Critical examination of factors affecting interaction on cmc

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This study examines how computer-mediated communication (CMC) systems, e-mail, bulletin board, real time discussion and listserv, enhance and inhibit on-line interaction from four theoretical constructs and four different types of interaction. A comprehensive search of the ERIC database was conducted and the relevant studies were referenced for the discussion. Analysis reveals that CMC systems enhance *and* inhibit on-line interaction. The user's perceptions and the attributes of CMC that enhance interactions must both be examined. The successful use of CMC in the classroom requires the selection of the correct CMC medium and group specific instructional design. CMC does not replace face-to-face communication. CMC provides a more flexible delivery and a greater selection of communication channels for online users. The users are able to optimize their communication, on-line image (face), and on-line impression easier than in face to face encounters that require the simultaneous use of all communication channels. Communication models and distance education theoretical constructs are reviewed.

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1. Introduction

Keegan [1] declares that 'Without a medium of communication the concept "distance education" would not be an educational process...both synchronous and asynchronous media are viable means of communication for distance education providing that they allow two-way communication' (p. 118). Discussing quality and access in distance education from theoretical constructs, Garrison [2] states that the 'concern for quality in distance education has identified an emerging paradigm based upon two-way communication as a necessary and central component of an educational transaction' (p. 17). In other words, interactive two-way communication is the critical component in distance education.

Computer-mediated communication (CMC) systems have been used as media of communication rather than for their technological properties. Examining CMC systems requires examining an interactive communication model. Each communicative act has a source/sender who originates the message, the message itself, a medium for transmitting the message, a receiver who interprets the message,

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and possible feedback to the source from the receiver [3, 4]. Communication only occurs when information is transmitted from a sender to a receiver and when the information has some level influence on the receiver. Shannon and Weaver's [4] Mathematical Theory of Communication is a universal model for all types of communication systems, including CMC. Four theoretical constructs concerning distance education are proposed by McIsaac and Gunawardena [5], transactional distance, interaction, learner control, and social context. Moore [6] proposed that the transactional distance is determined by the amount of dialogue that occurs between the learner and the instructor, and the amount of structure that exists in the design of the course. More dialogue occurs when there is less structure, thus stimulating more interaction and less distance between online users. The activity becomes knowledge transmission, not education, when 'interaction' is prevented. Therefore four types of interaction; learner–instructor, learner–content, learner–learner [7] and learner–interface [8]; must be fostered and built into the instruction.

Learner control is an additional issue to be examined when studying interaction. Saba and Shearer [9] proposed a system model based on Moore's [6] transactional distance construct to examine the relationship between dialogue and structure. They concluded that as learner control and dialogue increase, transactional distances decrease. Learner control and interaction are critical components of a learning environment. When learner controlled interactions occur in a learning environment, learners' and instructors' roles are reversed and learners initiate the dialogue. Instructors become facilitators, instead of information givers, during students' learning processes. To achieve the desired level of learner control, the three factors of control, independence, competence, and support [10], must be balanced.

When focusing on learner control the learner's social environment must be examined. Unfortunately, in distance education many instructions are designed and transferred without consideration of the learners' social environments [11]. Although learning technology in distance education can be applied in a variety of ways, and local recipients' perceptions of the medium can be very different at different times and in different places. Therefore, social presence [12], immediacy and intimacy may impact interaction, and deserve further examination. Currently, traditional courses are being enhanced through distance learning methods by on-line and Internet delivery of course material, either as adjunct, mixed, or completely on-line [13], as well as the use of CMC for class interaction.

CMC technologies in a distance education setting can be classified as synchronous (real time communication) or asynchronous (time-delayed communication) systems [5, 14, 15]. Asynchronous communication is communication that does not require participants to be communicating at the same time or in the same place; e.g. electronic mail, electronic bulletin board, and listserv. Synchronous communication requires participants to be communicating at the same

time, i.e. real time computer conferencing. Audio and video conferencing systems are not included in this discussion.

