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Computer-Mediated Learning Environments: Theory and Research Into Practice

Chris R. Rasch
Bradley University

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In their seminal book in entitled *The Network Nation: Human Communication Via Computer* (1978), Hiltz and Turoff accurately predicted that by the mid-1990s computer-mediated communication (CMC) would emerge as a medium capable of transforming individual and social behavior. Without question computer-mediated learning is beginning to emerge as an alternative teaching architecture (Berge & Collins, 1995; Coombs, 1993; D'Souza, 1992; Hiltz, 1994; Kuehn, 1994; McComb, 1994; Metz, 1993; Philips & Santoro, 1989). Harnessing the resources of this medium and enhancing our own level of computer literacy depends, in part, on understanding insights from current theory and research and their implications for guiding computer-mediated instruction. The purposes of this article are to: (1) review theory and research illuminating the potential benefits and costs of computer-mediated instruction; (2) suggest some starting points for implementing computer-mediated instruction; and 3) identify factors which are likely to influence the effectiveness of teaching in computer-mediated environments. Currently, the use of CMC in instructional contexts takes four primary forms: the use of electronic messaging (E-mail), infomatics, asynchronous conferencing, and synchronous conferencing. The integration of these forms results in the possibility of creating the "virtual classroom" (Hiltz, 1994).

COMMUNICATION TOOLS FOR THE VIRTUAL CLASSROOM

Electronic Messaging

Electronic messaging (E-mail) is perhaps the most accessible and utilized form of computer-mediated communication. Research suggests that electronic messaging is being utilized as an instructional tool for: (1) transmitting course resources (e.g., syllabi, bibliographies); (2) the submission and evaluation of students' written work; (3) for course management (e.g., reporting absences, clarification of assignments; 4) structuring interaction and cooperation among students working on small group projects; and (5) facilitating distance-learning enabling students to gain cross-cultural knowledge and experience (Bailey & Cotlar, 1994; McComb, 1994; Philips & Santoro, 1994).

Informatics

Informatics refers to access to remote learning resources such as on-line course lectures, Internet resources, simulations, and data-bases. The primary vehicle for increasing access to information and delivering resources to learners efficiently is establishing a presence on the World Wide Web. The development of a basic course web page is perhaps the first step in the process of implementing computer-mediated instruction. A basic course web page creates and might include representative models of required course assignments, a list of frequently asked questions, and deeper insights into the process of message construction which extends beyond the space limitations of our basic textbooks. Although creating a presence on the web is a time-intensive process, there are a number of excellent points of departure for utilizing the web

as an instructional resource (Delivering Instruction on the World Wide Web) and web pages for particular course (Plawson & Sypher, 1996; *Rhetorical Resources,* 1996).

Asynchronous and Synchronous Conferencing

Asynchronous conferencing provides access to shared files and creates the possibility for students to write, read, and respond to common information (Archee, 1993; Bump, 1990; Kuehn, 1993). Although asynchronous conferencing has a range of instructional applications (Berge & Collins, 1995), the most accessible for instructors may be collaborative tools such as Hypernews which is discussed below. Synchronous conferencing occurs when users log-on to their computers simultaneously and send and receive messages in "real time" (e.g. IRC (Internet Relay Chat), GDSS (Group Decision Support Systems) (Jessup & Valacich, 1993; McGrath & Hollingshead, 1994).

WHY COMPUTER-MEDIATED COMMUNICATION?

There are a number of reasons to begin harnessing the resources of computer-mediated communication in our basic course.

At the program level, utilizing computer-mediated instruction may assist in the process of developing students level of information literacy and increase coordination and integration. At the classroom level, implementing computer-mediated instruction may enhance instructional effectiveness by creating increased opportunities for collaboration, fostering engagement, and enhancing the chances of skill development.

