

A revised version of this paper was published as:

Warschauer, M. (2007). Technology and writing. In C. Davison & J. Cummins (Eds.), *The International Handbook of English Language Teaching* (pp. 907-912). Norwell, MA: Springer.

Technology and Writing

Mark Warschauer

University of California Irvine

Abstract

Information and communication technologies are having a profound affect on all aspects of language use, especially in written communication. The purposes of writing, the genres of written communication, and the nature of audience and author are all changing rapidly with the diffusion of computer-mediated communication, both for first and second language writers. This chapter reviews research on the relationship of new technologies to writing and discusses the implications of this research for English language learning and teaching. Issues addressed include the participatory dynamics and linguistic features of computer-assisted classroom discussion, the impact of e-mail exchanges on students' writing process, and the relationship of writing purpose to student outcomes in multimedia authoring. The chapter also addresses areas of debate and concern, such as whether the Internet fosters plagiarism, and whether new forms of computer-mediated writing serve to complement and enhance more traditional forms of writing or detract from them. Finally, future trends in technology-intensive writing, such as the increased importance and nature of electronic literacy, are also discussed, as are the implications of these trends for teaching and research.

Introduction

The development and spread of the personal computer and the Internet have brought the most significant changes in the technology of writing since the diffusion of the printing press. Changes in how and why people write are occurring so quickly that they are difficult to document, much less analyze. Yet, as difficult as such analysis is, it must be attempted if we are to understand the role that computer-mediated communication (CMC) can and should play in English language teaching, especially in the teaching and learning of writing.

This chapter looks at the relationship of CMC to English language writing. I will begin by reviewing research on classroom use of the main forms of CMC. I will then discuss current debates and concerns regarding the use of online communication in second language writing instruction. Finally, I will address future directions regarding research and practice of new technologies and the teaching of writing.

Summary of Main Research Findings

CMC covers a wide range of technologies of writing. These include various forms of synchronous, or real-time communication, such as that which takes place in instant messaging, on MOOs,¹ or via Internet relay chat; asynchronous (or delayed) communication, such as that which takes place via e-mail or on Web-based bulletin boards; and hypermedia (multimedia, hypertextual) authoring, for example, through the creation and publication of World Wide Web pages. Each of these three types of CMC: synchronous, asynchronous, and hypermedia has a corresponding use that is most popular in the writing classroom. These are computer-assisted classroom discussion (synchronous), e-mail exchanges (asynchronous), and Web page creation (hypermedia).

Computer-Assisted Classroom Discussion²

Computer-Assisted Classroom Discussion (CACD) refers to synchronous computer-mediated interaction that takes place among students, with or without the instructor, in a single classroom. Though there are many possible interfaces for this type of discussion, most of the published research on CACD has involved the use of a commercial software program called Daedalus Interchange (Daedalus Inc., 1989). The program features a split screen interface, which encourages students to write long sentences or full paragraphs, as opposed to the typical interface of chat rooms and MOOs that instead privilege rapid-fire abbreviated comments.

CACD became popular in the English composition classroom in the 1980s, due to several purported benefits. Instructors reported that control of discussion shifted decisively in the direction of the students, as students could speak to each other without having to wait for the teachers' permission (Balester, Halasek, & Peterson, 1992; Barker & Kemp, 1990; Faigley, 1990). They claimed that this fostered student-student discussion and promoted cooperative relationships among students (Langston & Batson, 1990). Students reportedly become better writers by having an authentic audience and a purpose for their writing (Peyton, 1990) as well

as more time on task. Electronic discussion allegedly encouraged a communal process of knowledge making (Barker & Kemp,) and a critical awareness about how communication, or miscommunication, occurs (DiMatteo, 1991).