The ERIC database was searched using as keywords 'interaction' and 'computer-mediated communication.' A total of 191 articles were reviewed focusing on the enhancement or the inhibition of interaction with CMC. Sixty-three articles were relevant for this study. In this discussion the user's ability to enhance or obstruct on-line interactions is analysed for all CMC systems, considering the characteristics of the medium and the user's perception of the medium. Though e-mail, listserv, and bulletin board systems may share the aspect of asynchronous communication, they are quite different in their operation and function [16].

2. CMC enhance interactions

Appropriate instructional design of CMC based education enhances on-line interactions among students, teachers, content and interface.

2.1 *Anonymity, multiple identities and aloneness*

'Cyberspace' allows one to have anonymity and multiple identities; also one can shift identities easily, taking on characteristics of others' identities [17]. Users may feel anonymous, although using their real names, because they might pass their computer-conversation partners on the street without being recognized [18]. Phillips [19] argued that the chance to speak anonymously could lead to the expression of honest opinion and to candidness of emotional comments. In fact on-line users tend to judge one's mind rather than appearance, race, accent, etc [20]. The online user is physically alone with the terminal attached to a telephone. The idea of 'being alone with one's terminal' may lead to a reduction of barriers and a relaxation of face-maintaining behaviour [18, 21–24]. McConnell [25] found that in a computer conferencing environment women are at less of a disadvantage than in face-to-face conversations. Garramone *et al*. [18] conclude that the aloneness and the anonymity of CMC may encourage on-line users to connect more intimately to others in society. The relative lack of social presence in CMC channels may be an advantage for some tasks, such as learning and perhaps writing or designing [26]. Anonymity, multiple identities, and aloneness may produce a more comfortable environment for some CMC users and encourage them to interact more on-line. Phillips [19], and Hartman *et al*. [27] insist that anonymity can give shy, critical, and considerate people the opportunity to comment without the fear of personal repercussions. Students who normally feel shy in a classroom setting often feel more comfortable, with less embarrassment, while communicating electronically with the instructor and other students [28, 29]. Interaction among instructors and students can be enhanced because students can reiterate or ask follow-up questions without the concern that their questions will be naïve [30]. E-mail discussions encourage students

who are sometimes silenced because of their status, race, handicap, or gender to speak up, to participate in e-mail discussions in ways that they avoid in traditional class settings [31]. Quiet students often contribute rather profound insights and questions that they would not have offered in a traditional class.

CMC has the potential of fostering abstract thinking and the development of social and communication skills. Female minority students normally are not interested in science subjects and participate less in science classes. Murfin [32] used a computer bulletin board and e-mail to bring scientists into contact with middle school female and African-American students. He found that this encouraged an interaction between scientists and female students in a science class.

2.2   *Expression equality*

CMC has been described as a venue where participants can participate equally in discussions [33–38]. Van Gelder [20] and Misanchuk *et al.* [24] referred to CMC as 'egalitarian.' The democratic openness of the computer conference environment allows all students an opportunity to contribute [39]. Harasim [40] described the possibility '...for anyone to become an information provider for others, thereby both democratizing information access and enabling new roles for network users. In the most successful online courses, students assume some of the roles that traditionally belong to the instructor' (p. 208). Democratic openness, the absence of nonverbal status cues, teacher-student role reversal, and learner-to-learner interaction within a CMC environment provide an opportunity for a more equal platform for communication and more stimulus for action than does a traditional classroom [38]. Therefore, more peer interactions were concluded [41–44].

Hawisher [45] and Hawisher and Moran [31] examined e-mail utilization in a college language class and confirmed 'the equalization phenomenon'; that is, the first-year college students in the e-mail group asserted themselves more frequently and had a greater influence on the group than those in the face-to-face (FTF) group. A CMC environment with the potential of expression equality enhances learner–learner and learner–teacher interactions. Roberts' [42] found that computer conferencing provided greater learner–learner interaction and the written work submitted was superior both as to breadth of research and quality of analysis. Edelson's study [41] established similar conclusions. By contrast Huang's study [46] concluded that CMC for language learning does not produce superior writing and discussion quality.

More teacher-learner interaction is generated because students have an equal opportunity to obtain response from teachers. CMC provides the ability for the instructor to have greater input into each student's learning experience [41, 44, 47]. However, the amount of teacher–learner interaction declined as the semester progressed [44].

