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## COMPUTER-MEDIATED COMMUNICATION

This essay provides an overview of computer-mediated communication (CMC), defined here as multimodal, often (but not exclusively) Internet-mediated communication. Globally, the Internet has qualitatively transformed the activities of everyday communication in professional, educational, and interpersonal realms (Castells, 2004). While Internet access remains unequally distributed across social classes and geopolitical regions (see van Dijk, 2005), user populations continue to expand around the world as life becomes increasingly mediated by ubiquitous computing. After a brief description of the development of the Internet and early CMC communication research, attention is given to CMC language educational issues and contexts of use. As research on the use of synchronous CMC tools (real-time chat style communication) forms a significant strand of second language (L2) education research, this literature receives considerable attention. Subsequently, the growing research literature on Internet-mediated intercultural communication is reviewed, followed by a discussion of emerging technologies that includes blogs, wikis, podcasting, and gaming environments.

### EARLY DEVELOPMENTS

#### *Global Context*

Computer-mediated communication begins with the Internet, but also emerges from a long line of mediated communication technologies such as the printing press, the telegraph, radio, the telephone, and television. The Soviet launch of Sputnik catalyzed the idea of building a global network for information sharing. Under the auspices of the Advanced Research Projects Agency, the first group of networked computers, called ARPANET, was developed and functional by 1969. ARPANET utilized a novel technology infrastructure that separated holistic information into “packets” that could be addressed separately and sent along potentially independent routes. Designed at the height of the cold war, this was a system engineered to function even when component parts were disabled. The initial ARPANET purposes were to share computing power, enable collaborative research projects, and provide remote access to distant computers. In addition to mediating scientific, military, and professional activity, however, ARPANET

rapidly evolved as a social technology that included interpersonal email communication and precipitated large-scale email listservs, the first of which, foreshadowing the evolution of the Internet as a general purpose and educationally relevant communication tool, was devoted to the discussion of science fiction literature.

Through the 1970s into the early 1990s, Internet users were predominantly members of academic, scientific, and computer science communities. The primary communication tool was email, though the synchronous tool Unix *TALK* was also popular. A wave of widespread Internet adoption extended from the early 1990s up through the late 1990s as university-supported email accounts were made available for faculty and students, many K-12 institutions became networked, and private sector Internet Service Providers offered connectivity to general population consumers. It was during this period that North American language educators in particular began using CMC in significant numbers. Globally, Internet access increased rapidly, particularly in northern Europe. Primary communication tools included email and Internet Relay Chat. MUDs and MOOs (text-based virtual environments, often used for role-playing and theme-based socializing), *ICQ*, and a variety of Instant Messaging tools (enabling real-time text and video chat) became popular among more sophisticated users, but email remained the dominant market share tool for everyday social, educational, professional, and commercial purposes. In the current era, and especially for people born after the mid-1980s, email is no longer the primary digital conduit for everyday social, school, and work interaction. Newer tools, particularly instant messaging, have become dominant for social and age-peer interaction. Additionally, text messaging over cell phones, coupled with an escalating reliance on Internet communication tools for social and professional purposes, has resulted in the emergence of ubiquitous computing, the expectation of being able to remain in perpetual contact over a suite of wired and wireless communication devices.

As of December 31st, 2005, there are estimated to be over 1 billion Internet users globally. Among world regions, North America has the greatest percentage of Internet penetration (68.1% of total population), followed by Oceania/Australia (52.9%) and Europe (35.9%). The greatest absolute number of Internet users currently reside in Asia (364,270,713) (from Internet Use Stats, [www.internetworldstats.com/stats.htm](http://www.internetworldstats.com/stats.htm)). Against this backdrop of global Internet growth, to paraphrase Internet pioneer Tim Berners-Lee, the Internet is less a technological fact than a social fact. Noting that the majority of Internet use is linguistic in nature, Crystal is likely correct that “we are on the brink of the biggest language revolution ever” (2001, p. 241).

