engage in an open exploration of ideas are more likely to make active use of online computer conferencing than students who only skim the course content or speed-read. Deep learners are also somewhat heavier users of online conferencing. In the 2000 survey, surface learning via skim reading has about the same negative independent effect (-.26) on computer conferencing use as in the 2001 survey. The other data in the 1999 and 2001 surveys are consistent with these results, though at a somewhat weaker level. In both 1999 and 2000, reproducing orientation results in a decreased use of computer conferencing, while meaning orientation has little effect. Relating ideas (a component of meaning orientation or deep approach to learning) seems to have a small positive though statistically insignificant effect on CMC use in 1999 and 2000. Our tentative overall conclusion is that meaning orientation, or a deep approach to learning, results in a greater use of online computer-mediated learning, while reproducing orientation results in its decreased use. This provides tentative support for hypotheses 1 (surface learners), 2 (syllabus boundness), 3 (deep learners), 4 (comprehension

learners), and 5 (relating ideas) in so far as they deal with participation in computer conferencing in general.

However, we want to move beyond generic online participation to differentiate types of online participation by types of ""approaches to learning"". In the three years we collected survey data, almost all students (95% to 100%) *read* messages in their *registered* course at least once during their course (see Table 9). About 80% read messages in registered course conferences at least once per week. Forty-seven percent (47%) read messages in registered course conferences at least once per day. Seventy-two to nine-two percent of students *send* messages to *registered* course conferences at least once per course. Forty-five percent (45%) do so at least once per month, and 28% do so at least once per week. When we turn to external *non-registered* courses, these figures drop significantly, as we would expect. From one-third to three quarters of students *read* messages in courses in which they were *not registered* at least once during a term. Only about 10% to 15% of students *send* messages to an *unregistered* course at least once per term. There is thus much more lurking or passive viewing of, than active participation in, non-registered course conferences. If given the opportunity, a significant proportion of students will explore courses in which they are not registered. There is no parallel for this kind of exploration in traditional face-to-face classrooms. We do not have an obvious norm or standard in face-to-face learning against which to compare our efforts at open online learning unrestricted by course boundaries. It is therefore difficult to know how successful we have been in creating this type of open instructional design. The critical question is whether this system benefits one type of learner over another.

In Tables 10 to 14, we explore the impact of "approaches to learning" on participation in registered and unregistered course conferences. We initially summarize our findings in Table 10. Students who score high on meaning orientation are more likely to read messages in registered course conferences than students who score high on reproducing orientation. This is particularly so in the 1999 and 2001 surveys. However, there is little difference in the impact of the two orientations on reading registered course messages in the 2000 survey. When we turn to the active sending of messages to registered course conferences, meaning and reproducing orientation are much more sharply differentiated. For example, in 1999, meaning orientation has a +.34 regression effect on sending messages to registered course conferences; the impact of reproducing orientation is not statistically significant. In 2000 and 2001, meaning orientation has a statistically significant positive impact on sending messages to registered course conferences; reproducing orientation has a statistically significant negative effect. When we turn to the reading of messages in non-registered course conferences, these effects are essentially the same. Students who score high on meaning orientation are more likely to view messages in non-registered course conferences, while those who score high on reproducing orientation are less likely to do so. The pattern for sending messages to non-registered course conferences is essentially the same, though the strength of the relationships is much weaker. This is probably due to the much lower variation in the dependent variable. Eighty-four to ninety percent of students are concentrated in the single category of "never" when asked if they ever send messages to non-registered course conferences.

So far, these data do not give us much ground to conclude that the deep approach to learning leads to greater participation in non-registered course conferences than registered course conferences. However, there is evidence, especially in registered course conferences, that meaning orientation results in an accelerated active participation (sending messages) than passive participation (reading messages only). In 1999 and 200, reproducing orientation results

in a much lower active sending of messages than reading of messages. The critical distinction might be between active and passive participation rather than between registered versus unregistered course participation.

In order to determine what is going on behind these generic meaning and reproducing orientations to learning, we look at the impact of the component "approaches to learning" factors in Tables 11 to 14. In Table 14, none of the component factors have statistically significant effects on sending messages to non-registered course conferences. In the other three tables, "relating ideas" (in 1999) or "comprehension learning" (in 2000 and 2001) positively impacts the reading of messages in registered and unregistered course conferences, and the sending of messages to registered course conferences. Surface learning (skimming) somewhat reduces reading messages in non-registered course conferences (Table 12), and sending messages to registered course conferences (Table 13). In the 2000 survey, syllabus boundness has a relatively strong negative effect on reading and sending messages to registered courses (Tables 11 and 13). This is interesting since we would expect syllabus boundness will have a positive impact on activities inside the boundaries of registered course conferences. However, it may be the online format that frightens syllabus bound students away from even registered courses. We will present more evidence on this later in the paper. It is also interesting that memorization (surface learning) has a positive impact on reading messages in registered course conferences, but not in non-registered courses. Students use memorization in online registered courses in order to achieve course objectives; there is no reason for students to attempt to access non-course content for the same purpose. It is not prescribed curriculum.

In summary, there is partial support for our first six hypotheses dealing with meaning and reproducing orientation. Students scoring high on meaning orientation (especially comprehension learning and relating ideas) are more active participants in online learning than students who score high on reproducing orientation (surface learning and syllabus boundness). Memorization, skim reading, and staying within the bounds of one's registered course is the opposite of active engagement in online conferencing, unless online engagement is specifically required by the instructor. Meaning orientation is directed toward deeper understanding. This depth often arises from the clash of competing perspectives. One of the optimal environments for such clashes is online debates with other students and instructors. However, there is not overwhelming evidence that the deep approach to learning will result in greater activity in unregistered course conferences than registered course conferences. Meaning orientation and reproducing orientation seem to equally distinguish students, whether it is reading messages in registered course conferences, or in unregistered course conferences. Contrary to our hypotheses, it is the active sending of messages to registered (not unregistered) course conferences that provides the greatest distinction between the deep and surface approach to learning.

II. Personal Importance of CMC Online Learning (PIOL)

In this section we turn to the student's subjective valuation of the personal importance of online course conferencing. In order to capture subjective conferencing use, we asked eleven questions on the personal importance of the use of various features of LearnLink. Four factors emerged. The first factor (Table 15) loaded highly on items dealing with registered course conferences, such as asking questions of the instructor and students in one's registered courses, exchanging messages through registered course conferences, and seeing if other questions posed in registered

course conferences are answered by others. This factor explained anywhere between 21% and 29% of the variation in the questionnaire items. The second and third factors measure the personal importance of interacting outside one's registered course, either in other non-registered courses (second factor in Table 16) or more generally non-academic social participation on our computer conferencing system (third factor in Table 17). In 1999 and 2000, these two factors were distinct. In 2001 survey, these two factors merged into a single factor, explaining 29% of the variance in the questionnaire items. The final factor is a measure of the personal importance of obtaining course information and schedules of lectures and tests (Table 18).