2.3   *One-to-many communication*

Listserv is a one-to-many communication that fosters on-line interaction among students and instructors. Many distance courses utilize listservs for class discussion. A number of studies have examined the use of listservs in this setting. Blocher [48] reported that students rated the listserv as having the highest ability for interaction with peers because of its one-to-many nature. Piburn and Middleton [49] also found that the listserv has generated an increasing volume of correspondence on a wide variety of topics. Some students have recognized the interaction as a means of collecting relevant articles and other tidbits of information. The students initiate the conversations, thus, reversing their roles with the teachers, the teachers answer questions, and the students react. This process increases learner control [50]. Long and complex conversations develop on listservs, as students explore their developing understandings of both content and pedagogy that also enhance learner-content interaction.

Listserv tends to be more readily available than bulletin boards. Listserv messages come to users' e-mail accounts, unlike bulletin boards, which require users to visit the board to retrieve their messages. Provided that users check e-mail messages regularly, listserv users can be reached more easily than bulletin board members; but the bulletin board provides better learner–interface interaction because of message threading.

2.4   *Access-availability*

Accessibility and availability of CMC augment interaction among learners, teachers and content. Internet instruction with hypertext is available continuously wherever Internet access exists. Students are able to access the content any time and anywhere because of the ability to store communications [24, 41, 51], which increases the level of interaction and provides flexibility [41, 44, 52–54] for users. In the other hands, different CMC systems provide opportunities to organize and structure inputs, outputs, and communication patterns in a variety of different ways [51], such as threaded messages or multi-subject interval real time discussions that increase the level of learner–interface interaction. Kahn and Brookshire [55] integrated a computer bulletin board in a social psychology course; the bulletin board expanded the learner–teacher interaction as well as interaction among students, and it allowed students easier access to their instructors.

Hoare and Race [29] reported that class discussion on a bulletin board could continue around the clock because students are free to enter comments any time that the computer system is available. The longer period of time allows greater student access to instructors and may increase learner–instructor interaction. Lauzon [56] argues that learner–instructor interaction is key for mutual knowledge construction. Learner–learner interaction is also essential for knowledge construction. 'Knowing (learning) is a social act that requires that

learners enter into a dialogue with others, to share stories out of which we build constructions… Thus by entering into dialogue we build communities that allow us to exist in-relation-to-others in our learning. And it is only when we learn-in-relation to others that we truly come to know' (p. 215).

There are data to demonstrate increased student-instructor interaction when CMC is utilized. Students seem more willing to ask the instructor for assistance [30, 57] and to approach instructors for personal reasons [28, 58]. Students with such access are less likely to encroach upon the instructor's time by calling their home or interrupting an ongoing discussion [28].

The CMC environment lends itself to easier course management. Coombs and Friedman [28] argued that instructors or moderators could maintain control over the time given to computer mediated exchanges with students and easily play a moderating role in the discussion. Software can be used to construct an ideal leadership structure and an environment for interaction [22, 59]. Instructors can take advantage of the several threads of communication that develop in student comments, as on the bulletin board, to direct and organize the discussion [60]. Paulsen [61] argued that e-mail could support a number of learning techniques, such as learning contracts, mentorship and apprenticeship, and correspondence study to increase interactions. Hartman *et al*. [27] examined the effects of computer network technologies on teacher–student and student–student interactions. It was concluded that teachers in networked sections, using bulletin board and e-mail, interact more with their students than do teachers in regular sections. Furthermore, CMC is used to communicate more frequently with less able students than with more able students; and, less able students communicated more with other students.