*Linguistic and Communication Theory CMC Research*

An early pioneer in linguistic analysis of CMC, Herring has authored research and edited volumes examining how CMC affects language use, message structure, and interactional dynamics (e.g. 1996). These issues have been at the forefront of linguistic, communication, and education research focused on CMC. Communication theorists and experimental researchers have analyzed CMC since the early 1980s. An early line of CMC research described the medium as inadequate for many task-related needs (Daft and Lengel, 1984) and ineffective for interpersonal exchanges due to the limited social information available within text-only environments, a framework described as the “reduced cues perspective” (see Parks and Floyd, 1996). This view has been reassessed in current research. Spears and Lea (1994), for example, note that while interpersonal cues are reduced in text-only communication, the cues that remain or are inferred can be highly important. Based on principals of social cognition and interpersonal relationship development, Walther (1996) argues that CMC relationships can be as, and in some cases more deeply relational, than those that occur face-to-face settings. Walther’s central claim is that in comparison to face-to-face communication, CMC interaction is not different in kind, but typically involves a slower rate of social information exchange. In cases of what Walther terms hyperpersonal interaction, the limited information available in interactive textual communication may precipitate cycles of selective self-presentation and over-attribution of idealized perceptions. This analysis helps to explain the quick intimacy and interpersonal intensity reported by many Internet users. In contrast to the reduced cues perspective, Walther’s research suggests that CMC is a viable medium for educational, interpersonal, and informational functions.

MAJOR CONTRIBUTIONS

*Synchronous CMC in IntraClass Second Language Education*

From the early through mid 1990s, the use of synchronous CMC (SCMC), commonly referred to as *chat*, formed the basis for a number of second language acquisition (SLA) studies. This research produced anecdotal and empirical evidence suggesting a number of pedagogical benefits from CMC use (Kelm, 1992). The research of Kern (1995) and Chun (1994) are widely regarded as some of the most influential from this early period. Kern (1995) quantitatively assessed the impression that foreign language students produce more language output in SCMC environments than they do in large group face-to-face classroom settings. Using a quasiexperimental methodology, Kern analyzed

a 50-min second-semester French foreign language SCMC session and compared it to an oral discussion by the same language students on the same topic. The SCMC treatment produced between two and three times more turns per student and a higher total number of sentences and words compared to the large-group oral discussion (see also Abrams, 2003). Kern also examined the linguistic quality of the discussions and found that students' SCMC language output was more sophisticated in terms of the range of morphosyntactic features and variety of discourse functions expressed (1995, p. 470). These findings are supported by Chun's (1994) study of fourth-semester German students. Her research suggested that SCMC use promoted increased morphological complexity and a greater ratio of complex sentences in written coursework over the course of one semester. More recent research has also suggested that SCMC language use is more accurate than that of face-to-face interaction (Salaberry, 2000). While Kern and Chun's research on L2 uses of large-group SCMC are seminal studies, Ortega (1997) has noted limitations to comparisons of computer-mediated classroom and whole-class oral discussions. Her critique is that the variables of group size and communicative task were not accounted for in early SCMC research (e.g. Beauvois, 1992; Chun, 1994; Kelm, 1992; Kern, 1995), an observation that has encouraged closer attention to pedagogical and group size variables.

A number of studies have adopted the interactionist SLA model designed for analysis of negotiation of meaning in oral interaction (e.g. Varonis and Gass, 1985) and applied it to CMC learner data and task configurations. Pellettieri's (2000) research on Spanish L2 learners found that dyadic groupings promoted an increase in corrective feedback and negotiation at all levels of discourse, a condition that prompted learners to produce form-focused modifications to their turns. Additionally, task type, specifically goal-oriented closed tasks, was positively correlated to the quantity and type of negotiations produced. In a similar study from the same period, Blake (2000) assessed the SCMC interactions of 50 intermediate learners of Spanish. Participants were arranged in dyads and asked to carry out three task types: decision-making, information gap, and jigsaw. Like Pellettieri, Blake found that jigsaw tasks produced the greatest number of negotiations, but nearly all negotiations were lexical in focus, with very few addressing problems in syntax or larger units of discourse. Building on this earlier research, Smith (2003) confirmed that task type affected the extent to which learners' engaged in negotiation, but also expanded the Varonis and Gass (1985) four-part model of face-to-face negotiated interaction—(i) trigger > (ii) indicator > (iii) response > (iv) optional reaction to response—by explicitly incorporating two additional phases to represent delayed reactions to response turns that are so frequent in

SCMC discourse. Smith terms these *confirmation* and *reconfirmation* phases, elements that explicitly conclude a given negotiation routine and which act as discourse markers suggesting the possibility of resuming nonnegotiation interaction (2003). Smith's expansion of the interactionist model provides a medium specific and more powerful analytic framework for research on computer-mediated negotiated interaction.