Our data seem to suggest that meaning orientation has a greater positive impact on student's personal importance in participating in unregistered course conferences than in registered course conferences. In 1999, the statistically significant standardized regression of the importance of participating in unregistered courses on meaning orientation is +.26 (Table 20) compared to only +.12 for registered course participation (Table 19). In 2000, the statistically significant standardized regression of the importance of participating in unregistered courses on meaning orientation is +.13 (Table 20) compared to +.08 for registered course participation (Table 19). And, in 2001, the statistically significant standardized regression of the importance of participating in unregistered courses on meaning orientation is +.15 (Table 20) compared to +.09 for registered course participation (Table 19). The key reason for these differences seems to be comprehension learning. Students who score high on comprehension learning are more likely to assign personal importance to the exploration of unregistered courses. Reproducing orientation does little to distinguish the importance of registered and unregistered course participation. These data provide support particularly to hypothesis 4 that comprehension learners will explore the uncharted online territory of courses in which they are not registered. There is also support for hypothesis 7 that it is the comprehension learners who will place greater importance on engaging in non-academic social discussions across the computer conferencing system as a whole. For example, in Table 21, comprehension learning has an independent and statistically significant effect of +.22 in 1999 and +.13 in 2001 on online non-academic social participation.

We had predicted in hypotheses 1 and 2 that reproducing orientation (surface learning and syllabus boundness) would positively impact on using online conferencing to obtain course information. (Downloading files seemed more consistent with reproducing orientation than online discussions and debates, which we thought were more consistent with meaning orientation). That does not appear to have happened. Reproducing orientation, syllabus boundness and surface learning have only weak effects on the personal importance of using online conferencing to obtain course information (Table 22). Only in the 2000 survey does surface (skim) learning have a positive influence on the importance of getting course information (+.18). We had also predicted in hypothesis 6 that students strong in achievement motivation would participate minimally in online conferencing unless forced to do so by the enticement of higher grades or marks for online participation. The data in Tables 19 to 22 largely support this. Achievement motivation has no statistically significant effect on the personal importance students place on registered and unregistered computer conferencing, and on obtaining course information. Rather surprisingly, in 1999 and 2000, it does have modest but opposite effects on the personal importance students place on online non-academic social participation (Table 21). We are unable to explain this aberration. Achievement motivation has no effect in the 2001 survey.

III. Fear of CMC Online Learning (FCMCOL)

In this section we examine the influence of "approaches to learning" on anxieties over participating in online conferencing. Hara and Kling (2000) note that student distress with online courses is a neglected topic of research in the rush by educators, researchers, and vendors to promote distance education. The development of the questionnaire items in this section arose from meetings we had with instructors and staff in medicine and the health sciences who noted the high level of stress and anxiety exhibited by some of their students when asked to post messages online for the entire class, and indeed for potentially all 8,000 students who had accounts on our online conferencing system. Our hypotheses predict that students who merely reproduce or regurgitate information, those who are the surface learners, who skim read, who engage in rote memorization, and who stay within the strict boundaries of their registered courses and within the explicit expectations of their instructors, will be at risk in online conferencing environments. Although research has shown that specific educational environments, such as law, encourage surface learning (Richardson, 1992: 38), we think that in research-intensive universities, such as ours, that emphasize problem-based learning, inquiry and critical thinking, such students will hesitate to display their lack of deeper understanding of knowledge domains; they will refrain from posting messages for the entire class, or indeed for others outside their class, to view.

Because of the emotive power of the feelings elicited by our items, and their strong relationship with our theoretical domain of interest, we initially show the regression of several individual questionnaire items on "approaches to learning" in Tables 25 to 31. We asked students their degree of agreement or disagreement (5-point Likert scale) with thirteen statements. This provides a rich understanding of the anxieties we are measuring. The general format of the questions was: "Please indicate the degree to which you agree or disagree with the following statements about your own LearnLink participation. I sometimes hesitate to send messages to a course folder because..." Some of the specific statements that we analyzed separately are as follows:

- "I am not comfortable voicing my opinion in public." (Table 25)
- "I am afraid that everyone else on LearnLink outside my course will read my message." (Table 26)
- "I am afraid of expressing my opinions for everyone in the class to read" (Table 27)
- "I only want the professor and other students in my class to see my messages" (Table 28)
- "Someone might make fun of my message or criticize what I have written." (Table 29)
- "I feel that my knowledge is under par compared to my classmates" (Table 30)
- "I feel that my contribution might seem silly to someone who is smarter" (Table 31)

When we examine the standardized regression coefficients for meaning and reproducing orientation at the bottom of these tables, the pattern that emerges is quite distinct. Unlike previous data in this paper, reproducing orientation, not meaning orientation, has the strongest effects. Controlling for meaning orientation, the higher the students score on reproducing orientation, the greater the anxieties they display over posting messages. The independent regression coefficients exceed +.30 on almost all individual items for all three years of our surveys. The items that elicit the strongest effects are measures of embarrassment over lack of knowledge rather than simply posting per se. Issues of silliness, discomfort, embarrassment,

self-confidence, ridicule, and fear are central to this emotive theoretical dimension. The component of "approaches to learning" that is most powerfully linked to this anxiety is surface learning, especially the tendency to skim curriculum content. There is not a lot of differentiation between posting to registered and unregistered courses, or more generally on LearnLink. There seems to be a deep fear of displays of ignorance in front of others, whether this involves only a few students in one's own class or thousands of students on the entire computer conferencing system. Meaning orientation has the opposite effect: students who score high on meaning orientation display low anxiety over posting messages to the class or beyond. However, the size of the coefficients for meaning orientation is smaller than those for reproducing orientation, and they tend to run in a negative direction. Very few are statistically significant. This implies that it is really the learning approach dealing with reproduction and regurgitation of information, rather than the lack of deep understanding, that impacts the most on anxieties over posting messages in online conferencing.

We created two completely new factor indexes out of these questionnaire items dealing with anxieties over posting messages on computer conferencing systems to which others in registered and non-registered courses have access. These factors deal with anxiety or embarrassment over public displays of ignorance of skills or subject content matter. We show in Tables 23 and 24 only those that load above +.300. One factor, explaining about 40 per cent of the variance in the items, was clearly dominant. The theoretical dimension underlying this factor is embarrassment over lack of knowledge or writing skill, feeling ridiculed in front of one's classmates, the course instructor, and students from other courses who invade one's own course. It includes a fear that one's opinions might not be correct or acceptable to others, that others will have access to one's own postings, that one may be criticized, that one's ignorance in the knowledge domain of the course will be exposed, that one's classmates may be smarter than oneself, or that the instructor will become aware of a student's ignorance. At the most general level, this factor taps into the fear of expressing one's opinion "in public." "Public" in this case can extend from one other classmate all the way to the entire class and the professor, and to all 8,000 students and other professors on the online conferencing system, LearnLink. It is remarkable that we were able to create such a strong factor out of advice and observations by instructors and students on how students interact in our online conferencing system. It is also remarkable that this factor is so stable over three independent tests on three different student bodies in three different academic years.

The other factor is much weaker. It explains only about 4 to 6 percent of the variations in the 13 questionnaire items. The underlying theoretical dimension deals with the issue of class boundaries, or boundaries of learner communities. Who has access to one's messages, and who does not have access to one's messages? Possibilities include other students in one's own class, the professor in one's own class, and definitely not others outside one's registered course. The factor loads moderately high on the questionnaire item, "I only want the professor and other students in my class to see my messages" and on "I only want other students in my class, but not the professor, to see my messages". The latter item complements "I don't want the instructor to see my messages", which has modest weight. In 2000 and 2001, it also has modest loadings on "I am afraid that everyone else on LearnLink outside my course will read my message".