2.5   *Collaboration*

Computer conferencing supports collaboration among learners [24, 38, 54, 62–65], instructors (experts) [40, 66], content [67], media [67] and writing/composition [68–70]. The learning and interaction that occur in environments that employ CMC encourage collaboration and teamwork and require active rather than passive participation. Collaboration promotes interaction, dialogue, and negotiation between reader and writer. Blocher [48] argued that peer collaboration requires positive interaction and provides learners with dialogue that can help clarify confusing course material as well as grasp understandings that might go beyond the individual's conceptions. Good management of peer learning also includes making intelligent choices in selecting a peer. Collaboration should not be limited to peers only, computer conferencing supports the individual through a social network of peers as well as the instructor via collaboration and teamwork in which participants share the roles of both expert and novice [40]. Through a computer conferencing system one collaborative group can link with other collaborative groups with similar projects both nationally and internationally [67],

access experts or communities of practice, access resources and network with peers [13, 71]. In a recent study [66], e-mail and bulletin board were use to create a collaborative learning setting for undergraduate courses. It was concluded that CMC increased the interaction among students, between students and instructors, among teachers, and between a class and wider academic and nonacademic communities. Similarly, Sproull and Kiesler [38] concluded that computer conferences and e-mail allowed learners to generate more proposals for action than traditional classrooms.

2.6   *Student publishing*

Student publishing [43] via CMC is another method of increasing learner–leaner interactions, leaner–content interactions, and the quality of the interactions in a technology based learning environment. Jonassen [63] argued that when learners have a wider audience for their writing or other scholarly activities, they tend to invest more effort in the process and learn more because there are more learner-learner and learner-content interactions involved. Cohen and Reil [72] found that assignments written to communicate with peers by using an electronic bulletin board and e-mail were more fluent, better organized, and clearer than those that were written merely for grades. Authoring newspapers and booklets collaboratively by collecting articles from partner schools around the world by using bulletin board and e-mail results in better use of grammar and syntax [73]. Student publishing also can be taken one step further by using an on-line database [74] to increase learner–content interaction and to enhance students' knowledge construction. Jonassen *et al*. [14] argued that in a distance education environment, remote access to on-line databases facilitate the construction of knowledge. Retrieved information can be used to support positions in a computer conference discussion, for elaboration on a particular topic, or for satisfying personal curiosity. Turning students' works into searchable databases can attain the construction of knowledge [74].

Student publishing can be taken one further step with utilization of on-line peer evaluation [43, 74]. Critical feedback provides information to create dissatisfaction with their present level of knowledge and the opportunity to improve. Recent development in educational research suggests that the revelation of the inadequacies of the learner's present knowledge can promote cognitive restructuring [75, 76]. Critical evaluation by peers requires learners to reshape their ideas and learn new information that they might not discover on their own, a major factor influencing effective collaborative learning [77]. Traditionally, only teachers have possessed the authority to contradict learners. The value of peer disagreement, group controversy, and peer reviews has just recently been recognized [39, 77–83].

2.7   *Hypertexts*

Hypertext is one of the most valuable functions provided by computer technology. All CMC systems can be very easily embedded with hyper links that will direct the learners to more resources on a particular content to increase learner–content interaction. This hypertext information is ubiquitous on the Internet, these archives are rapidly proliferating, and CMC has made it possible to access thousands of archives around the world [63]. On a Web-based bulletin board, students are able to post messages and resource links as well [84]. The messages branch out to more information and resources, providing greater opportunities for learner–content interaction.

2.8   *Time delay*

Asynchronous CMC tools, such as e-mail, bulletin board, or listserv, provide more time for students to reflect on their communication. The time delay allows students to prepare their comments and assignments more carefully [24, 35, 41, 54, 58, 85], a definite advantage when English is a second language, as well as reducing the student's anxiety during examinations [86]. This ability may afford users enhanced opportunities for selective self-presentation, rendering qualitatively different interpersonal impressions than they might convey in synchronous CMC or face-to-face communication [87]. Students can take advantage of the time delay inherent in the asynchronous CMC systems to reflect and compose coherent responses [60, 88]. A study on the use of e-mail in a reading education class [89] has shown that reflective thinking does occur among students in e-mail interactions.

3.   CMC inhibit interactions

The attributes of CMC with an inappropriate instructional design are likely to inhibit online interactions among students, teachers, content and interface.