Research on CACD in the second language classroom has focused on several aspects. These include the amount of student participation, the linguistic characteristics of interaction, and the impact of CACD use on students' writing. Several studies included quantitative measures to evaluate amount of student participation and compare it to face-to-face-discussions (Chun, 1994; Kelm, 1992; Kern, 1995; Sullivan & Pratt, 1996; Warschauer, 1996a). All studies found a greater amount of student participation in three measures--percentage of student talk vs. teacher talk, directional focus of student talk (toward other students or toward the teacher), and equality of student participation. Specifically, total amount of student participation in electronic discourses ranged from 85%-92% (85% in Sullivan and Pratt; 86% and 88% in two classes studies by Kern; and 92% in Kelm). In face-to-face discourse, student participation ranged from 35% (Sullivan & Pratt) to 37% (one class in Kern) to 60% (the second class in Kern).

Sullivan and Pratt (1996) found that 100% of the students participated in electronic discourse and only 50% in the face-to-face discussion. Kern (1996) and Kelm (1992) similarly found that some students said nothing face-to-face, while all participated online. Warschauer (1996a) in an experimental study comparing small group discussion online or face-to-face, found that the online groups were twice as balanced, principally because the most silent students increased their participation many-fold online. As for directional focus of comments, Chun (1994) found that 88% of student comments and questions online were directed to each other. Kern (1995) found in one class that 232 online comments were directed to specific students, whereas only 1 face-to-face comment was similarly directed.

This data suggests important results toward the possibilities of promoting collaborative learning in the classroom. One of the main obstacles toward achieving a collaborative classroom is the teacher-centered nature of discussion, with classroom discourse dominated by the ubiquitous *IRF* sequence of an *initiating* move by the teacher, a *responding* move by a student, and a *follow-up* move by the teacher (Mehan, 1985).³ While electronic discussion is certainly not the only way to break this pattern, it does appear to be a very effective way. Warschauer (1999, 2002a) conducted ethnographic research of students in an ESL composition course that used CACD extensively throughout the semester. The study found that the student-directed nature of the discussion—which contrasted greatly with the face-to-face discussions in the classroom, almost all of which were dominated by the teacher—allowed students to explore and develop their opinions on important topics related to second language writing, such as the nature of plagiarism and the value of networking with professors and fellow students.

Other studies have investigated the linguistic characteristics of students' discourse in CACD, comparing it to face-to-face interaction. Research has shown that students in CACD use language that is lexically and syntactically more complex than in face-to-face interaction (Warschauer, 1996a) and covers a wide range of communicative and discourse functions (Chun, 1994; Kern, 1995). The types of sentences they use required not only comprehension of the preceding discourse but also coherent thought and use of cohesive linguistic references and expressions (Chun). One instructor noted a significant improvement in the depth and strength of student arguments following online collaborative discussion (Kern). Based on her

study, Chun claims that electronic discussion appears to be a good bridge between writing and speaking skills, with the strengths of each domain apparently helping the other.

Finally, at least one report (Kelm, 1992) indicated that synchronous communication can also be a useful tool for developing students' linguistic accuracy. Kelm, in a university intermediate Portuguese course, used students' own computer-mediated messages as a basis for review of particular grammatical points and noted an 80% reduction in certain grammatical errors (e.g., incorrect usages of gerunds and progressives) following this review. This type of post-hoc analysis is difficult for oral communication, which is generally not recorded and thus is less accessible for later review.

Two studies have attempted to analyze student's writing performance as a result of having participated in online discussions. Sullivan and Pratt (1996), comparing one ESL writing class using online discussion and one ESL writing class not using it, found a significant advantage for the online discussion course in writing improvement (using holistically scored essays) over the course of the semester. However, the results are questionable, both due to the small size of the sample (i.e., two classes) and also because of the unusual finding that the non-computer class actually decreased in writing proficiency over the course of the semester. A second study, by Schultz (2000), compared the revisions that students made to their writing after having participated in peer feedback sessions via CACD as compared to via face-to-face communication. The study found that advanced language students made more detailed, local revisions after feedback via CACD, whereas they made more extensive, global revisions after feedback via face-to-face discussion. Students made the greatest number of revisions, and appeared to improve the papers the most, when they were able to combine peer-feedback via both CACD and face-to-face discussion.