The effects of our individual questionnaire items are summarized in the analysis of the two factors in Tables 32 and 33. In Table 32, reproducing orientation has a very powerful effect in elevating the levels of anxiety over displays of ignorance in posting messages in online learning environments, while meaning orientation reduces such anxieties. Similarly, in Table 33,

reproducing orientation has an independent effect on the "class boundary" factor. Students who engage in surface learning (especially skim reading) are more intimidated by a learning environment that is open to students and professors outside of their registered course. They express a fear that students outside their course will read their messages.

It is interesting that the questionnaire items and factors on anxieties in this section produced stronger effects on online conferencing than the more positive questions earlier in the paper dealing with active participation in online conferencing, and its personal importance to the student. This implies that decisions about participating in online learning may very well be more strongly rooted in issues of affect and emotion than in issues of cognition and rationality.

Educational and Scientific Importance

In conclusion, our hypotheses in this paper received partial support. In light of our data, we seek to revise our hypothesis for future research in the following ways.

Proposition 1: Surface Learners: We had hypothesized that information transfer and staying within the bounds of their registered online course conferences will attract students strong on surface learning. We thought that they would prefer file uploads and downloads in order to obtain lecture notes without engaging in collaborative messaging. We in fact found no strong evidence for this. Surface learners seemed to score the same on information transfer as deep learners. However, the goals of information transfer are different for these two kinds of learners: surface learners intend to conduct a file download for the purposes of memorizing course material; deep learners intend to conduct a file download for the purposes of understanding the deeper implications of course material. Surface learners will attempt to avoid online conferencing altogether. Those who skim read and memorize are not comfortable about voicing their opinions in a "virtual public" before classmates and those outside their own classes. They are afraid that these "significant others" will make fun of their postings and the assumed ignorance of knowledge domains they display or reveal. They always view others as smarter than themselves. They respond by hiding their ignorance in not participating in online conferencing. However, they will use online conferencing if their instructor has made it obvious that he or she will penalize them if they do not participate. In this sense, they share characteristics with achievement learners.

Proposition 2: Syllabus Boundness: We hypothesized that syllabus-bound students would stay within the bounds of their registered online course. On the whole, we found that syllabus boundness did not play a large role in influencing online conferencing. It generally had non-significant effects on our various measures of online conferencing. However, we did find that syllabus boundness had a modest depressing effect on online conferencing use, even to the extent of reading fewer messages in registered course conferences. Syllabus boundness seems to deter students from active online conferencing; they significantly had low rates of sending messages to their own registered course conferences, even though this is within the prescribed curriculum. The issue here may be activity/passivity, not registered/non-registered course conferences. There are strong indications that syllabus bound students will hesitate to send messages to course conferences because the information or opinions in their messages might be wrong, they are not comfortable voicing their opinion in public, or they are afraid of expressing their opinions for their entire class to read. Like surface learners, syllabus-bound students will shy away from e-

Learning if they think their subject matter ignorance will be on display before others. This is not true for learners who score high on meaning orientation (deep and comprehension learners).

Proposition 3: Deep Learners: We had hypothesized that deep learners would be one of the heaviest users of online conferencing. Collaborative discussions, question and answer activities, and the exploration of unregistered course conferences would attract students strong on deep learning. However, we found only modest evidence that the pure single index of deep learning had positive influences on online conferencing. It often merged with other components of meaning orientation, such as "relating ideas." Ironically, we found stronger evidence that deep learners read and send messages to registered course conferences than to unregistered course conferences. Deep learners also assign greater personal importance to participating in registered than unregistered online course conferencing. They also show some evidence of using online conferences to get course information, tests, and schedules, which we thought to be only a strong characteristic of surface and syllabus-bound learners. There are strong indications that deep learners have positive self-confidence in posting messages to quasi-public conferences. They do not allow anxieties and fears to get in the way of participating online. This is probably due to their deeper understanding of course material.

Proposition 4: Comprehension Learners: These learners are e-learners *par excellence*. They have absolutely no fear of online conferencing. They like to pursue ideas, no matter the virtual direction in which this takes them. Exploration of unregistered courses, and collaborative learning, attract students strong on comprehension learning. They are the heaviest users of active online conferencing; they upload and download files; they engage in chats and discussions with instructors and classmates, regardless of course registration. Comprehension learning has much stronger effects on reading messages in unregistered course conferences than registered course conferences. Comprehension learners are active in sending messages to conferences, especially in their own registered courses. They place much greater personal importance in interactively participating in unregistered course conferences and non-academic social debates than in registered course conferences or passively getting course information. Comprehension learning is generally not a significant factor in understanding anxieties over posting messages to online conferences to which others have access. Where comprehension learning does emerge as a factor, it has a negative effect on posting anxiety; that is, it lowers the level of anxiety. Out of all the "approaches to learning", comprehension learning has the strongest positive effects on online learning. The reasons seem obvious. Comprehension learners use their intuition to follow leads into unexplored territory. Online conference environments are unexplored territories. One never knows what surprises await one at each virtual turn, or click of the mouse. For this reason, comprehension learners thrive in the chaotic environment of E-Learning, at least the variant analyzed in this paper.

Proposition 5: Relating Ideas: Students who relate ideas like to draw a cognitive map of the connections among issues and concepts, and to related what they learn to past experiences and knowledge. They are more systematic thinkers than comprehension learners. We hypothesized that they would explore non-registered course conferences, chats, and engage in collaborative discussions, especially question and answer sessions. We were unable to construct a strong "relating ideas" factor from our data, explaining only 8 per cent in 1999, and 2% in 2000 and 2001. If we focus on the 1999 data, "relating ideas" has an independent positive effect on online conferencing. Relating ideas also has independent and positive effects on reading and sending messages to registered and unregistered course conferences. It positively influences students' personal valuation of the importance of unregistered course participation. It has little effect on

elevating or reducing the level of anxieties over online postings. Generally, it is a less important factor than comprehension learning for understanding online conferencing.

Proposition 6: Achievement Motivation: These learners focus on academic grades and "getting through", even to the extent of knocking down fellow students. We hypothesized that they would stay within their registered course conferences, focusing on information transfer. There is no motivation in terms of marks and grades to wander into unregistered courses. However, we discovered that this factor is not really significant in understanding online learning. Part of the problem may have been our weak measurement of its underlying theoretical dimension. Our factor explained only 3% to 5% of the variation in our questionnaire items on the personal importance of using online conferencing. Not surprisingly, it generally did not become a huge factor in encouraging or discouraging online participation. However, when we asked respondents whether they participated in response to threats by the instructor that they would be penalized in marks for not participating, achievement motivation became a significant enabling factor encouraging students to engage in online conferencing. In fact, the threat by the instructor of being penalized for not participating became the most powerful motivator for students to read and send messages to registered course conferences, but naturally had no effect them reading and sending messages to non-registered course conferences. This general proposition still has some efficacy: strategic and competitive students tend to use online conferencing to the extent that their instructors attached marks for online participation.