3.1   *Less computer literacy skill*

Literacy skills are required to achieve desired activities and goals when CMC is integrated into the classroom. These computer literacy skills include keyboarding skills, reading skills, writing skills [5, 41, 90], and general computer operation skills [41, 91, 92]. People who cannot type or read and write well (or who believe they cannot) will become the computerized society's new 'handicapped' group [19]. The nature of CMC is currently grounded in its emphasis on English writing skills because of its text-based orientation. The text-based character of CMC is an important issue for individuals of foreign origin. Communication written with a keyboard can be used as an ideologically charged tool for either cultural domination or cultural survival [93]. For cultures that have

historically transmitted their teaching through an oral tradition, such as Native Americans [94], and have been recently introduced to a typing keyboard, such as Asian students, the use of English text introduces a huge disadvantage for the student and inhibits interactions.

Computer literacy skills apply to students and instructors or moderators equally. They should have the ability to resolve hardware and software problems, which affect the online discussion and create anxiety [59]. While user's computer literacy skill is considered, the hardware should not be ignored, such as frustration with the Internet service providers (ISP) and equipment limitations [24, 41, 44, 92]. The limitation of computer literacy and technology should be applied to both students and teachers [95].

3.2   *Privacy*

The issue of privacy affects the social psychology of on-line communication. The debate regarding the private/public aspect of on-line communication is a major issue that deserves further scrutiny. All CMC systems are considered public [96]. Computer conferencing should remind the online user of the spectrum of electronic surveillance and the negative impact eavesdropping produces on interactions. More than a third of the online users responded with the statements that 'information can come into the wrong hands' and 'outsiders can see private messages' [97, p. 131]. The communications and activities of an on-line course are largely public if the course is structured for collaborative learning and the students examine each other's work [98]. This is very critical when the discussion topic is sensitive or personal. Some users are aware of this, while others are not. Steinfield [99] found that users were reluctant to employ electronic mail for confidential matters. Users generally perceive e-mail as not being private, although e-mail is considered as a more personal communication. When an environment is perceived as public, interaction and communication are curtailed. The public nature of a virtual classroom will have a negative impact on student learning [100].

3.3   *Impersonal*

De-individuation occurs when people have anonymity or when the situation lacks societal cues, mores, and values [38, 101, 102]. According to Kiesler [103], 'without nonverbal tools, a sender cannot easily alter the mood of a message, communicate a sense of individuality, or exercise dominance or charisma... Communicators feel a greater sense of anonymity and detect less individuality in others' (p. 48). Saunders and Heyl [104] reported that some students complain about the disjointed nature of dialogue on computer conferencing systems. Recent studies have found that CMC technologies are not inherently personal or impersonal [87, 105]. The amount of interaction among learners and instructors is inhibited if the communicators are technologically inexperienced, and if they are

unable to emphasize the special stylistic [106] and persuasive strategies required or if the teacher/moderator is unable to create a sense of social presence.

Blocher [48] reported that the listserv was less personal because it is a one-to-many form of communication. This has a greater negative impact on interaction, particularly on female learners. If women feel that messaging on a listserv is not directed to them or is trivial, such as flaming of others, they tend to engage less.

3.4 *Longer process*

Both synchronous and asynchronous CMC systems tend require more time than face-to-face communication. Studies have shown that CMC groups took longer to reach a decision than face-to-face groups; some CMC groups even failed to achieve consensus at all within the allotted time [37, 41, 44, 58, 107, 108]. Walther [105] argues that on a CMC system interpersonal effects normally occur more slowly. Gunawardena and Zittle [107] examined this nature of CMC, and reported agreement among participants that there were more social and personal messages toward the latter part of a CMC conference than during the initial stages, because student responses are longer and more complex than those created through face-to-face discussion [60, 109]. This may discourage many online learners and produce a negative impact on interaction, particularly in e-mail, bulletin board, and listserv settings. Romiszowski and De Hass [110] also argued that due to the time delay experienced in asynchronous CMC discussions; participants may have difficulty maintaining a clear impression about the topics being discussed.

3.5 *Domination*

Although CMC systems have been found to provide equal participation for on-line learners [35, 38, 107, 111], opposite findings have been reported. Domination of the discussion on CMC could have a negative impact on interactions, such as gender dominance issues [54], minority barriers, and physical disadvantage. Selfe and Meyer [112] found evidence that men and high status participants dominate e-mail discussions. Herring [113] observed that in mixed-gender discussion lists men seemed to do most of the talking, attracting attention to themselves, although not all men were as adversarial as they were vocal; but, she found men often dominate discussions even when the topics were female oriented.

