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10. TECHNOLOGIES FOR SECOND LANGUAGE LITERACY

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Information and communication technology (ICT) has been used in language classrooms for more than two decades. Over this time, classroom use has moved from drill, text manipulation, and word processing to more interactive and communicative applications such as e-mail, chat, and web-based programs, requiring learners to acquire computer literacies. This chapter will begin by discussing both the parameters of ICT and the scope of literacies. It is then organized around discussion of the two types of literacies at the intersection of ICT and L2 learning: how new technologies facilitate acquisition of L2 literacies and what L2 literacies are needed for learners to participate in an increasingly digital world. Although research has mostly been limited to small-scale context-dependent case studies of individual classrooms, it has identified a number of issues that need to be considered as teachers (and learners) use ICT for language learning. Although ICT provides a natural context for learner autonomy, that autonomy needs to be developed systematically. In addition, ICT provides a context for learner identity formation through hybrid uses of language(s), in ways unexpected by teachers and learners. These new ways of using language may empower and motivate learners. Similarly, whereas ICT provides opportunities for collaboration and interaction, they are not automatic, and instruction needs to be skillfully scaffolded for learners to benefit from such opportunities.

Both concepts in this title are contested in the literature on language education. In the 21st century, technologies almost always refer to computer-based technologies, rather than earlier (and still existing) technologies such as overhead projectors, language labs, videos, or even print or pen. That some of these older technologies are now also digital and computer-based is usually ignored. In this chapter, I will refer only to computer-based technologies where the computer is obvious to the user. Even so, advances in digital technology are leading us to an era where the computer as we know it may not be transparent to the user (Murray, 2004). For the purposes of this chapter, I refer to these technologies as ICT, information and communication technology, rather than CALL (computer-assisted language learning). ICT captures the two primary uses of these technologies—they provide a context for human-human and human-machine communication, and they provide a

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context for information production, delivery, and sharing. I will not use CALL, except for packaged language learning materials, because CALL is the earliest term used in language teaching and is therefore often associated with the metaphor of computer as a tool for language learning and language lesson delivery, even though Warschauer argued eloquently for the reintroduction of CALL to replace cyber (see Murray, 2004; Warschauer, 2001 for discussions of nomenclature) even though some of his readers have tried to use NBLT (network-based language teaching) for those ICTs available only with networked computers. ICT is more commonly used in Europe, despite EUROCALL having defined CALL as the "academic field that explores the role of information and communication technologies in language learning and teaching" (Davies, 2001, p. 13).

Literacy is also a contested concept, with definitions and use ranging from the ability to read and write, that is, to code and decode, to the ability to function in reading and writing in everyday events to understanding how language and ideology function through written texts and being able to appropriate written language for one's own creative and personal needs (see, for example, Gee, 1996; Street, 1995). These differing perspectives are often summarized as opposing views—literacy as individual skill and literacy as social practice. For the purposes of this chapter, I will take the view that literacies are socioculturally constructed and inherently ideological, but, like Freebody and Luke (1990), acknowledge that mastery of the other roles in literacy behavior (such as code breaker or text participant) are also essential underpinnings of a more critical approach.

The title is also ambiguous in that, on first glance, it seems to refer only to how technologies can support L2 literacy development; however, there is the additional reading of what L2 literacies are needed to use the technologies, an equally important focus for L2 education because knowing the literacies required to use the new technologies is often critical for learners to meet their social, personal, and educational needs (Goodwin-Jones, 2000). This chapter will therefore discuss both how new technologies facilitate acquisition of L2 literacies and what L2 literacies are needed for learners to participate in an increasingly digital world.