In summary, research on CACD supports the view that it can be an important component of the second language writing classroom, especially when judiciously combined with, rather than replacing, face-to-face discussion.

E-Mail Exchanges

Electronic mail, similarly to computer-assisted classroom discussion, has been a tool in both first-language and second language education. It is used both for communication between teacher and student as well as long-distance exchanges between students in different locations. In first-language studies, Hartman et al. (1991) found (a) that teachers using e-mail substantially increased their communication with students over time compared to teachers using traditional modes (face-to-face, paper, and phone); (b) that teachers using e-mail interacted substantially with lower-performing students compared to teachers using traditional modes who interacted overwhelmingly more with higher performing students; (c) that students in computer networked sections communicated more with each other than did students in non-networked sections; (d) that students with lower SAT verbal scores made use of e-mail most frequently; and (e) that writing anxiety limited participation less in e-mail than it did in traditional modes. Mabrito (1991, 1992) found that that high-apprehensive writers (a) contributed more equally to e-mail discussions than they did to face-to-face discussions, (b) made more text-specific

comments in e-mail discussions than in face-to-face discussions (1991), (c) offered more ideas for revision during e-mail discussions than in face-to-face discussions (1992), (d) were influenced more by group comments received during e-mail discussions than during face-to-face discussions (1992), and produced better papers after e-mail discussions than after face-to-face discussions (1992).

In second language learning, Wang (1993) compared the discourse of ESL students' dialogue journals written in both e-mail and traditional paper format. She found that the students using e-mail journals wrote greater amounts of text, asked more questions, and used different language functions more frequently than did students writing on paper.

St. John and Cash (1995) used linguistic analysis and learn reports to describe the learning process and results achieved by an adult learner of German who carried out a lengthy e-mail exchange with a native speaker. Their research found that the learner systematically studied the new vocabulary and grammatical structures in his incoming e-mail and used this information to improve his own letter writing, with dramatic results by the end of six months. The learner compared the results he achieved via the e-mail exchange to what he was getting out of a language course taken simultaneously, and noted that in the language course there was no automatic record of classroom discourse that he could draw on and learn from.

Tella (1991, 1992a, 1992b) carried out an ethnographic study based on a semester-long series of e-mail exchanges between several high school classes in Finland and England. Tella's well-documented study found that:

1. Emphasis switched from teacher-centered, large-group sponsored teaching toward a more individualized and learner-centered working environment, while the content of the class shifted from that of a standard syllabus to the students' own writings (Tella, 1992b).
2. The e-mail communication gave a good chance for practicing language in open-ended linguistic situations. A shift from form to content was achieved; a free flow of ideas—and with it expressions, idioms, and vocabulary (Tella, 1992b).
3. The whole writing process changed to some extent. Rather than writing their compositions only once, as is the norm, the Finnish students naturally edited and revised their compositions, poems, and other messages to make them appropriate for their English peers. Instead of writing most of their compositions and other work alone, they increasingly made use of peer tutoring and other collaborative methods in order to compose their e-mail messages together (Tella, 1992b).
4. The quality of writing improved as writing changed from teacher-sponsored and led, only to be marked and graded, to real-purpose writing with genuine audiences around the world (Tella, 1992b).
5. The modes of writing became more versatile, including not only the narrative and descriptive genres usually found in regular class, but also personal, expressive, and argumentative use of language (Tella, 1992b).
6. Reading also became more public and collaborative, with students actively assisting each other in studying incoming messages. Students also used different reading strategies to read the wide variety of messages, notices, and documents that came in (Tella, 1992b).

Many of Tella's results were confirmed by Barson, Frommer, and Schwartz (1993), who carried out an action research study of a project-oriented e-mail exchange between language students at three universities. Their study found that

students developed free and spontaneous communication using complex structures in the exchange, due in large part to the students' sense that the communication was real rather than pedagogical.