CMC may have a detrimental impact on organizational communication structure [114]. The traditional unequal teacher-student relation can be destroyed by CMC. Tu [115] reported that Chinese teacher authority, which was an absolute power within teacher–student relation, is threatened by computer-mediated disclosures. The power of authority has been challenged by CMC and has been shifted from teachers to students or all users of CMC.

3.6   *Communication style*

Personal communication style may have a negative impact on interaction, if one is not familiar with the written online communication style [116]. Gunawardena and Zittle [107] concluded that instructors who rely on nonverbal cues to provide feedback, and who have a lesser-developed ability to project their personality, would need to learn to adapt to CMC media by developing skills that create a sense of social presence. Being unfamiliar with on-line communication style will negate the socio-emotional sense and cause participants to sense a lower degree of social presence thus inhibiting learner–learner and learner–instructor interactions. Therefore, on-line users, teachers and students, must learn how to use 'emoticons', humour and metaphor [117, 118], and being responsive [118, 119] to express the missing non-verbal cues in text-based CMC system. Ahern and others [120] proposed three teacher's discourse styles, questions, statements, and conversational, to increase asynchronous on-line peer interaction.

3.7   *Uninhibited behaviour*

Uninhibited behaviour may have a negative impact on interaction. Although 'flaming' behaviour is rare in the CMC environment [121], insinuating and offensive messages can be spread easily in some newsgroups [122, 123]. Kim and Raja [122] reported that the extremely verbal uninhibition (aggression and self-disclosure) occurred frequently on a computer bulletin board that indicated 'face threatening acts.' CMC users are able to create multiple identities and socialize with different people with both pseudo and real identities at the same time. The user's self-awareness is reduced and uninhibited behaviour results [124]. A number of researchers [31, 38, 125, 126] focused on the perception of the medium it appears that a writer's relation to a screen and electronic communication seems different from a writer's relation to a written letter or memorandum. Writing on a screen will cause communicators to lose the sense of an audience, become self-absorbed, and lose the constraints and inhibitions that the imagined audience provides. Therefore, roles become less clear, and it is difficult to discern who is producing information for whom [127]. This false sense of anonymity that students feel when using e-mail prompts some to send messages electronically that they would never dare say in a face-to-face interaction [30].

   Hoare and Race [29] reported that students using bulletin board and e-mail make statements they would not make in a face-to-face meeting, are occasionally abusive, and make bold statements even though their names are attached to their communications. According to Kiesler [103], 'without nonverbal tools, a sender cannot easily alter the mood of a message, communicate a sense of individuality, or exercise dominance or charisma... Communicators feel a greater sense of anonymity and detect less individuality in others' (p. 48). In other words, on-line users perceive themselves as invisible and others as visible. This perception very easily creates uninhibited behaviour. To prevent this uninhibited behaviour,

communicators should assume that any message sent is permanent; have in mind a model of the intended audience; and, do not insult or criticize third parties without giving them a chance to respond. Recipients are advised to avoid responding while emotional, assume the honesty and competence of the sender and avoid irrelevancies.

3.8 *Perception*

User's perception is a critical factor to the level online interaction. A listserv may inhibit users' interactions because of their perception of the medium. Listserv users may perceive it as an impersonal CMC system even though messages come to a personal e-mail account because it provides a one-to-many communication. Blocher [84] reported that students viewed the listserv was a venue for unwanted, annoying and generally useless messaging, probably because not all of the messages appealed to users' interests. Unwanted messages jammed in students' e-mail create an annoying feeling. If a listserv has many subscribers and is fairly active traffic jams are created in students' e-mail logs. If contents and topics are interesting to subscribers, it may foster learner–learner and learner–instructor interaction; if contents and topics are dull, learners' willingness to participate in the listserv discussion may be impaired.