Propositon 7: Deep Approach to Learning (Meaning Orientation): On the basis of our three annual surveys of students from a diverse range of academic programs in the health sciences, natural sciences, and social sciences, we are able to fairly confidently state the following proposition about the influence of meaning orientation (deep approach to learning) on online computer conferencing. The deep approach to learning, or learning to understand, results in:

- A heightened active use of almost all aspects of online conferencing
- Increased reading and sending of messages and files to registered course conferences
- Increased reading and sending of messages and files to un-registered course conferences
- A greater subjective valuation by learners of the importance of participating in online registered and unregistered course conferences
- A greater subjective valuation by learners of the importance of participating in online non-academic social debates and discussions
- A reduction in the level of anxiety over personal displays of knowledge or ignorance contained in postings to online conferences.

Propositon 8: Surface Approach to Learning (Reproducing Orientation): The surface approach to learning (reproducing orientation), or superficial learning, results in:

- A significantly weak or decreased use of almost all aspects of online conferencing, including file transfers, exchanging messages, and engaging in debates and chats
- Decreased reading and sending of messages and files to registered course conferences
- A greatly enhanced level of anxiety over personal displays of knowledge or ignorance contained in postings to online conferences.
- Considerable fear in exposing one's opinions to others, especially outside one's registered course conferences.

We do not accept the view that deep and surface learning are necessarily dichotomous "approaches to learning". Many students combine both deep and surface learning as part of their overall learning strategy. This is a requirement of certain instructional designs in which material has to be both memorized and deeply understood. To get at this issue, we divided our meaning and reproducing orientation scales into thirds and cross-classified them into nine categories (tables not shown). Deep and surface learning interact with one another in their effects on online conferencing: the effect of each depends to some extent on the effects of the other. High meaning orientation wipes out the effect of reproducing orientation on reading messages in unregistered course conferences. If students are intense deep learners, increasing surface learning does not appear to lower the viewing of non-registered courses. However, if students are intense surface learners, increasing the amount of deep learning among them will greatly increase their viewing of unregistered course conferences. The key influence here is the deep approach to learning.

Turning to sending messages to registered courses, the strength of the effect of meaning orientation seems to depend on the level of reproducing orientation. Where reproducing orientation is low, varying the level of meaning orientation has little effect. Surface learning probably pulls down even deep learners. However, among students with a high level of reproduction orientation, meaning orientation or deep learning seems to have a greater effect on sending messages to registered course conferences. Some students appear to strategically combine memorization and deep learning in an online environment. Richardson (1992: 38) found that law students were distinct in combining high levels of both meaning and reproducing orientation. In fact, the second highest rate for sending messages to registered course conferences is among students who score highest on both reproducing orientation and on meaning orientation (4.24). The highest score is among those students who are high in deep learning and lowest in surface learning (4.47). Conversely, where meaning orientation is high, varying the level of reproducing orientation has little effect on sending messages to registered course conferences. In this scenario, deep learning overwhelms surface learning. But where meaning orientation is very low, varying the level of reproducing orientation has a greater effect on sending messages to registered course conferences. Surface learning thus has its greatest effect where deep learning is least intense.

The same principle applies to sending messages to non-registered course conferences: where meaning orientation is low, reproducing orientation has its greatest effect in lowering the sending of messages to unregistered courses. But where meaning orientation is high, varying the level of reproducing orientation has little effect on sending messages to unregistered course conferences. Students can combine quite different levels of deep understanding with high levels of memorization. Student who have low levels of deep learning and high levels of surface learning will have low levels of sending messages to unregistered course conferences (mean=1.17). But students who have high levels of deep learning and at the same time high levels of memorization will have somewhat greater rates of sending messages to unregistered course conferences (mean=1.71).

Despite these combinations and permutations between deep and surface learning, there are still the extremes to consider: those who benefit the most and least from online learning. Assuming an equal tripartite distribution in scales, about 15% of our three samples scored simultaneously high on meaning orientation and low on reproducing orientation. In a sense, these are the pure deep learners. Another 15% of our three samples fall at the other extreme – those who simultaneously score high on reproducing orientation and low on meaning orientation. These

students are the pure surface learners. Other analyses conducted by ourselves on first year inquiry students have consistently found that about 25% fall into this pure surface learning category (Cuneo et al, 2000). It is this 15% to 25% who will become the "lost generation" in a world of "e-learning". These pure surface learners have the lowest mean score in reading messages in registered course conferences (6.61) in contrast to the pure deep learners (7.58). In terms of reading messages in unregistered course conferences, the pure surface learners score 1.82 in contrast to the pure deep learners (2.79). For sending messages to registered course conferences, the pure surface learners score 2.82 while the pure deep learners score 4.47. In sending messages to unregistered course conferences, the score for pure surface learners is 1.17 compared to 1.70 for the pure deep learners. On our embarrassment factor index which measures the conceptual dimension of anxiety over posting messages to computer conferences, the pure surface learners score a high of +.547 in contrast to the low score of -.530 for the pure deep learners. It is unclear what kinds of online instructional designs can be developed to assist this "lost generation". Our variant of E-learning (open online conferencing) and surface learning are an oxymoron; they do fit not together; they are not compatible. It is true that surface learners may thrive in a web environment of accessing online textbooks and printing out pages upon pages of texts organized linearly. But it seems clear that these students are at risk in an online conferencing environment that promotes, and indeed expects, students to engage in online critical thinking, problem-based learning and inquiry-based learning.

This research has implications for the most effective ways in which instructors should design the online environment. Open course structures are most advantageous to students strong on comprehension learning, or the free exploration of ideas. The collaborative features of FirstClass are compatible with deep and comprehension learning -- asking questions, seeking understandings, exploring ideas freely.

However, quasi-open computer-mediated communications environments are not safe places for students unsure of their writing skills and knowledge; they likely do not promote confidence building among poor writers and surface learners. Students unsure of their knowledge will experience panic and anxiety over posting messages in semi-public areas where others can view them. Such students, who also score high on measures of surface learning and reproducing orientation, perform poorly academically. In our three surveys, they attained a lower grade point average than students more confident about posting messages. Surface learners prefer passive web browsing rather than active posting of message and engaging other students in online dialogue (Cuneo, Campbell, and Harnish, 2002).

The implication of this research is that online learning might not be appropriate for all students. Some students might have to be trained in deeper approaches to studying before engaging in online learning. Asking questions and promoting discussion in online learning is not compatible with surface or competitive learning- - memorizing facts, competing with other students, and for marks. Competitive students, focused on marks and narrow course requirements, do not see much benefit in computer-mediated communications, even when part of formal course designs. E-learning is compatible with surface learning only in limited information transfer about courses.