Cummins and Sayers (1995) provide eight portraits of e-mail exchanges between diverse groups of learners from around the world. These exchanges involve students of different languages (e.g., Spanish and English); different "abilities" (e.g., hearing and deaf); different ethnic groups (African-American, Mexican-American, and Afro-Caribbean); different life experiences (Croatian refugees and suburban and urban Americans); and different viewpoints (Palestinians and Israelis). They conclude that these projects have allowed students "to amplify literacy and intellectual skills collaboratively with peers in culturally and geographically distant settings" (p. 21). In their view, the key to the success of these projects includes the engagement of students and teachers in collaborative critical inquiry around issues of importance to students' lives.

A study by Kern (1996) further supports the idea that e-mail exchanges can bring broad benefits of cultural and historical knowledge as well as enhanced student motivation. Kern organized and investigated a French-English exchange between students in the United States and France based on e-mail communication and an exchange of essays on topics related to the immigrant experience. He noted that:

While ostensibly an exercise in communicative language use, this e-mail exchange has been at least as significant in enhancing students' cultural and historical awareness as well as their overall motivation in learning French. For example, in discussing "the French family" students are not restricted to studying textbook descriptions of fictional families—they learn about real families of various social backgrounds and traditions, living in different environments, each with their own particular perspective on the world. Students have expressed great satisfaction in learning about important historical events of which they had little or no previous knowledge, such as the Algerian war or the Armenian massacre of 1915. Many students have been pleasantly surprised to find that what they are learning in French class connects with what they are learning in their other courses in history, sociology, and anthropology (p. 118).

The motivational benefits of e-mail communication were further explored by Warschauer (1996b), who carried out an international survey of 167 students in 12 university language classes in three countries. The survey found that three factors explained students' heightened motivation due to participation in e-mail exchanges: their enjoyment of international communication, their sense of empowerment (and possible career benefit) due to the development of new technological skills, and their belief that communication via e-mail assisted their language learning. The study also found that these benefits were heightened in courses in which the e-mail exchanges were well integrated into the overall goals and structure of the course, rather than included as a marginal add-on to course activities.

Web-Page Authoring

The development and publication of World Wide Web pages represents a qualitatively different type of computer-mediated communication. Unlike the previous two categories, Web page authoring does not feature a type of direct interaction between pairs or a group of interlocutors. Rather, it represents a type of

writing (or, more correctly, multimedia authoring) for publication to a broad public audience.

Most of the writing about language learners' Web page creation has been anecdotal or descriptive in nature (see, for example, Barson & Debski, 1996; Shetzer & Warschauer, 2001). The most in-depth research on Web page authoring in the second language classroom was conducted by Warschauer (1999, 2000). His two-year ethnographic study focused on three classes that made extensive use of Web page authoring, including a university graduate ESL writing course, a university writing-intensive Hawaiian language course, and an English composition course at a community college (in which two-thirds of the students were second language speakers of English). The processes and results in the three courses varied dramatically. Warschauer (2000) interpreted this variation according to four factors related to the purposefulness of the writing: (a) whether students understood the purpose, (b) whether students found the purpose socially or culturally relevant, (c) whether the electronic medium was appropriate for achieving the purpose, and (d) whether students were encouraged and enabled to use medium-appropriate rhetorical features to fulfill the purpose.

In the first class, students designed professional home pages that were meant to highlight their academic accomplishments and research interests. However, since most of the students were first-year masters' students, they had few academic accomplishments and were unclear of their research direction. They thus failed to grasp the purpose of the assignment and put little time and effort into it, with correspondingly poor results. In the second class, students worked together to develop a class Website with links to their individual pages based on research projects related to the life and history of the Hawaiian people. The students found the assignment highly relevant and important to their own community; they were also allowed and encouraged to develop multimedia works of art, rather than merely cutting and pasting their essays from a word processor onto the Web. The students put a great deal of time and effort into all aspects of the assignments—both in terms of text development and broader artistic design—and appeared to benefit greatly from it. In the third class, students developed English-language Web sites and other multimedia products (such as brochures) for local community organizations in a service learning assignment. In this case, the value of the assignment varied greatly from group to group, and depended largely on whether students felt the purpose was authentic (i.e., if they sensed that the local organization was actually going to use the product).