Information Literacy

Shapiro and Hughes (1996) suggest that information literacy involves acquiring knowledge and skill in a number of different domains including: (1) resource literacy — ability access network information resources; (2) tool literacy — the ability to understand the use of computer applications that are relevant to the areas of work and professional life a student expects to inhabit; 3) publishing literacy — the ability to publish research and ideas electronically, including use of the various forms of computer-mediated communication; and 4) critical literacy — the ability to evaluate critically the potential strengths and limitations of information technologies. Because the basic course is the first course in communication, often both for majors and non-majors, it furnishes an appropriate vehicle for beginning to enhance students level of information literacy.

Coordination

A continuous challenge in the supervision of the multi-section basic course is balancing the competing goals of instructor autonomy and achieving consistent instruction and coordination across sections. CMC can be most usefully viewed as a coordination tool which enables people to find diverse ways to coordinate their work. The creation of course web pages and the construction of asynchronous learning environments may have considerable potential for helping to furnish students with increased opportunities for collaboration with other students, and create the possibility for a more integrated and consistent program of instruction (see Sloan Center for Asynchronous Learning).

Instructional Effectiveness

Although we are still in the "horseless carriage stage" in terms of understanding the relationship between computer-mediation and learning, there is emerging research suggesting that computer-mediation may increase studentteacher contact, enhance the quality of the teacher-student relationship, foster engagement, and enhance the chances of student skill development.

CMC as a tool for increasing student-teacher contact. There is considerable case study research suggesting that CMC liberates the student from the constraints of time and distance and in doing so increases access and contact with the instructor. For example, Hartman, et. al. (1995) compared interaction in writing classes that had access to networked communication tools with interaction in classes using traditional modes of communication. They found the use of CMC to support collaborative learning and writing did not replace traditional forms of communication with teachers, but increased the total amount of teacher-student communication about writing. Ory, Bullock, and Burnaska (1995), in a post-course survey of 1,118 students enrolled in 19 different courses utilizing asynchronous learning, found that 41% of the students reported an increase in communication with the instructor and 43% reported an in the quality of their interaction with instructors. It appears that CMC can furnish convenient access to teaching-learning resources, and for a certain percentage of students may increase teacher-student contact. Hiltz (1994) argues that increased teacher-student contact is the single most important factor in creating a collaborative teaching and learning environment.

CMC as a tool for relationship management. CMC may create a instructional context which facilitates increased affiliation, affinity, mutual sharing of power and control, and

reduced social distance. It has been suggested that computer-conferencing in organizations may create greater equality of participation, less dominance, and greater status equality in comparison to face-to-face group discussions (Jessup & Valacich, 1993; McGrath & Hollingshead, 1994). The creation of more egalitarian spaces for communication may increase motivation to communicate, stimulate desire for affiliation, and enhance the quality of the teacher-student relationship (Dubrovsky, Kielser, & Sethna, 1991; Metz, 1993). Frymier (1994) found that the affinity-seeking strategies most predictive of liking in the classroom were: (a) assume equality (teacher presents self as equal and does not appear superior); (b) facilitate enjoyment (develop a learning environment which is enjoyable and interesting); (c) elicit other's disclosure (teacher inquires about student's interests and opinions); and (d) provides positive reinforcement. In a qualitative case study of the uses and functions of electronic mail in teaching the basic course, Kasch (1995) argues that computer-mediation may increase the opportunity for instructors to construct messages which offer and elicit increased levels of self-disclosure and enhance student self-esteem in ways that may not always be possible in the conventional classroom. The time pressure to transmit both knowledge and develop skill in our basic courses and the increasing class size often restrict the time instructors can devote to encounters where the primary interactional goal is relationship development and self-esteem enhancement. The development of a positive student-teacher relationship increases the likelihood of cognitive and affective learning (Richmond, 1990).