The second perception aspect is disunities of time, space, and action [41]. Most CMC users are accustomed to the sensation experienced in FTF encounters. When the FTF contact is removed, the discomfort and anxiety can be easily prevented. For some novice users who are unfamiliar with the on-line culture and the attributes of the media, the anxiety can be raised by the disunities of time, space, and action (asynchronous manner). When more familiar with the on-line community, the level of anxiety will be reduced. Eastman [128] argued that even though on-line users work alone, we are all together.

3.9 *Misunderstanding*

CMC users gain meaning by understanding and interpreting the on-line text messages. The learner relies upon feedback that is contingent upon learner actions; when learners maintain naïve beliefs and fragmented understandings, the system must be able to present consequences and data that can be perceived as consistent or inconsistent; learners may not perceive the implications of such responsive data; and interactions may be distorted and misunderstood. The system interface design is critical for sharing meaning as a necessary means toward increasing both partners' (i.e. the learner and the system) understanding of each other's point of view at important points during the interaction. The lack of non-verbal cues, biased and confounded meanings, failure to share meanings within system boundaries, and incongruent meta-level approaches [129] can easily occur and cause the meaning of messages to be misunderstood.

3.10   *Lost in threaded messages*

Threaded message and multi-subject discussion may cause users to feel lost in an on-line discussion. Unlike a FTF discussion, CMC discussion messages are not all serial. Users can easily lose the sense of who is talking about what to whom, resulting in a particularly negative impact on minority students [119, 130] or novice users. In Tu's [119, 130] studies, it was concluded that Chinese students felt lost in on-line discussions fairly easily because of the rapid topic changes in Western classrooms. Two strategies were proposed [131] to permit students to engage in discursive learning: using strategic snipping to simulate conversational overlaps, and using formulations and indexical repairs to emulate conversational practice.

3.11   *Heavy workload*

A heavier workload occurs for both teachers and students. Students [41] and teachers [84] have more messages to read and digest than in the FTF learning environment because of the equality of on-line participation. In an on-line community, all users share equal opportunities to express their thoughts in the discussion. Multiple messages are allowed to occur simultaneously in on-line communication unlike traditional FTF communication. A significant amount of messages creates a heavier reading load for on-line users. Students who are unable to follow the discussion may simply give up the discussion or will skip many of the discussion messages [119]. The process of moderating class conferences and daily individual interactions with students through e-mail is very time consuming and imposes a greater burden than FTF lecturing, particularly for the first timer or a new faculty member [66]. The information overload [24] and the time demands [132] can have negative impact on the level of interaction.

4.   Conclusion

Computer-mediated communication can enhance and inhibit interactions in distance education and communication. In the early studies, only the attributes of CMC interaction are considered. In this study, it was found that user's perceptions on the CMC are associated critical factors influencing the level of interaction, such as public/private sense, communication style, flaming message, individuality, and facing saving, etc. CMC is an optimal communication pathway. CMC was proposed to replace FTF communication. However, this is not the only issue for examination because CMC can inhibit as well as enhance interaction. CMC is not a perfect solution to replace FTF. FTF does have value for human communication. From this comprehensive study, it is concluded that CMC has the capacity to deliver messages through separate channels, which is not available in FTF setting. For example, in a computer conferencing system, one must choose the appropriate communication media to deliver the message, such as asynchronous,

synchronous, one-to-one, or one-to-many. However, in the FTF setting this choice is not available. Manipulation of the communication preference occurs with ease through CMC. ESL students have a choice to select an asynchronous means to communicate with others because this channel provides opportunities for composition and editing of messages and thus promote a better image. Online users are able to manipulate their images easily. Therefore, CMC environments provide better opportunities for online users to select an optimal or an ideal channel of communication. The issue is not to replace FTF; it is the presence of a more flexible communication avenue as an instructional tool.

To foster a better environment for students to interact, an appropriate instruction design is required that will consider the characteristics of CMC, and the users' perception of the medium. Integrating CMC into classrooms requires an understanding of the relationship between CMC, the learners, and the instructors. Increasing all four types of interactions necessitates a thorough understanding of the strengths and weaknesses of each CMC system and the users (students and teachers) to integrate CMC technology into a virtual classroom.

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