Few other studies have been carried out on Web page authoring in the language classroom, though Lam (2000) has carried out a very interesting investigation into an ESL student's production of a Website outside the classroom. In her study, she analyzed the in-class and out-of-class English writing experiences of a Chinese immigrant to the United States. Though he was struggling with academic English in school, he was quite a proficient user of English on the Internet, having produced his own English-language Website about Japanese pop-music and communicating about it with people around the world via e-mail. Lam's study highlights the wide variety of genres that online writing includes as well as the new forms of hybrid identity that are emerging in the era of electronic communication.

Current Debates and Concerns

Much of the debate and concern around the use of online communications in the English language classroom focuses on the ways in which writing changes in the electronic realm, and whether these changes are beneficial or harmful to the teaching of writing. Three particular concerns have been raised about online writing: (a) that it is informal, (b) that it is graphic (rather than text) dominant, and (c) that it facilitates plagiarism.

A number of works have analyzed the style, genre, and special features of computer-mediated texts, comparing them to other forms of writing, as well as oral communication (Collot & Belmore, 1996; Crystal, 2001; Moran & Hawisher, 1998; Yates, 1996). Some of the features that are common in many electronic texts pointed out by Crystal include the use of repeated letters (*aaaaahhhhhh, oooooops*) or punctuation marks (*hey!!!!, no more!!!!*) for a prosodic affect; the use of all capitals (I SAID SO), extra spacing (*w h y n o t ? ?*), or asterisks (*the *real* effect*) for emphasis; the use of emoticons, or *smileys*, to convey a feeling (*:-), :-/*); the use of special abbreviations or acronyms (*lol* for *laughing out loud*, *tafn* for *that's all for now*); reduced use of capitalization or punctuation (*an excerpt from a tommy cooper forward i got*); and abbreviated and informal language (*where r ya from?*).

However, as Moran and Hawisher (1998) point out, computer-mediated communication includes a wide variety of more formal and informal styles and genres, just as other forms of writing (think of anything from a shopping list to a formal essay) and speech (anything from a chat with a friend to a public speech). Just because many forms of CMC are informal, more formal genres can be chosen for classroom use, when appropriate. For example, students can interact by CACD or e-mail in an informal conversational voice, but then collaborate together to write and publish an electronic journal, magazine, or newspaper on the Web.

A related concern of many educators is that online communication is dominated by graphics rather than texts and that students that produce multimedia will get distracted from writing and instead waste a great amount of time on perfecting fonts, colors, or images (Halio, 1990). Classroom research (e.g., Warschauer, 1999) indicates that students largely respond in this regard to the expectations set by the instructor. Teachers that set up assignments demanding a product that includes both sophisticated writing and a highly professional look are more likely to achieve both. In contrast, to overemphasize the design of a Website can result in students paying little attention to texts, whereas to underemphasize design issues can limit students' opportunities to develop important new multimedia literacies.

Finally, there is little doubt that the rapid diffusion and growth of the Internet facilitates students' plagiarism by making available millions of texts around the world for easy cutting and pasting, many of them commercially-provided and tailored to high school and college students' needs. Online plagiarism takes a variety of forms from the blatant and intentional (e.g., purchasing an essay online) to the accidental and ill-informed (e.g., quoting small amounts of online material without proper citation, see discussion in Burbules & Casllister, 2000). However, the Internet also provides instructors the opportunities to check for plagiarism, either informally through search engines or through special commercial anti-plagiarism sites (Hafner, 2001). And Internet-based discussion can even be an excellent realm for exploring students' ideas about plagiarism (Warschauer, 1999). As Pennycook

(1996) points out, plagiarism for second language learners is a complex and challenging issue; at the same time that they are encouraged to improve their language through modeling and copying the words of others, they are prohibited from doing so in certain instances. The new challenges of plagiarism in the online era can provide instructors a valuable opportunity to address this issue head on in the classroom, and thus help students advance their understanding of the nature of academic research and writing.