Literacies for Using New Technologies

Scholars have identified a variety of ways of referring to reading and using the new technologies, whether in one's first or other languages—digital literacies (Snyder, 1999), silicon literacies (Snyder, 2002), electronic literacies (Warschauer, 1999), web literacy (Sorapure, Inglesby, & Yatchisin, 1998), information literacy (American Library Association, 2000), and computer literacy (Corbel & Gruba, 2004). It is interesting to note that all these terms focus on the means of production of these new worlds and are usually juxtaposed to print literacy. Because computer literacy is often narrowly defined as how to manipulate a mouse or use specific software (such as a word processor), scholars and researchers have suggested these other, more encompassing terms that include how to communicate online and how to access, evaluate, and use information presented in an electronic medium. They have also identified the increasing need for visual literacy (Kress, 1997) in the new digital

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media. However, computer literacy narrowly defined is essential for competence in the other literacies. As Corbel and Gruba (2004) note, many CALL programs and ESL teachers assume their learners are computer literate. However, research with adult second language learners in Australia (McPherson & Murray, 2003; Murray & McPherson, 2002) has shown that this assumption is flawed. It is likely that this assumption is also not accurate in many settings where English is being taught to adult refugees or to children in countries or areas of nations with low technology uptake (see, for example, Murray, 1999). Even in nations with high technology uptake, access may be limited for a variety of reasons such as socioeconomic class or cultural usage patterns. If we take a broader definition of digital literacies, we find that access to not only the computer and the Internet but also to their various functions is limited for many learners (Hargittai, 2002). For example, in a study of U.S. German learners interacting with German English learners (Savignon & Roithmeier, 2004), German learners posted less to the discussion board than did the U.S. learners. The researchers note that the German students were less familiar with and had less access to CMC than did their American counterparts.

For language learners, such reading and using includes learning digital literacy in another language, learning how to navigate the new technologies (Murray & McPherson, 2004b) and also learning how to read new digital texts such as web pages (Thurstun, 2004). "While the Web contains texts that follow the conventions of print-based texts (for example, narratives, information texts), the Web also contains new configurations of texts, where more than one genre might appear on one webpage, for example" (Murray & McPherson, 2004a, p. 3). Little research has been conducted on how language learners navigate the web in their target language, whereas a number of studies have been conducted on how such learners read on the web. Ganderton (1999), in a study of French L2 learners observing both navigation and reading, found that his groups of learners were able to navigate one site reasonably successfully, but had difficulty with a second site, when links outside the main site came up as a second browser window. He also found that learners tried to extrapolate from experiences on English web sites, when they didn't understand the L2 vocabulary for a specific navigation action such as "*Validez*" in French (i.e., "confirm"). One experimental study conducted with low-literate adults (who were not necessarily second language learners), however, provides some insights on what may be the navigation difficulties of adults using another language in which they are not very proficient. This research confirmed much of the research on readability—that scrolling is difficult, links are not always clearly identified, graphics do not always clarify, redundancy needs to be built in, the path history needs to be displayed, and guidelines in simple language need to be provided (Zarcadoolas, Blanco, Boyer, & Pleasant, 2002).

Research into web page reading for native speakers has identified characteristics that facilitate reading and those that hinder, as compared to print reading (e.g., Thurstun, 2004). In general, they conclude that screen reading is more difficult than print reading. They have identified features such as color, font size, scrolling, nominalization, graphics, and white space as contributing to the readability of online texts. However, in addition to reading the Web, learners also need to learn

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how to construct knowledge from a nonlinear, hypertext navigation. Second language learners, even if quite fluent readers of print text, have difficulties reading texts specific to the Web, such as home pages (Murray & McPherson, 2004b); have difficulty determining which online texts have reliable information or information in a genre they need (Murray & McPherson, 2004a; Walz, 2001); lack skills for evaluating nontext features such as visuals (Sutherland-Smith, 2002) or pop-ups and advertisements (Murray, 2003); or of how to skillfully modify, rather than copy online texts (Bloch, 2001; Sutherland-Smith, 2002). Research with fluent English native speaker readers also indicates that Web reading, especially the hypertext environment of the Web, is more cognitively demanding (for example, Calisir & Gurel, 2003). However, the skills of literacy to navigate the Web are essential for life, whether social, personal, or educational, in an increasingly digital world; for many learners, these skills will need to be in an L2, especially English because it still dominates information on the Web.