Although much of the research from the 1990s focused on comparing SCMC and face-to-face instructional treatments, a growing number of L2 SCMC investigations explore cross-modality transfer between spontaneous SCMC and oral L2 language production (e.g. Abrams, 2003). Payne and Whitney (2002) applied psycholinguistic models of language production and working memory to cross-modality transfer and found a significant difference in the oral proficiency gains between experimental (+SCMC) and control (-SCMC) groups. In a follow-up study, Payne and Ross (2005) augmented this psycholinguistic approach with discourse and corpus analytic techniques to explore how individual differences in working memory capacity may affect language use in SCMC. A principal finding was that learners testing at lower levels of measured phonological working memory were able to use the scrolling on-screen messages from other students as they generated their own contributions. Payne and Ross hypothesize that SCMC creates a "bootstrapping effect" that reduces the cognitive demand of L2 language production and may enable students with measured low-span working memory to produce more complex language than would otherwise be the case. New possibilities in cross-modality research include emerging CMC tools that support bimodal chat (i.e. a combination of both text and voice communication) that may prove promising as an environment that supports a variety of learning styles and cognitive attributes.

#### *Internet-Mediated Intercultural L2 Education*

With greater Internet access across more of the world, there has been the suggestion that Internet-mediated intercultural communication constitutes a "second wave" of L2 pedagogy (Kern et al., 2004, p. 243). Internet-mediated intercultural L2 education involves interaction between learners interested in one another's expert language. This approach extends the context of language learning from the local classroom to intercommunity and international interaction and emphasizes the acquisition of discrete linguistic accuracy, but in the service of developing intercultural communicative competence (see Belz and Thorne, 2006).

There exist numerous models of Internet-mediated intercultural L2 education (for a review, see Thorne, 2006). One approach, termed

telecollaboration (Belz, 2003; Warschauer, 1996), describes international class-to-class partnerships within institutionalized settings. Telecollaboration practitioners tend to formally align their courses and often utilize parallel texts (e.g. translations of written material and remakes of films) to structure dialogue, form the basis of cross-cultural analyses, and encourage critical reflection on language-culture relations. Telecollaboration models are administratively intensive to initiate and maintain due to the high level of coordination between partner classes (e.g. Belz and Müller-Hartmann, 2003). However, class-to-class partnerships arguably provide the strongest support for developing sophisticated understandings of intercultural communication through careful design of student-initiated investigations and the explicitly designated role of the instructor as critical mediator and resource. A variant of the telecollaboration model involves connecting language students with heritage speakers on the same campus, a format that Blake and Zyzik's (2003) research indicates to hold significant promise. While many institutions and regions include populations possessing heterogeneous linguistic and cultural backgrounds, intracommunity linguistic resources remain largely untapped in instructed L2 education. Tandem learning, used extensively in Europe, involves the pairing of individuals in complementary dyads where each is interested in learning the other's language (Kötter, 2002; O'Rourke, 2005). Tandem learning is most associated with noninstitutional learning configurations and typically requires partners to negotiate discussion topics and the balance between overt pedagogical and conversational activity. A final approach to L2 education that utilizes the Internet to access expert speakers is to encourage learners to participate in established and noneducationally oriented Internet communities, such as discussion fora associated with newspapers such as *Le Monde* (Hanna and de Nooy, 2003).