Future Directions

The nature of writing can be expected to continue changing in coming decades, as new forms of audio-visual communication complement or challenge the importance of the written word in a variety of realms. Because of these changes, many university English departments are altering their curricula and even their names in order to better reflect the nature of communication in today's world (Flynn, 1997).

In the future, computers will be used in the English language classroom not to teach the same types of writing as before in a new way, but rather to teach the new types of writing that are emerging in the online era. The special characteristics of text production and interpretation in computer-mediated realms has been referred to as electronic literacy, which, according to Warschauer (2002b), includes four main components: (a) computer literacy, comfort and fluency in using hardware and software; (b) information literacy, the ability to find, analyze, and critique information available online; (c) multimedia literacy, the ability to interpret and produce documents combining texts, sounds, graphics, and video); and (d) computer-mediated communication literacy, the mastery of the pragmatics of synchronous and asynchronous CMC. Shetzer and Warschauer (2000) discuss a strategic approach toward the promotion of electronic literacy through an emphasis on communication, construction, research, and autonomous learning (see also Warschauer, Shetzer, & Meloni, 2000).

The continued growth of electronic communication for writing will likely change the nature of second language learning research as well. The archived and easily searchable nature of electronic texts will allow for far more sophisticated forms of linguistic and corpus analyses, including comparisons of L1 and L2 writing, developmental comparisons among groups of L2 learners, and comparisons among different categories of L2 learners (e.g., from different countries, or taught through different instructional methods).

Finally, the expanded use of automated writing evaluation software will likely have a major impact on second language writing instruction, assessment, and research. Software engines developed by Educational Testing Service, Vantage Learning, and other companies can now provide almost instantaneous holistic scoring of essays, as well as feedback on a number of mechanical, stylistic, and organizational features (see discussion in Ware & Warschauer, in press). These engines are already being used to score standardized tests and have recently been incorporated into commercial online services designed for classroom instruction.

In summary, the digital era has just begun. As online communication continues to develop and expand, it will pose challenges not only to how we teach

Mark Warschauer 3/14/05 9:51 AM

Deleted: online

Mark Warschauer 3/14/05 9:52 AM

Deleted: is just beginning

writing, but also to how we conceptualize writing and its role in education and society.