Using New Technologies to Learn Language

These new technologies provide the potential ". . . to engage native speakers at a distance, to utilize authentic materials and to enable learners to interact with rich, multi-dimensional learning environments" (Levy & Debski, 1999 p. 7), all of which are contexts that facilitate language acquisition. However, much of the literature on ICT in language teaching and learning has been anecdotal, written by the innovators and early adopters (Rogers, 1995), intended to persuade and help the uncommitted or resistant to use the new technologies. Studies on ICT in language education have primarily been case studies of particular learners in particular contexts, focusing on the process of using ICT in language learning, with little attention being paid to learning outcomes. This has lead researchers such as Chappelle (2001) to advocate for a closer link between interactionist SLA research methodologies and research in CALL. In contrast, other researchers (Warschauer & Kern, 2000) claim that the advantages of ICT are best researched in "particular practices of use in particular contexts" (p. 2).

Although this focus on the particularities of contexts and use has produced many studies, generalizing from the extant literature is somewhat difficult, although some trends can be identified. Over the 1980s and 1990s, many studies focused on second language learners composing using new technologies, including comparing peer review online with face-to-face, the amount of revision after online feedback compared with face-to-face feedback. Other studies of online discussion compared online dialogue journals with pen-and-ink dialogue journals. More recently, research has moved away from comparing online and face-to-face interactions and have focused more on examining literacy uses using computer-mediated communication (CMC) or students' use of the Web for information gathering. This chapter will therefore focus on these recent trends.

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Computer-Mediated Communication (CMC)

Because CMC provides language learners with opportunities for interaction, often with native speakers, it has been more widely researched than other aspects of ICT use in language learning. CMC can be used as a means in learning tasks and projects or can be used instructionally as a goal in itself. In the former, the product of instruction also needs to be investigated, whereas in the latter, the captured online interactions are both process and product. However, much of the research has focused only on the process. Because these are written forms of interaction, in the language learning setting, they have been seen as a bridge to oral interaction; yet, as indicated above, acquiring the skills of CMC in the target language can be a goal in itself. However, a recent study found that although there was an increase in quantity of language produced in asynchronous CMC compared with synchronous CMC and face-to-face discussion, there were no significant differences among the three groups in quality on lexical and syntactic measures (Abrams, 2003).

Interaction

The new technologies provide opportunities for learners to interact with native speakers at a distance through a variety of different online tools such as e-mail, chat, and discussion boards. The literature overall supports the use of CMC with language learners, an exception being a survey conducted by Corbel and Taylor (2003), in which a majority (56%) of teachers of adult immigrants felt that e-mail had low educational cost effectiveness. However, in a nondirected self-access situation, adult immigrants themselves chose e-mail in preference to all other applications, but their choice of language was primarily their home language (Lever, 2004), including accessing news from their home country. Left to their own devices, these students did not choose educational packages to increase their English language learning. Their choice mirrors computer use in noneducational settings, where e-mail has become the "killer app" (application).

Most commentators and researchers have noted the advantage of asynchronous CMC modes such as e-mail and discussion lists because they allow learners to interact in their own time and place. Savignon and Roithmeier (2004), for example, demonstrated how two classes, one a U.S. class learning German, the other a German class learning English, collaborated to produce a jointly-constructed CMC conversation on a bulletin board. These learners used "the potential of CMC to engage . . . in the interpretation, expression, and negotiation of meaning essential for the development of communicative competence" (p. 284). Similarly, Schwienhorst (2004) found that in NS/NNS interactions in MOO (text-based synchronous interaction), there was no significant difference in topic initiation between the two groups. However, as in much of the extant literature, studies in different contexts have produced differing results, as is often the case when research is context-dependent and not large scale. In an interchange via e-mail between students of Japanese in Australia and students of intercultural communication in Japan, students seldom tried to deal with breakdowns in communication (Stockwell, 2004).

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However, synchronous CMC such as chat and teleconferencing have also been found to be effective in language teaching and learning, although because of the synchronous nature of this medium, there are overlapping turns, with little time to compose messages reflectively (see for example, Sengupta, 2001). Asynchronous CMC such as e-mail, because of its time delay, gives learners the opportunity to produce more syntactically complex language (Sotillo, 2000). Although, as Biesenbach-Lucas and Weasonforth (2001) have found, whereas e-mail and word processed texts shared similar cohesive features, e-mail texts were shorter and provided less initial orientation for the reader.