CMC as a tool for fostering engagement. Sprague (1993) argues that teaching works best when students are fully engaged in the class, engaged with each other, and deeply engaged in the subject matter. It may be that the creation of a computer-mediated learning environment fosters engagement by: (1) enhancing learner's level of active

involvement; (2) increasing the level of participation by freeing the student from the constraints on communication present in face-to-face encounters in the classroom; and (3) fostering collaboration between students. Research suggests that the creation of computer-mediated learning environments can facilitate discussion and active involvement of students in the subject (Hiltz, 1986; Hiltz, 1990; McComb, 1994). Time is always a precious resource in introductory communication courses which have both a knowledge and a skill component. The time necessary for skill development, individualized instruction, or in-depth discussion (particularly in the hybrid course) is necessarily limited.

Asynchronous conferencing may enable an instructor to simulate and extend classroom discussion of concepts, focus more attention on the process of skill development, and create simulations which enable students to apply concepts and principles. For example, Hypernews is a web-based collaboration fosters asynchronous discussion. Hypernews is designed for users to post messages to a computer-mediated bulletin board on issues and themes relevant to the course. These messages then furnish the basis for creating discussion "threads" which can subsequently be extended and elaborated on by other users. These messages can be edited, categorized, and tracked by the instructors who function as the moderators of the list. Hiltz (1994) argues that computer-mediated learning environments are well suited to fostering collaboration by facilitating group work in which the entire class works together to master the subject matter and teach it to one another.

Enhance equality of participation. Various factors may lead to classroom discussions which favor certain learners over others. Teacher-led discussions often limit students' participation, focus student attention on the teacher's agenda, and thus, do not promote active involvement or question-asking (Daly, Kreiser, & Rogharr, 1994;

Smagorinsky & Fry, 1993). Unless teachers are maximally competent discussion leaders and are adept at involving shy, reticent, or unmotivated students, discussion can often be dominated by the most vocal members. The creation of computer-mediated learning environments may facilitate interaction involvement and heighten participation (D'Souza, 1992; Dubrovsky, Kiesler, & Sethna, 1991; McComb, 1993; Phillips & Santoro, 1989).

Enhanced chances for skill development. With the emergence of a new medium of communication, it is important to ask how the use of CMC can contribute to a course whose primary aim is to enhance skill in oral communication? It is possible that the increased collaboration between teachers and students afforded by computer-mediated contact may be particularly useful in enhancing skill in message construction. The important influence of new technology may not be that it allows us to disseminate information more efficiently, but rather that it allows students and teachers to collaborate more closely in the process of message construction. Consider the text from a teacher-student exchange via electronic mail aimed at enhancing the learner's ability to organize and structure messages:

STUDENT E-MAIL AND INSTRUCTORS RESPONSE

Dear Chris; I hope you have had a good Tuesday so far. This is my preliminary outline of my first main point.

General Purpose: When I am done speaking I want my audience to know the signs of low self-esteem and how one can use communication to enhance or improve another person's self-esteem.

I. What are the signs of low self esteem?

I would like to begin by showing pictures of three different people and giving a short description of them.

1. Jamie — a female, hunched over, glasses, no friends
2. Holly — cheerleader, boyfriend, Homecoming Court
3. Scott — wants to be a dentist. smart, popular, football

I will ask the audience to vote for the ones that have a low self-esteem.

I will try to dramatize that one's self-esteem is independent of surface level feature.

INSTRUCTOR RESPONSE
Tell me what you going to say, not what your going to do. How is the audience supposed to infer a person's self-esteem only by looking at their picture? What idea or concept are the photos going to be used to develop or dramatize? Might have the audience what their impressions are and use this as a bridge to the signs of low self-esteem. Might move this "chunk" back to your introduction.

A. Physical Signs
   1. Posture — Have everyone stand up and check own poster — one person walk across room
   2. Dress — Statistic — women who wear make-up higher esteem
   3. Eye Contact Audience Partner — stare game

INSTRUCTOR RESPONSE
Can you make your answers a tad more concrete? For example, what kind of posture, what kind of dress what kind of eye contact? Is staring a sign of high or low self esteem? Message construction is a process of asking and answering questions. Try to provide as concrete as answers as possible to the questions you pose i.e. what are the physical signs of low self-esteem?