References

- Balester, V., Halasek, K., & Peterson, N. (1992). Sharing authority: Collaborative teaching in a computer-based writing course. *Computers and Composition*, 9(3), 25-39.
- Barker, T., & Kemp, F. (1990). Network theory: A postmodern pedagogy for the written classroom. In C. Handa (Ed.), *Computers and community: Teaching composition in the twenty-first century* (pp. 1-27). Portsmouth, NH: Heinemann.
- Barson, J., & Debski, R. (1996). Calling back CALL: Technology in the service of foreign language learning based on creativity, contingency and goal-oriented activity. In M. Warschauer (Ed.), *Telecollaboration in foreign language learning* (pp. 49-68). Honolulu, HI: University of Hawai'i Second Language Teaching and Curriculum Center.
- Barson, J., Frommer, J., & Schwartz, M. (1993). Foreign language learning using e-mail in a task-oriented perspective: Interuniversity experiments in communication and collaboration. *Journal of Science Education and Technology*, 4(2), 565-584.
- Burbules, N. C., & Casllister, T. A. J. (2000). *Watch IT: The risks and promises of information technologies for education*. Boulder, CO: Westview Press.
- Chun, D. (1994). Using computer networking to facilitate the acquisition of interactive competence. *System*, 22(1), 17-31.
- Collot, M., & Belmore, N. (1996). Electronic language: A new variety of English. In S. C. Herring (Ed.), *Computer-mediated communication: Linguistic, social, and cross-cultural perspectives* (pp. 13-28). Amsterdam: Benjamins.
- Crystal, D. (2001). *Language and the Internet*. Cambridge: Cambridge University Press.
- Cummins, J., & Sayers, D. (1995). *Brave new schools: Challenging cultural illiteracy through global learning networks*. New York: St. Martin's Press.
- Daedalus Inc. (1989). Daedalus Integrated Writing Environment. Austin, TX: The Daedalus Group.
- DiMatteo, A. (1991). Communication, writing, learning: An anti-instrumentalist view of network writing. *Computers and Composition*, 8(3), 5-19.
- Faigley, L. (1990). Subverting the electronic workbook: Teaching writing using networked computers. In D. Baker & M. Monenberg (Eds.), *The writing teacher as researcher: Essays in the theory and practice of class-based research* (pp. 290-311). Portsmouth, NH: Heinemann.
- Flynn, L. J. (1997, November 9). College English departments embracing cyber-studies. *New York Times*. Retrieved February 20, 2002, from the World Wide Web: <http://www.nytimes.com/library/cyber/week/110997georgia.html>
- Hafner, K. (2001, June 28). Lessons in Internet plagiarism. *New York Times*. Retrieved February 20, 2002, from the World Wide Web: <http://www.nytimes.com/2001/06/28/technology/28CHEA.html>
- Halio, M. P. (1990). Student writing: Can the machine main the message. *Academic Computing*, 4, 16-19, 45.
- Hartman, K., Neuwirth, C., Kiesler, S., Sproull, L., Cochran, C., Palmquist, M., & Zubrow, D. (1991). Patterns of social interaction and learning to write: Some effects of networked technologies. *Written Communication*, 8(1), 79-113.
- Kelm, O. (1992). The use of synchronous computer networks in second language instruction: A Preliminary Report. *Foreign Language Annals*, 25(5), 441-454.
- Kern, R. (1995). Restructuring classroom interaction with networked computers: Effects on quantity and quality of language production. *Modern Language Journal*, 79(4), 457-476.
- Kern, R. (1996). Computer-mediated communication: Using e-mail exchanges to explore personal histories in two cultures. In M. Warschauer (Ed.), *Telecollaboration in foreign language learning* (pp. 105-119). Honolulu, HI: University of Hawai'i Second Language Teaching and Curriculum Center.
- Lam, E. (2000). Second language literacy and the design of the self: A case study of a teenager writing on the Internet. *TESOL Quarterly* (34), 457-482.
- Langston, M. D., & Batson, T. (1990). The social shifts invited by working collaboratively on computer networks: The ENFI project. In C. Handa (Ed.), *Computers and community: Teaching composition in the twenty-first century* (pp. 149-159). Portsmouth, NH: Boynton/Cook.
- Mabrito, M. (1991). Electronic mail as a vehicle for peer response: Conversations of high- and low-apprehensive writers. *Written Communication*, 8(4), 509-532.
- Mabrito, M. (1992). Computer-mediated communication and high-apprehensive writers: Rethinking the collaborative process. *The Bulletin* (December), 26-30.
- Mehan, H. (1985). The structure of classroom discourse. In T. A. van Dijk (Ed.), *Handbook of discourse analysis* (pp. 120-131). London: Academic Press.