Tables

Table 1: Cronbach Alpha reliability coefficients for additive indexes				
Approach to Learning Type	Lancaster / Ramsden (1983)	1999	2000	2001
Deep (4 items) (D)	.56	.76	.50	.58
Relating (3 items) (R)	.47	.65	.46	.38
Comprehension (4 items) (C)	.65	.81	.63	.62
Surface (6 items) (SU)	.49	.84	.64	.65
Syllabus Boundness (3 items) (SY)	.51	.72	.64	.62
Competitiveness (4 items) (CP)	.58	.79	.65	.59
Meaning Orientation (D + R)	.79	.83	.62	.66
Meaning Orientation (D + R + C)		.88	.73	.71
Reproducing Orientation (SU + SY)	.73	.88	.75	.75

Tables: I: Approaches to Learning Factors

Table 2: Factor loadings for Deep Learning, 1999-2001.			
Question Number	1999 (relating/ deep) (f2)	2000 (f6)	2001 (deep / relating) (f1)
1. I generally put a lot of effort into trying to understand things which initially seem difficult.	+.436	+.441	+.471
2. I try to relate ideas in one subject to those in others, whenever possible.	+.622		+.507
6. I often find myself questioning things that I hear in lectures or read in books.	+.579		+.423
8. I need to read around a subject pretty widely before I'm ready to put my ideas down on paper.	+.341		
11. In trying to understand a puzzling idea, I let my imagination wander freely to begin with, even if I don't seem to be much nearer a solution.	+.303		
13. I usually set out to understand thoroughly the meaning of what I am asked to read.	+.601	+.555	+.545
14. I find it helpful to "map out" a new topic for myself by seeking out the ideas fit together.	+.703		+.414
16. I tend to read very little beyond what's required for completing assignments.			-.428
17. I like to play around with ideas of my own even if they don't get me very far.	+.430		
18. When I'm tackling a new topic, I often ask myself questions about it which new information should answer.	+.481		+.461
(N)	(114)	(265)	(569)
Variance Explained	8%	2%	15%
Principal Axis Factoring, Varimax Rotation with Kaiser normalization. Displayed Factor loadings + or - .40.			

Tables

Table 3: Factor loadings for Relating Ideas, 1999-2001.			
Question Number	1999 (relating/ deep) (f2)	2000 (f5)	2001 (f6)
1. I generally put a lot of effort into trying to understand things which initially seem difficult.	+.436		
2. I try to relate ideas in one subject to those in others, whenever possible.	+.622	+.453	
6. I often find myself questioning things that I hear in lectures or read in books.	+.579		
8. I need to read around a subject pretty widely before I'm ready to put my ideas down on paper.	+.341		+.498
9. I find I have to concentrate on memorizing a good deal of what we have to learn.			+.394
11. In trying to understand a puzzling idea, I let my imagination wander freely to begin with, even if I don't seem to be much nearer a solution.	+.303		
13. I usually set out to understand thoroughly the meaning of what I am asked to read.	+.601		
14. I find it helpful to "map out" a new topic for myself by seeking out the ideas that fit together.	+.703	+.693	
17. I like to play around with ideas of my own even if they don't get me very far.	+.430		
18. When I'm tackling a new topic, I often ask myself questions about it which new information should answer.	+.481		
(N)	(114)	(265)	(569)
Variance Explained	8%	2%	2%
Principal Axis Factoring, Varimax Rotation with Kaiser normalization. Displayed Factor loadings + or - .40.			

Table 4: Factor loadings for Comprehension Learning, 1999-2001.			
Question Number	1999 (f4)	2000 (f2)	2001 (f3)
5. Ideas in books often set me off on long chains of thought of my own, only tenuously related to what I was reading.	+.731	+.598	+.537
6. I often find myself questioning things that I hear in lectures or read in books.		+.441	+.336
11. In trying to understand a puzzling idea, I let my imagination wander freely to begin with, even if I don't seem to be much nearer a solution.	+.705	+.522	+.706
17. I like to play around with ideas of my own even if they don't get me very far.	+.460	+.595	+.528
18. When I'm tackling a new topic, I often ask myself questions about it which new information should answer.		+.402	
20. Often when I'm reading books, the ideas produce vivid images which sometimes take on a life of their own.	+.486	+.445	+.419
(N)	(114)	(265)	(569)
Variance Explained:	3%	10%	5%
Principal Axis Factoring, Varimax Rotation with Kaiser normalization. Displayed Factor loadings + or - .30.			

Tables

Table 5: Factor loadings for Surface Learning, 1999-2001.				
Question Number	1999 (f1)	2000 (f1) (skim)	2000 (f7) (memorize)	2001 (f5)
3. Lecturers seem to delight in making the simple truth unnecessarily complicated.	+.598	+.387		
4. I like to be told precisely what to do in essays or other assignments.	+.509			
7. It's important to me to do things better than my friends, if I possibly can.	+.382			
8. I need to read around a subject pretty widely before I'm ready to put my ideas down on paper.	+.336			
9. I find I have to concentrate on memorizing a good deal of what we have to learn.	+.645	+.570		
10. I prefer courses to be clearly structured and highly organized.				+.318
15. When I'm reading I try to memorize important facts which may come in useful later.	+.311		+.522	+.428
16. I tend to read very little beyond what's required for completing assignments.	+.784	+.485		
19. The best way for me to understand what technical terms mean is to remember the textbook definitions.	+.515		+.436	+.474
21. I usually don't have time to think about the implications of what I have read.	+.710	+.636		
22. I enjoy competition: I find it stimulating.				
23. Often I find I have read things without having a chance to really understand them.	+.754	+.582		
Variance Explained	38%	15%	2%	2%
(N)	(114)	(265)	(569)	(569)
Principal Axis Factoring, Varimax Rotation with Kaiser normalization. Displayed Factor loadings + or - .30.				

Table 6: Factor loadings for Syllabus Boundness, 1999-2001.			
Question Number	1999 (f5)	2000 (f4)	2001 (f2) (surface/ syllabus)
3. Lecturers seem to delight in making the simple truth unnecessarily complicated.			+.408
4. I like to be told precisely what to do in essays or other assignments.	+.468	+.631	+.447
9. I find I have to concentrate on memorizing a good deal of what we have to learn.			+.448
10. I prefer courses to be clearly structured and highly organized.	+.658	+.639	+.359
15. When I'm reading I try to memorize important facts, which may come in useful later.	+.451		
16. I tend to read very little beyond what's required for completing assignments.			+.384
21. I usually don't have time to think about the implications of what I have read.			+.587
23. Often I find I have read things without having a chance to really understand them.			+.618
24. I would do almost anything to get one of the highest marks in my course.	+.383		
(N)	(114)	(265)	(569)
Variance Explained	3%	4%	8%
Principal Axis Factoring, Varimax Rotation with Kaiser normalization. Displayed Factor loadings + or - .30.			

Table 7: Factor loadings for Achievement Motivation, 1999-2001.			
Question Number	1999 (f3)	2000 (f3)	2001 (f4)
1. I generally put a lot of effort into trying to understand things which initially seem difficult.	+.400		
7. It's important to me to do things better than my friends, if I possibly can.	+.563	+.622	+.636
12. I hate admitting defeat, even in trivial matters.	+.510	+.556	+.447
15. When I'm reading I try to memorize important facts which may come in useful later.	+.356		
17. I like to play around with ideas of my own even if they don't get me very far.	+.515		
18. When I'm tackling a new topic, I often ask myself questions about it which new information should answer.	+.358		
22. I enjoy competition: I find it stimulating.	+.722	+.713	+.475
24. I would do almost anything to get one of the highest marks in my course.	+.376	+.374	+.496
(N)	(114)	(265)	(569)
Variance Explained	4%	5%	3%
Principal Axis Factoring, Varimax Rotation with Kaiser normalization. Displayed Factor loadings + or - .30.			