#### WORK IN PROGRESS

##### *Wikis, Blogs, Podcasting, and Gaming*

Blogs and wikis are considered second-generation web applications and represent relatively modest technological advancements over their static webpage predecessor (for a review of these technologies, see Thorne and Payne, 2005). Wiki (from the Hawai'ian *wiki wiki* meaning "quick") describes a web-based environment that supports collaborative writing. The "WikiWiki concept" was invented by Ward Cunningham in 1995 with a project called the Portland Pattern Repository, a computer programming site. Wikis are intensely collaborative and allow multiple users to edit content and contribute to the writing process. The radical dimension to wiki use is its challenge of the notion

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of authorship. In the archetypal wiki, there is no distinction between “author” and “audience” per se since readers of a wiki page can spontaneously opt to become a collaborating author. Individual wiki pages can be password limited to one or a group of users using an access control list, but wiki technology is premised on the idea of universal write/access. Within the context of group and educational uses, wikis obviate the need to laboriously merge individual contributions in order to avoid deleting one another’s work. Most wiki engines track each addition, deletion, and modification so that changes can be assessed against earlier versions of the text. Furthermore, determining the amount of individual participation in a group project for assessment purposes need not rely exclusively on self- and peer-assessments by group members or observational hunches by the teacher. Like an archaeological tell, a wiki’s current content is but the top layer of temporally stratified laminations of text that record the history of the writing process (Thorne and Payne, 2005).

Blogs and blogging are terms describing use of a web application that displays serial entries with date and time stamps. Most blogs include a comments feature that allows visitors to post responses. In its short history—the first use of the term blog (from “web log”) is variably reported to have occurred in either 1996 or 1997 and blogging as a populist movement dates only from the turn of the millennium—the rise of blogging as a form of communicative and informational expression has been mercurial. To take one example, LiveJournal (<http://livejournal.com>) reports over 7 million blogs created, approximately 5 million of which have been updated at least once. LiveJournal reports that female-presenting bloggers outnumber users presenting as males by approximately two to one (67.3% vs. 32.7%, respectively). The ages of LiveJournal users span from 13 (35,856 blogs created by this age group) to 55 (1,229). The 15–20-year age group produces the majority of the blogs on this site which suggests that the everyday digital literacy practices of current high school and college students differ significantly from those of earlier generations. Within L2 education contexts, blogging provides an alternative to writing assignments that would normally be presented only to the instructor. The chronological ordering of blog entries creates for each student an archive of their personal work that they can revisit and reflect upon. In addition to its intraclass use as a journaling tool, blogging is also being used to link together study abroad students and those still at their home universities. While still in the exploratory phase, such uses of blogs serve a number of functions, such as providing predeparture cultural exposure for students still at their home university, helping students currently abroad to synthesize and put into narrative form their cultural and linguistic experiences, and for creating predeparture orientation materials that

represent student specific experiences and points of view. It should be noted that in addition to blogs, a large number of additional mediated social networks exist, such as facebook ([www.facebook.com](http://www.facebook.com)), myspace ([www.myspace.com](http://www.myspace.com)), and friendster ([www.friendster.com](http://www.friendster.com)). To date, however, their potential as sites for language learning remains largely unexplored.

One of the principal critiques of textual CMC in language education has been that oral production and aural comprehension are not explicitly exercised. A number of technologies now support the broad distribution of sound, video, and compilations of media that are proving useful for language education. One of the most popular is “podcasting,” the practice of sharing mp3 audio content on the Internet that takes its name from Apple’s popular mp3 player the iPod. Students can (and already do) download podcasts representing a diverse array of current authentic audio texts. Additionally, podcasts and mp3 files are being used to distribute more conventional foreign language audio materials. Podcasts can also be included within blog sites, forming what are called audio blogs. Similarly, “vlogs,” describing blogs embedded with video, provide the benefit of visually contextualized audio data. More broadly, the availability of Internet data and technologies in ever smaller footprint devices, such as cell phones and video-capable ipods, will continue to open up possibilities for mobile, anyplace-anytime access to and production of Internet-distributed text, video, and audio resources.

A final genre of digital environment that will likely emerge as the premier L2 educational technology in the immediate future is virtual environment games (Gee, 2003), which provide the opportunity for what might be termed virtual immersion. One variety of gaming involves interaction within preprogrammed (but sometimes customizable) environments, the best selling example of which is *The Sims*. A game that simulates the activities and responsibilities of everyday life, *The Sims* is now produced in a number of languages. In an informal assessment of *The Sims* as a foreign language-learning tool, Purushotma (2005) found that the vocabulary and tasks comprising the game were highly aligned with conventional foreign language course content. The difference between instructed foreign language learning and a game like *The Sims*, suggests Purushotma, is that exposure to the target language is always linked to carrying out tasks and social actions, which concomitantly embeds vocabulary and constructions in rich associative contexts.