B. Social Signs — take it to streets — Holly story
   1. Leader or Follower? Do you stand for your own beliefs?
      A. leader/followers
      B. personality in group setting

INSTRUCTOR RESPONSE
Can you make you answers a tad more concrete at the subpoint level? For example, what social behaviors are typical of low self-esteem? I see what you are getting at, but do you see that, when you ask What are the social behaviors which typify low self-esteem and you answer leader/follower, this is not really as concrete as answer as it needs to be to build message structure...what concretely are you trying to say?

   2 Personality in Group Settings- try to be someone you are not? Ask how many went out drinking on weekend to try to enhance or create a different personality
   3. What social activities make a person happy?

C. Emotional Signs
   Tell story about Scott
   Quote: *"Happiness is inward and not outward, and therefore does not depend on what we have, but on who we are,"* — Henry Vandyke
   1. Lack of Confidence — how much critical attention you give yourself
   2. Lack of Happiness (Depression) — feel like sleeping a lot, withdraw from social settings,
   3. Lack of Energy — I know this is a stretch — I'll

INSTRUCTOR RESPONSE

OK you pose the questions what are the emotional signs of low self-esteem or what emotional states may be typical of a person with low self esteem?

A. lack of confidence and critical attention to yourself are not really the same thing, what are you trying to say?
B. depression (good concrete answer here) Some theories of depressions suggest that low self-esteem can be a contributing factor....might take a look at a couple of outlines on the course web site for additional insights.

Can you connect this "stuff " a little closer to a college aged audience? Have you ever been depressed? What caused college students to be down or depressed? How does one feel about oneself when on is depressed?

This structure looks potentially workable, but also consider that low self-esteem may be manifested and hence spotted by looking for changes or signs in their communication behavior e.g. less talk/social withdrawal, negative self-talk. When your building message structure try to keep the question and answer structure tight. For example, when you use a general organizing scheme like physical, social and emotional than, for example:

What are the signs of low self-esteem?

A.
B. Social
   What are the social-behavioral consequences when one's self-esteem is damaged or under assault?
   1) social withdrawal
   2) negative self talk

That's all for now. Your suggestions are always helpful, thank you for taking the time to really read and respond — I appreciate it. Have a nice night. See you on Thursday! *Laura E.*

Although it might be argued that our task in the basic course is to teach speaking not writing, composition is a large part of oral proficiency, indeed three of the canons of rhetoric are focused on compositional issues. It may be that electronic messaging can facilitate message construction skill, particularly the ability to organize messages and understand the interrelationship between ideas. Having collected over 3,000 E-mail to and from students, it has been my experience that the use of electronic messaging to evaluate student work increases the volume of instructor feedback, the immediacy of feedback, and the level of collaboration.

POTENTIAL CONSTRAINTS ON COMPUTER-MEDIATED LEARNING

Just as individuals who have positive experiences with computer-based technical innovation in organizations often function as "cheerleaders" (Schmitz & Fulk, 1991), perhaps it is not surprising the discussion of CMC in instructional contexts has been rather optimistic. It is suggested that CMC can create a learning environment which: (a) makes possible a "round-the-clock learning community" (Hiltz, 1994); (b) creates a "community of scholars among students" (Selfe & Eilola, 1988); (c) liberates the disenfranchised less able students in a class by increasing the level of teacher and peer attention thus, enabling them to become more active participants (Hartman, Neuwirth, & Kiesler et. al. 1995; and (d) will even likely result in higher ratings in selected areas of one's teaching evaluations (Ellsworth, 1995). Listening only to voices of expectation and anticipation may be unwise if we are to enhance our own level of "critical literacy'" regarding computer-mediated learning (Hawisher & Selfe, 1991).