Tables II. Actual Participation in CMC Online Learning

Table 8: Standardized regression of "Factor index for Active Use of computer-mediated communications" on "approaches to learning"/Studying, 1999-2001.			
	1999	2000	2001
Deep (D)	-----	-.04	+.12*
Relating (R)	+.17	+.11	-.08
Comprehension (CH)	-.09	-.13	+.20**
Surface(SK) (skim)	-.03	-.26*	-.28***
Surface (SM) (memorize)		-.12	-.08
Syllabus (SY)	-.17	-----	-----
Achievement (CP)	+.04	-.03	+.00
Meaning Orientation (MO)	+.03	-.06	+.18**
Reproducing Orientation (RO)	-.14	-.23*	-.33***
(N)	(39)	(75)	(236)
Note: 10-item factor index of "which feature of LearnLink do you use most often".			
Note: Significance F-test: * <.05; ** <.01; *** < .001.			

Table 9: Percent of students read and sending messages to registered and unregistered online course conferences during a course, 1999-2001.					
	Registered Course Conference		Unregistered Course Conference		(N)
Survey Year	Read	Send	Read	Send	
2001	95%	72%	38%	13%	(513)
2000	99%	91%	54%	10%	(280)
1999	100%	92%	77%	16%	(114)

Tables

Table 10: Standardized regression of reading and sending messages to registered and non-registered course conferences on meaning and reproducing orientations, 1999-2001.

		Registered Course Conference		Non-Registered Course Conference		(N)
		Meaning Orientation	Reproducing Orientation	Meaning Orientation	Reproducing Orientation	
Read	1999	+.18	+.07	+.18	-.00	(99)
	2000	+.00	-.06	+.15*	-.01	(260)
	2001	+.11*	-.10*	+.13*	-.05	(497)
Send	1999	+.34**	+.14	+.13	-.06	(102)
	2000	+.15*	-.13*	+.08	+.04	(260)
	2001	+.17***	-.17***	+.09*	-.02	(497)

Note: Meaning and reproducing orientation are two-factor solutions.

Table 11: Standardized Regression of Reading messages in registered course conference on "approaches to learning"/Studying, 1999-2001.

	1999	2000	2001
Deep (D)	-----	+.06	+.12**
Relating (R)	+.24*	-.02	+.03
Comprehension (CH)	+.01	+.04	+.02
Surface(SK) (skim)	-.04	+.02	-.05
Surface (SM) (memorize)		+.13*	-.04
Syllabus (SY)	+.11	-.13*	
Achievement Motivation (AM)	+.08	-.14*	-.02
Meaning Orientation (MO)	+.18	+.00	+.11*
Reproducing Orientation (RO)	+.07	-.06	-.10*
(N)	(99)	(262)	(497)

Note 1: Significance F-test: * <.05; ** <.01; *** < .001.
Note: Dependent variable: "On average, how often do you generally participate in the following on LearnLink? A). Read messages posted in the conferences of the course you are taking."

Table 12: Standardized Regression of Reading messages in non-registered course conferences on "approaches to learning"/Studying, 1999-2001.

	1999	2000	2001
Deep (D)	-----	+.04	-.00
Relating (R)	+.24*	+.01	+.07
Comprehension (CH)	+.16	+.13*	+.17***
Surface(SK) (skim)	+.07	-.05	-.12*
Surface (SM) (memorize)		+.06	+.06
Syllabus (SY)	-.10	+.00	-----
Achievement Motivation (AM)	-.06	+.05	-.02
Meaning Orientation (MO)	+.18	+.15*	+.13*
Reproducing Orientation (RO)	-.00	-.01	-.05
(N)	(98)	(260)	(490)

Note 1: Significance F-test: * <.05; ** <.01; *** < .001.
Note: Dependent variable: "On average, how often do you generally participate in the following on LearnLink? B). Read messages posted in the conferences of other courses you are NOT taking."

Table 13: Standardized regression of "Sending messages to own registered course conferences" on "approaches to learning"/Studying, 1999-2001.

	1999	2000	2001
Deep (D)	------	+.05	+.14**
Relating (R)	+.23*	-.03	+.01
Comprehension (CH)	+.18	+.18**	+.12**
Surface(SK) (skim)	+.10	-.02	-.12**
Surface (SM) (memorize)		+.05	-.08
Syllabus (SY)	+.10	-.21**	-----
Achievement Motivation (AM)	+.24*	-.02	-.02
Meaning Orientation (MO)	+.34**	+.15*	+.17***
Reproducing Orientation (RO)	+.14	-.13*	-.17***
(N)	(101)	(260)	(493)

Note 1: Significance F-test: * <.05; ** <.01; *** < .001.
Note: Dependent variable: "On average, how often do you generally participate in the following on LearnLink? C). Send messages to the conferences of the course you are taking."

Table 14: Standardized regression of "Sending messages to other non-registered course conferences" on "approaches to learning"/Studying, 1999-2001.

	1999	2000	2001
Deep (D)	-----	+.00	+.03
Relating (R)	+.08	-.05	+.04
Comprehension (CH)	+.14	+.10	+.07
Surface(SK) (skim)	+.01	+.02	-.07
Surface (SM) (memorize)		+.07	+.07
Syllabus (SY)	-.08	-.03	-----
Achievement Motivation (AM)	+.00	+.06	-.02
Meaning Orientation (MO)	+.13	+.08	+.09*
Reproducing Orientation (RO)	-.06	+.04	-.02
(N)	(102)	(258)	(490)

Note 1: Significance F-test: * <.05; ** <.01; *** < .001.
Note: Dependent variable: "On average, how often do you generally participate in the following on LearnLink? D) Send messages to the conferences of other courses you are NOT taking."

Tables III. Personal Importance of CMC Online Learning

Table 15: Factor loadings for Personal Importance of Online registered course interactive participation, 1999-2001.

Question Number	1999 (f1)	2000 (f1)	2001 (f2)
6c) Ask questions of the instructor in your course.	+.631	+.680	+.736
6d) Ask questions of other students in your course.	+.906	+.973	+.843
6e) Participate in course-related discussions.	+.679	+.627	+.660
6f) See if answers to posted questions clear up my questions about the course.	+.579	+.685	+.545
(N)	(100)	(265)	(485)
Variance Explained	29%	27%	21%

Note: "How important to you personally are the following for your use of LearnLink?"
Principal Axis Factoring, Varimax Rotation with Kaiser normalization. Displayed Factor loadings + or - .50.

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Table 16: Factor loadings for Personal Importance of Online unregistered course interactive participation, 1999-2001.			
Question Number	1999 (f3)	2000 (f3)	2001 (f1)(merges with social)
6g) View folders of other courses in which you are not registered.	+.702	+.718	+.657
6h) Leave messages in folders of other courses in which you are not registered.	+.709	+.528	+.935
6i) Engage in non-academic discussion about student social life.			+.696
6j) Look for other students on LearnLink to engage in chat.			+.822
(N)	(100)	(265)	(485)
Variance Explained	7%	8%	29%
Note: "How important to you personally are the following for your use of LearnLink?" Principal Axis Factoring, Varimax Rotation with Kaiser normalization. Displayed Factor loadings + or - .50.			