A second variety of virtual immersion is massive multiplayer online games (MMOGs). These Internet-mediated environments are immensely popular among young adults and are already “educational” in the sense players must learn to negotiate complex game rules as well as negotiate play in realtime with other online players. Many MMOGs

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are multilingual and involve thousands of players from around the world (e.g. Worlds of War). For the growing number of students participating in MMOG cultures, the international, multilingual, and task-based qualities of these social spaces, where language use is literally social action, may one day make them *de rigueur* sites for language learning (or perhaps, somewhat ironically, students will study foreign languages to enhance their gaming skills and interactional capacity in these language-driven action-scapes).

While research on wikis, blogs, podcasting, and gaming environments is nascent in language education, these multimodal technologies show potential to support the performance of a diversity of linguistically mediated social identities—something most instructed language educational contexts are not oriented to provide. Additionally, including use of these technologies in second language education may potentially forge linkages between students' often highly developed everyday digital literacy practices and linguistic expression in additional languages.

### PROBLEMS AND OUTSTANDING CHALLENGES

This section addresses two challenges to CMC use in education. The first begins with the assertion that the Internet does not exist generically as a neutral medium. Rather, Internet communication tools, like all human creations, are cultural tools that carry interactional and relational associations, preferred uses (and correspondingly, inappropriate uses), and expectations of genre-specific communicative activity. Kramsch and Anderson note that information and communication “has become more mediated than ever, with a mediation that ever more diffuses and conceals its authority. The role of education, and [foreign language] education in particular, is precisely to make this mediation process visible” (1999, p. 39). Cultures-of-use of Internet communication tools develop over time in relationship to use in particular discursive settings and to mediate specific social and informational functions (Thorne, 2003). The suggestion is that Internet technologies, *as culture*, will have variable meanings and uses for different communities, a perspective that makes educational uses of technology a more complex, but ultimately more vibrant, undertaking.

A second challenge precipitated by the Internet is that there now exists an amplification of the conventional generation gap between top-down processes and pedagogies that operate in formal learning environments, and bottom-up life experiences of students in secondary and university environments. This gap has been confirmed by recent research by the Pew Internet and American Life Project (2002) based on focus groups (136 students in gender-balanced and racially diverse

clusters) and voluntary participation data (200 students who submitted online essays describing their use of the Internet for school). The 2002 Pew report revealed that while nearly all students used the Internet as a regular part of their educational activities, little is known about how the Internet is actually used for schoolwork, nor has there been adequate consideration of Internet use as it might substantively inform school policies, practices, and pedagogies. Increases in mediated communication suggest that for many students, performing competent identities in second and additional language(s) may now involve Internet-mediation as frequently as face-to-face and nondigital forms of communication. As Internet users expand numerically and geographically, and as Internet information and communication tools continue to evolve, research and pedagogical innovation in the area of CMC and language education will need to continually adapt in response to new populations, communication tools, and the communicative activities of the present and near future.

#### FUTURE DIRECTIONS

Unlike the CMC L2 research of the 1990s, where the use of the Internet was often treated as a proxy or a heuristic to assist with the development of communicative performance within the primary foci of L2 instruction (i.e. face-to-face communication, aural comprehension, and nondigital epistolary conventions such as letter and essay writing), Internet-mediated communication is now a high-stakes environment in its own right. Business and work activity is conducted via asynchronous and synchronous channels. Interviews occur via instant messaging. Moreover, appropriately, educational activity is now often mediated by email, threaded discussion, and chat, while blogs and wikis, among other technologies, also are increasingly incorporated into general education and L2 course activities. Furthermore, with the proliferation of small footprint technologies, such as cell phones that support text messaging, Internet connectivity, and image, audio, and video display and recording, “computer”-generated and “computer”-mediated communication now include a multiplicity of devices and media that extend far beyond the apparatus conventionally referred to as a computer. This acknowledgement of the seemingly inevitable shift toward mediated forms of communication is not intended to valorize Internet use as universally positive or superior to earlier forms of communication. Rather, the hope is that the availability of new communication and information technologies will provide opportunities to make transformational decisions at the level of classroom practice, curricular innovation, and the larger goals and purposes of language education.

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