Loss of Social Presence/Immediacy

CMC may create learning environments which lack social presence and immediacy. Social presence refers to the extent to which communication exchanges are sociable, warm, personal, sensitive, and active (Short, Williams, & Christie, 1976). Concern is often expressed about the de-personalizing effects of CMC due to the lack of social context and nonverbal communication (Sproull & Riesler, 1991). Immediacy has been defined as the degree of perceived physical or psychological closeness between people (Mehrabian, 1967). CMC may lack the richness of face-to-face communication and create psychological distance, hence it might be expected that some students may resist computer-mediated instruction, perceiving it to be impersonal and lacking immediacy. Research suggests that immediacy, motivation, and learning are interrelated (Christophel, 1990; Christophel & Gorham, 1995). Should we move toward the creation of learning environments in which factors thought to be connected to motivation and learning might be less likely to operate?

Computer-Mediated Learning Environments as Comfort Zones?

It is often argued that the creation of computer-mediated learning environments can increase interaction involvement by liberating students from the fear or inhibition of talking to instructors or participating in class (D'Souza, 1992; McComb, 1993; Philips & Santoro, 1989). For example, in a qualitative study of students' impression of computer-mediated instruction, Kasch (1995) found that a number of students believed that the context created by CMC created a comfort zone for discussion (e g. "when one uses electronic messaging there is less fear of being evaluated by other students in the class"; "I

think it is easier to talk to an instructor over e-mail because it takes away the fear or anxiety I may have when talking directly to him or her."). It may be that for many students "interpersonal transactions via computer-mediated channels cost less" (Ellsworth, 1995). The creation of computer-mediated learning environments may create more egalitarian communication environments which liberate muted voices. However, if our primary mission in the basic course is to enhance skill in face-to-face communication, is the creation of computer-mediated "comfort zones" likely to lead toward or away from this goal?

Constraints on Participation

Although computer-mediated instruction has the potential to support an active learning process beyond the walls of the classroom (Berge & Collins 1995; Nalley, 1995), there may be factors peculiar to computer-mediated learning environments which may constrain involvement and participation. In computer-mediated environments the loss of social context cues may make the politeness norms governing talk less visible, leading to violation of appropriateness rules and "flaming" (Spears & Lea, 1992). For example, Berge and Collins (1995) have suggested that in computer-mediated environments, the non-reticent personality may be encouraged to become overly zealous in their responses, or to become publicly inflammatory and aggressive on a personal level in ways that generally do not occur in other media. Interjecting messages in asynchronous conferences may also involve risk for some students and create apprehension. Participating in electronic conferences fosters a need for response, and for one's contribution to the discussion to be ignored is to be rejected (Feenberg, 1987). It is certainly possible that "flaming" and fear of rejection may be potential

threats to self-esteem which may decrease participation in computer-mediated environments.

Marginalization

It may be that computer-mediated learning environments create a more egalitarian space for instructional communication. For example, Hartman, *et al* (1995) have suggested that because less able students are often the most disenfranchised members of the classroom, a technology which redistributes teacher and student attention so that less able students can become more active participants may have a significant impact on learning outcomes. However, Hiltz (1994) suggests that the "virtual classroom" is a self-activated mode of learning in which the minimum level of motivation and academic skill required to be a successful student is higher than the minimum level needed to get by in a traditional classroom. Should we create computer-mediated learning environments in order to motivate the uninvolved and less able student by employing a technology which may require a higher level of motivation and academic ability to begin with?

STRATEGIES FOR IMPLEMENTING COMPUTER-MEDIATED INSTRUCTION

Current research suggests that the degree to which the promises of computer-mediated learning are realized is contingent on the interaction of a number of variables and processes (e g., technology, nature of the course, access, and student characteristics) (Hiltz, 1994).

TECHNOLOGY

Access

Access is always an issue which needs to be considered in conceptualizing the goals of a course utilizing computer-mediated instruction. For example, Hiltz (1994) reports that 13% of students enrolled in an asynchronous learning network indicated that access to a personal computer is a serious problem, and 40-50% experience serious problems with access to the university modem pool. Wide variation in the degree to which students have access to technology may significantly privilege certain learners over others and constrain computer-mediated instruction.