Because negotiation of meaning has been found to be necessary for language acquisition (see for example, Pica, 1994), several studies have examined whether in fact negotiation of meaning occurs in CMC and whether learner output increases. Most of this research has examined various forms of chat—either restricted chat, available only to the learners and their instructors, or chat in public chat rooms where learners can interact with native speakers. Sotillo (2000) found similar discourse features occurring in internet relay chat as in face-to-face interactions, with rapid interactions and negotiations among their ESL students; however, learners were often unfocussed, discussing issues not pertinent to the task. Learners of Japanese, interacting with native speakers via chat in a virtual world, on encountering difficulties in understanding each other, negotiated meaning (Toyoda & Harrison, 2002), as did learners of English (Smith, 2003). Similarly, learners of Italian, participating in public chat rooms "negotiate[d] for meaning and modif[ied] their interlanguage when engaged in open ended conversational tasks with unfamiliar interlocutors" (Tudini, 2003 p. 141). Most negotiations were the result of lexical or syntactic problems. In general then, the research on synchronous CMC has found it provides learners with opportunities for informal conversational practice and facilitates fluency, rather than accuracy. However, Smith (2003) also found that task type affected the extent of learner negotiations and that this effect was different from what has been identified as used in face-to-face interactions, prompting him to develop a new model for describing negotiated interaction via CMC.

Although most CMC research has examined written versions, recent developments in the technology have made voice CMC possible for language learning. Researching a distance education context, Wang (2004) found that using NetMeeting (a proprietary desktop videoconferencing system) supported learners' oral and visual interaction. With increasing availability of broadband in some areas and of the convergence of visual, audio, and text, research into technology use and L2 learning will need to investigate these new channels of communication.

Identity formation

"In the presentation of self online, one is not recognized by one's physical appearance, but through one's textual behaviors" (Wood & Smith, 2001, p. 55). In the online context, identity is formed through interaction, by how people create identities through CMC in their home language and the target language. As Turkle (1995) has noted, the Internet provides opportunities for multiple subjective identity,

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opportunities that Warschauer (2000) identified in his study of a Hawaiian language class. He demonstrated how several of the learners, through synchronous discussions, e-mail and the writing of projects on web pages, found symbolic value in Hawaiian language use on the Internet, "allowing them to say to themselves and to the world that they are Hawaiian and proud of it" (p. 11). For one of these learners, the online activities allowed her to express her Hawaiianness, which had been difficult in face-to-face encounters, not only because of her shyness, but also because of her fair coloring. Examining a Usenet forum popular with Chinese students in the United States, Bloch (2004) found them liberated in using English as they adopted a traditional Chinese rhetorical style, finding their collective argumentative voice in English. In contrast, Warschauer, El Said, and Zohry (2002) express concern that the use of English among a group of Egyptian professionals was encroaching on the more traditional use of classical Arabic for formal written communication. They found that a diglossic situation developed: the Egyptian professionals used English for formal CMC, but Egyptian Arabic for more informal uses, thus creating both a global and local identity. In a recent groundbreaking study of informal, noninstructed chat use, Lam (2004) found that the two teenage Chinese immigrants she studied developed new identities as bilingual speakers of English and Cantonese. In this chat room, participants used both languages, code-switching between them, using a variety of English constructed by the group that differed from standard American English. Her focal learners were more comfortable using English in the chat room than in face-to-face situations.