Table 17: Factor loadings for Personal Importance of generic non-academic social online participation, 1999-2001.			
Question Number	1999 (f2)	2000 (f2)	2001 (f1) (merges with unregistered course interactions)
6g) View folders of other courses in which you are not registered.			+.657
6h) Leave messages in folders of other courses in which you are not registered.			+.935
6i) Engage in non-academic discussion about student social life.	+.836	+.762	+.696
6j) Look for other students on LearnLink to engage in chat.	+.548	+.637	+.822
(N)	(100)	(265)	(485)
Variance Explained	13%	13%	29%
Note: "How important to you personally are the following for your use of LearnLink?" Principal Axis Factoring, Varimax Rotation with Kaiser normalization. Displayed Factor loadings + or - .50.			

Table 18: Factor loadings for Personal Importance of obtaining registered course information, 1999-2001.			
Question Number	1999 (f4)	2000 (f4)	2001 (f3)
6a) Obtain lecture notes or other course information.	+.886	+.753	+.528
6b) Obtain schedules of lectures, tests and other course events.	+.524	+.591	+.761
(N)	(100)	(265)	(485)
Variance Explained	6%	4%	5%
Note: "How important to you personally are the following for your use of LearnLink?" Principal Axis Factoring, Varimax Rotation with Kaiser normalization. Displayed Factor loadings + or - .50.			

Table 19: Standardized regression of "Factor index for Personal Importance of online registered course interactive participation" on "approaches to learning"/Studying, 1999-2001.			
	1999	2000	2001
Deep (D)	-----	+.15*	+.07
Relating (R)	+.05	-.05	-.03
Comprehension (CH)	+.12	+.02	+.03
Surface(SK) (skim)	-.07	+.05	-.05
Surface (SM) (memorize)		+.13*	+.01
Syllabus (SY)	+.06	-.08	-----
Achievement Motivation (AM)	+.04	+.02	+.02
Meaning Orientation (MO)	+.12	+.08	+.09*
Reproducing Orientation (RO)	-.01	+.06	-.05
(N)	(99)	(251)	(465)
Note: Significance F-test: * <.05; ** <.01; *** < .001.			

Table 20: Standardized regression of "Factor index for Personal Importance of Online unregistered course interactive participation" on "approaches to learning"/Studying, 1999-2001.

	1999	2000	2001
Deep (D)	-----	+.03	+.04
Relating (R)	+.14	+.07	+.08
Comprehension (CH)	+.18	+.09	+.13**
Surface(SK) (skim)	-.05	+.04	-.01
Surface (SM) (memorize)		+.07	+.04
Syllabus (SY)	+.12	+.01	-----
Achievement Motivation (AM)	-.17	-.04	+.00
Meaning Orientation (MO)	+.26**	+.13*	+.15***
Reproducing Orientation (RO)	+.11	+.07	+.02
(N)	(99)	(251)	(465)

Note: In 2001, online unregistered course interactive participation factor index merges with generic non-academic social online participation factor index.
Note: Significance F-test: * <.05; ** <.01; *** < .001.

Table 21: Standardized regression of "Factor index for Personal Importance of generic non-academic social online participation" on "approaches to learning"/Studying, 1999-2001.

	1999	2000	2001
Deep (D)	-----	-.09	+.04
Relating (R)	-.12	+.07	+.08
Comprehension (CH)	+.22*	+.09	+.13**
Surface(SK) (skim)	+.02	-.05	-.01
Surface (SM) (memorize)		+.00	+.04
Syllabus (SY)	-.15	-.07	-----
Achievement Motivation (AM)	+.22*	-.13*	+.00
Meaning Orientation (MO)	+.02	+.04	+.15***
Reproducing Orientation (RO)	-.14	-.10	+.02
(N)	(99)	(251)	(465)

Note: In 2001, generic non-academic social online participation factor index merges with unregistered course interactions factor index.
Note: Significance F-test: * <.05; ** <.01; *** < .001.

Table 22: Standardized regression of "Factor index for Personal Importance of obtaining registered course information" on "approaches to learning"/Studying, 1999-2001.

	1999	2000	2001
Deep (D)	-----	+.12	+.05
Relating (R)	+.03	+.13*	-.01
Comprehension (CH)	+.15	-.04	+.07
Surface(SK) (skim)	+.02	+.18**	-.00
Surface (SM) (memorize)		-.06	+.06
Syllabus (SY)	-.06	-.02	-----
Achievement Motivation (AM)	-.10	-.05	+.04
Meaning Orientation (MO)	+.14	+.11	+.10*
Reproducing Orientation (RO)	-.00	+.08	+.02
(N)	(99)	(251)	(465)

Note: Significance F-test: * <.05; ** <.01; *** < .001.

Tables IV. Fear of CMC Online Learning

Table 23: Factor loadings for Anxiety over Public Display of Ignorance in Posting Messages, 1999-2001.			
Question Number	1999	2000	2001
a) I am afraid of expressing my opinions for everyone in the class to read.	+.791	+.857	+.733
b) I am afraid that everyone else on LearnLink outside my course will read my message.	+.489	+.571	+.497
d) Someone might make fun of my message or criticize what I have written	+.678	+.825	+.771
f) The information or opinions expressed in my message might be incorrect or wrong	+.767	+.678	+.718
g) I feel that my contribution might seem silly to someone who is smarter	+.927	+.752	+.846
i) I am not comfortable voicing my opinion in public	+.606	+.776	+.663
j) I feel that my knowledge is under par compared to my classmates	+.506	+.488	+.607
k) I don't want the instructor to see my messages	+.492	+.470	+.425
(N)	(70)	(261)	(452)
Variance Explained	41%	39%	41%
"Please indicate the degree to which you agree or disagree with the following statements about your own LearnLink participation. I sometimes hesitate to send messages to a course folder because:" Principal Axis Factoring, Varimax Rotation with Kaiser normalization. Displayed Factor loadings + or - .40.			

Table 24: Factor loadings for Anxiety over Class Boundaries in Posting Messages, 1999-2001.			
Question Number	1999	2000	2001
b) I am afraid that everyone else on LearnLink outside my course will read my message.		+.419	+.366
d) Someone might make fun of my message or criticize what I have written			+.324
k) I don't want the instructor to see my messages	+.420	+.309	+.661
l) I only want the professor and other students in my class to see my messages	+.801	+.568	+.594
m) I only want other students in my class, but not the professor, to see my messages	+.728	+.510	+.782
(N)	(70)	(261)	(452)
Variance Explained	9%	3%	6%
"Please indicate the degree to which you agree or disagree with the following statements about your own LearnLink participation. I sometimes hesitate to send messages to a course folder because:" Principal Axis Factoring, Varimax Rotation with Kaiser normalization. Displayed Factor loadings + or - .40.			