Utilizing Tools Designed to Foster Collaboration

Research generally suggests that the perceived effectiveness of computer-mediated instruction depends on the instructors ability to harness the resources of the medium in ways which create shared spaces for communication. The use of electronic mail is a necessary but probably not sufficient condition for fostering the goals of collaborative learning (Shedletsky, 1993a, 1993b). The promise of computer-mediated instruction is less likely to be realized unless technology which is explicitly designed to foster engagement and collaboration is adopted. Useful starting points for beginning the process of constructing computer-mediated environments are *The Virtual Classroom* (Hiltz, 1994) and *Learning Networks* (Harasim, Hiltz, Teles, & Turoff 1995); and on the Internet (Ball, 1996; Schank, 1996; the Sloan Center for Asynchronous Learning; and the Basic Course Home Page).

NATURE OF COURSE AND COURSE MANAGEMENT

Anticipatory Learning

Students involved in asynchronous learning environments often express a desire for more or better training (Ory, Bullock, & Burnaska, 1995). Research in organizational contexts suggests that the two factors which influence the use and perceived usefulness of CMC systems are experience with computer-mediated communication and social influence (influence of peers and supervisors) (Hunter & Allen, 1992; Schmitz & Fulk, 1991). Given that students will have different levels of experience, classroom time normally needs to be allocated to enhance learner's level of "tool literacy."

We Can Build It, But Will They Come?

Technologies are not easy to impose on people, and students may resist learning in computer-mediated learning environments. Resistance is likely to increase if instructors are not perceived to be highly enthusiastic about the instructional innovation and if the innovation is not deeply integrated into the course (Ory, Bullock, & Bunaska, 1995). It is important to weave CMC deeply into the fabric of the course (Bailey & Cotlar, 1994; Norton, 1992). For example, Shedletshy (1993a) found that, without structure, the use of electronic mail to create a shared discourse space results in talk which is primarily social rather than intellectual and collaborative. Hiltz (1994) agrees that learning outcomes in the "virtual classroom" will depend on willingness of teachers and students to take advantage of its potential to support an active learning process that incorporates extensive interaction among students and between instructor and students). In

organizational contexts, the adoption of computer-mediated communication has been found to be a function of the degree to which high status people utilized the medium, evaluation feedback (e.g., rewarding electronic contributions) and establishing routines and expectations so that computer-mediated interaction becomes normative behavior (Sproull & Kiesler, 1991). Unless courses are structured in ways which encourage students to harness the resources of the medium, the potential benefits of computer-mediated instruction are less likely to be realized.

Instructor attitude and ability are also likely to be important in realizing the potential benefits of computer-mediated instruction. For example, given the loss of social presence when interacting in most computer-mediated environments, instructors may want to think about ways in which to maximize verbal immediacy in their computer-mediated interactions with students (e.g., managing topical intimacy, employing less formal forms of address, increasing use of first person plural, and so forth) to substitute or even overcompensate for the loss of the nonverbal context (Walther, 1992; 1996).

The most important effect of technology may not be to let people do old things more efficiently but to allow people to do things that were not even feasible or possible with the old technology (Sproull & Kielser, 1991). For example, Riel (1993) suggests computer networking can be used creatively as a tool for global education designed to promote multi-cultural sensitivity through the creation of learning circles. However, the "medium is not necessarily the message", and realizing the promise of computer-mediated instruction will ultimately depend on the creativity of the teacher and the context for learning created by the interaction between teacher and student.

Will the creation of computer-mediated learning environments liberate the voices of students who would otherwise be silent, break down the walls of the classroom and promote

"round-the-clock" learning, and give students responsibility for the management of learning? It is not yet clear the degree to which these promises will or can be realized through computer-mediated instruction. What is clear is that information technology will furnish modes of accessing and manipulating knowledge which are radically different from those offered by the traditional curriculum. Teaching effectiveness in the basic course is likely to depend increasingly on understanding the nature, function, benefits and potential costs of computer-mediated communication.

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