- Moran, C., & Hawisher, G. E. (1998). The rhetorics and languages of electronic mail. In I. Snyder (Ed.), *Page to screen: Taking literacy into the electronic era* (pp. 80-101). London: Routledge.
- Pennycook, A. (1996). Borrowing others' words: Text, ownership, memory, and plagiarism. *TESOL Quarterly*, 30 (2), 201-230.
- Peyton, J. K. (1990). Technological innovation meets institution: Birth of creativity or murder of a great idea? *Computers and Composition*, 7 (Special Issue), 15-32.
- Schultz, J. (2000). Computers and collaborative writing in the foreign language curriculum. In M. Warschauer & R. Kern (Eds.), *Network-Based Language Teaching: Concepts and Practice*. New York: Cambridge University Press.
- Shetzer, H., & Warschauer, M. (2000). An electronic literacy approach to network-based language teaching. In M. Warschauer & R. Kern (Eds.), *Network-based language teaching: Concepts and practice* (pp. 171-185). New York: Cambridge University Press.
- Shetzer, H., & Warschauer, M. (2001). English through Web page creation. In J. Murphy & P. Byrd (Eds.), *Understanding the courses we teach: Local perspectives on English language teaching*. Ann Arbor, MI: University of Michigan Press.
- St. John, E., & Cash, D. (1995). Language learning via e-mail: Demonstrable success with German. In M. Warschauer (Ed.), *Virtual connections: Online activities and projects for networking language learners* (pp. 191-197). Honolulu, HI: University of Hawai'i, Second Language Teaching and Curriculum Center.
- Sullivan, N., & Pratt, E. (1996). A comparative study of two ESL writing environments: A computer-assisted classroom and a traditional oral classroom. *System*, 24(4), 491-501.
- Tella, S. (1991). *Introducing international communications networks and electronic mail into foreign language classrooms* (Research report 95). Helsinki: Department of Teacher Education, University of Helsinki.
- Tella, S. (1992a). *Boys, girls and e-mail: A case study in Finnish senior secondary schools*. (Research report 110): Department of Teacher Education, University of Helsinki.
- Tella, S. (1992b). *Talking shop via e-mail: A thematic and linguistic analysis of electronic mail communication*. (Research report 99): Department of teacher education, University of Helsinki.
- Wang, Y. M. (1993). *E-mail dialogue journaling in an ESL reading and writing classroom*. Unpublished Ph.D. dissertation, University of Oregon at Eugene.
- [Ware, P., & Warschauer, M. \(in press\). Electronic feedback and second language writing. In K. Hyland & F. Hyland \(Eds.\), Feedback on ESL writing: Contexts and issues. New York: Cambridge University Press.](#)
- Warschauer, M. (1996a). Comparing face-to-face and electronic communication in the second language classroom. *CALICO Journal*, 13(2), 7-26.
- Warschauer, M. (1996b). Motivational aspects of using computers for writing and communication. In M. Warschauer (Ed.), *Telecollaboration in foreign language learning* (pp. 29-46). Honolulu, HI: University of Hawai'i, Second Language Teaching and Curriculum Center.
- Warschauer, M. (1999). *Electronic literacies: Language, culture, and power in online education*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Warschauer, M. (2000). Online learning in second language classrooms: An ethnographic study. In M. Warschauer & R. Kern (Eds.), *Network-based language teaching: Concepts and practice*. New York: Cambridge University Press.
- Warschauer, M. (2002a). Networking into academic discourse. *Journal of English for Academic Purposes*, 1(1).
- Warschauer, M. (2002b). *Technology and social inclusion: Rethinking the digital divide*. Cambridge: MIT Press.
- Warschauer, M., H. Shetzer, & Meloni, ? (2000). *Internet for English Teaching*. Alexandria, VA, TESOL Publications.
- Yates, S. J. (1996). Oral and written linguistic aspects of computer conferencing: A corpus-based study. In S. C. Herring (Ed.), *Computer-mediated communication: Linguistic, social and cross-cultural perspectives* (pp. 29-46). Amsterdam: John Benjamins.

Footnotes

¹ Technically, Multi-user Object Oriented. MOOs refer to a type of text-based virtual reality that allows interpersonal interaction and the development and exploration of objects and spaces.

² This section and the following draw in part on my previous discussion of these topics in Warschauer, 1997.

³ Also referred to as IRE: initiation, response, and evaluation.