Table 25: Regression of "I am not comfortable voicing my opinion in public" on "approaches to learning"/Studying, 1999-2001. (QE8L)			
	1999	2000	2001
Deep (D)	-----	+.10	-.17***
Relating (R)	-.20	-.10	+.08
Comprehension (CH)	-.13	-.19***	-.11**
Surface(SK) (skim)	+.16	+.32***	+.24***
Surface (SM) (memorize)		-.01	+.11**
Syllabus (SY)	+.17	+.13*	-----
Achievement Motivation (AM)	-.28*	-.05	+.05
Meaning Orientation (MO)	-.11	-.15**	-.14***
Reproducing Orientation (RO)	+.35***	+.32***	+.32***
(N)	(101)	(259)	(493)
Note: Significance F-test: * <.05; ** <.01; *** < .001.			

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Table 26: Regression of "I am afraid that everyone else on LearnLink outside my course will read my message." on "approaches to learning"/Studying, 1999-2001. (QE8L)			
	1999	2000	2001
Deep (D)	-----	+.07	-.09*
Relating (R)	-.02	-.06	+.03
Comprehension (CH)	+.01	-.04	+.07
Surface(SK) (skim)	+.12	+.23***	+.15***
Surface (SM) (memorize)		-.02	+.10*
Syllabus (SY)	+.02	+.12	-----
Achievement Motivation (AM)	-.16	-.03	+.06
Meaning Orientation (MO)	+.04	-.04	-.01
Reproducing Orientation (RO)	+.16	+.23***	+.23***
(N)	(98)	(259)	(492)
Note 1: Significance F-test: * <.05; ** <.01; *** < .001.			

Table 27: Regression of "I am afraid of expressing my opinions for everyone in the class to read" on "approaches to learning"/Studying, 1999-2001 (E8AR).			
	1999	2000	2001
Deep (D)	-----	+.12*	-.14**
Relating (R)	-.14	-.05	+.11**
Comprehension (CH)	-.06	-.12*	-.06
Surface(SK) (skim)	+.22*	+.29***	+.18***
Surface (SM) (memorize)		+.03	+.05
Syllabus (SY)	+.21*	+.14*	-----
Achievement Motivation (AM)	-.17	-.03	+.11**
Meaning Orientation (MO)	-.06	-.06	-.06
Reproducing Orientation (RO)	+.37***	+.32***	+.23***
(N)	(100)	(258)	(499)
Note 1: Significance F-test: * <.05; ** <.01; *** < .001.			

Table 28: Regression of "I only want the professor and other students in my class to see my messages" on "approaches to learning"/Studying, 1999-2001 (QE8L).			
	1999	2000	2001
Deep (D)	-----	+.10	-.13**
Relating (R)	+.21	-.02	+.13**
Comprehension (CH)	+.06	+.02	-.01
Surface(SK) (skim)	+.28*	+.18**	+.15**
Surface (SM) (memorize)		+.05	+.02
Syllabus (SY)	+.06	+.12*	-----
Achievement Motivation (AM)	+.15	+.08	+.07
Meaning Orientation (MO)	+.12	+.06	-.01
Reproducing Orientation (RO)	+.19	+.24***	+.17***
(N)	(82)	(258)	(494)
Note: Significance F-test: * <.05; ** <.01; *** < .001.			

Table 29: Regression of "Someone might make fun of my message or criticize what I have written." on "approaches to learning"/Studying, 1999-2001. (QE8L)			
	1999	2000	2001
Deep (D)	-----	+.15*	-.19***
Relating (R)	-.16	-.02	+.12**
Comprehension (CH)	+.06	-.09	-.08
Surface(SK) (skim)	+.15	+.35***	+.14**
Surface (SM) (memorize)		+.06	+.15***
Syllabus (SY)	+.15	+.08	-----
Achievement Motivation (AM)	-.14	-.04	+.10*
Meaning Orientation (MO)	+.00	-.01	-.10*
Reproducing Orientation (RO)	+.30***	+.34***	+.29***
(N)	(100)	(260)	(496)
Note 1: Significance F-test: * <.05; ** <.01; *** < .001.			

Table 30: Regression of "I feel that my knowledge is under par compared to my classmates" on "approaches to learning"/Studying, 1999-2001. (QE8L)			
	1999	2000	2001
Deep (D)	-----	-.09	-.24***
Relating (R)	-.07	-.05	+.10*
Comprehension (CH)	-.05	-.01	-.02
Surface(SK) (skim)	+.29*	+.30***	+.32***
Surface (SM) (memorize)		+.02	+.08*
Syllabus (SY)	+.05	+.02	-----
Achievement Motivation (AM)	-.06	-.07	-.02
Meaning Orientation (MO)	-.09	-.12*	-.13**
Reproducing Orientation (RO)	+.24*	+.21***	+.37***
(N)	(101)	(260)	(492)
Note 1: Significance F-test: * <.05; ** <.01; *** < .001.			

Table 31: Regression of "I feel that my contribution might seem silly to someone who is smarter" on "approaches to learning"/Studying, 1999-2001 (Q8GR).			
	1999	2000	2001
Deep (D)	-----	+.05	-.19***
Relating (R)	+.03	-.07	+.12**
Comprehension (CH)	+.06	-.04	-.06
Surface(SK) (skim)	+.28*	+.36***	+.26***
Surface (SM) (memorize)		+.06	+.10*
Syllabus (SY)	+.21*	+.10	-----
Achievement Motivation (AM)	-.04	+.01	+.12**
Meaning Orientation (MO)	+.07	-.06	-.10*
Reproducing Orientation (RO)	+.35**	+.35***	+.34***
(N)	(101)	(260)	(490)
Note 1: Significance F-test: * <.05; ** <.01; *** < .001.			

Table 32: Regression of Anxiety over Public Display of Ignorance (Factor Index) on "approaches to learning"/Studying, 1999-2001.

	1999	2000	2001
Deep (D)	-----	+.10	-.18*
Relating (R)	+.01	-.09	+.10*
Comprehension (CH)	+.08	-.13*	-.06
Surface(SK) (skim)	+.32*	+.34***	+.27***
Surface (SM) (memorize)		+.04	+.10*
Syllabus (SY)	+.29*	+.13*	-----
Achievement Motivation (AM)	-.10	-.05	+.12*
(N)	(69)	(248)	(452)
Meaning Orientation (MO)	-.11	-.10	-.12*
Reproducing Orientation (RO)	+.43**	+.35**	+.34***
(N)	(69)	(248)	(452)

Note 1: Significance F-test: * <.05; ** <.01; *** < .001.
Note: Dependent variable: 9-item embarrassment index about posting messages on LearnLink for others to view. "

Table 33: Regression of "Class Boundary" Factor Index on "approaches to learning"/Studying, 1999-2001.

	1999	2000	2001
Deep (D)	-----	-.07	-.16***
Relating (R)	-.24	-.02	+.10
Comprehension (CH)	-.06	-.05	-.04
Surface(SK) (skim)	-.05	+.22***	+.06
Surface (SM) (memorize)		+.07	+.10*
Syllabus (SY)	+.14	+.01	-----
Achievement Motivation (AM)	-.17	+.15*	+.04
(N)	(69)	(248)	(452)
Meaning Orientation (MO)	-.08	-.09	-.08
Reproducing Orientation (RO)	+.17	+.20**	+.17**
(N)	(69)	(248)	(452)

Note 1: Significance F-test: * <.05; ** <.01; *** < .001.
Note: Dependent variable: 9-item embarrassment index about posting messages on LearnLink for others to view. "

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