What these studies have in common is how the interaction of global and local identities give rise to hybridized language varieties in these increasingly glocal discourse contexts (Koutsogiannis & Mitsikopoulou, 2004). Just as these language learners choose among their available languages to communicate and indeed, develop hybridized forms, so too might learners want to choose among the available technology modes to interact. Almost two decades ago, with the much more primitive CMC tools then available, Murray (1988) found that highly technologically savvy workers chose among the available modes depending on the context. Recent research (Thorne, 2003b) on American students learning French and being required to use e-mail with a French keypal found that for some learners, e-mail was not a mode of choice for developing interpersonal relations with age-peers, which had been the purpose for the teacher assigning the keypal interactions. Some learners did not participate in e-mail, even though the e-mail part of the course was graded. For these learners, identity with age-peers is established through immediate, synchronous modes such as instant messaging (IM) or short message service (SMS), the latter of which has yet to be exploited in instructed language learning.

Collaboration

Second language acquisition research has shown that collaboration among learners facilitates language acquisition. Such advantages of collaboration have also been noted in online collaborative activities, such as project-based learning (Debski, 2000) or other task-based activities that require collaboration (Shield, Weininger, & Davies, 1999). Most supporting research has been of case studies in natural, not

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experimental, settings. Recently, however, a quasi-empirical study (Beatty & Nunan, 2004) of two groups of students, one working with an interface that was based on constructivist principles, the other on one that followed a behaviorist model, found that the constructivist interface did not lead to more collaboration, as hypothesized. The researchers note that, although hypertext provides learners with more choices and is said to lead to greater learner autonomy, in fact, learners may not have the necessary skills to navigate the choices productively, a finding similar to that of Toyoda (2001) for project-oriented CALL. Schwienhorst's analysis (2003) suggests that in keypal activities, in addition to computer literacy skills, activities need to be set up so that they are embedded in coursework, teachers need to explicitly teach learners to reflect, learners need to participate in the design of the activities, and time needs to be provided for reflection. In other words, collaboration is not a necessary consequence of CMC, but may need to be contextualized and scaffolded for learners.

Telecollaboration has been identified as "the application of global computer networks to foreign (and second) language learning and teaching in institutionalized settings" (Belz, 2003a, p. 2) and involves learners using CMC for a variety of interactions (for example, debate) with other learners distributed around the world. Within this broader theme, a focus on the sociocultural dimensions of such interactions has arisen, in addition to the more descriptive linguistic analyses of the language of interaction, the argument being that, not only does the distributed communication network of CMC facilitate access to native speaker language models and interaction, but to native culture. These studies (Belz, 2003b; Thorne, 2003a) have examined intercultural competence and found, among other things, that the medium provides an opportunity for cultures-of-use to co-evolve, just as other researchers have identified the evolution of hybrid discourses (see, for example, Lam, 2004).

CALL Programs

In a three-dimensional simulation program, learners doing the tasks required engaged in L2 (Spanish in this case) negotiation of meaning (Gonzalez-Lloret, 2003). In a broad survey of learners' perceptions of and attitudes to language learning activities delivered on the Web, Felix (2001) found that learners perceived the Web "as a viable environment for language learning in tertiary settings, especially as an add-on to face-to-face teaching" (p. 314). She does note, however, that another group that had been included in the study pulled out because of their frustrations with the technical difficulties they encountered, with two mature-age learners claiming to have lost all interest in learning the language. As in other studies (Toyoda, 2001), the limited computer literacy skills of the learners had a significant impact on student perceptions, perseverance, and success with online learning.

Using the Web to Support Learning

The World Wide Web provides the opportunity for language learners to access authentic materials in the target language. However, this very authenticity can be problematic for learners, in terms of the level of the language they access, the

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genres with which they are unfamiliar, and their ability to determine the reliability of the source (see, for example, Murray, 2003).

Research has identified a number of strategies teachers can use to prevent students from being lost in cyberspace, strategies that include teacher selection of web sites for students to visit (Corbel & Taylor, 2003; Murray, 2003), teacher-designed web pages (Murray & McPherson, 2004a), or careful scaffolding of web site reading (Murray & McPherson, 2004b). Such teacher-direction may seem antithetical to one of the purported advantages of using technology, that is, learner autonomy or self-direction (Healey, 1999; Jones, 2001). Yet another strategy is to design language learning activities that are essentially CALL, but delivered on the web rather than through CDs, a strategy has been discussed under CALL previously.

Motivation. Research has indicated that learners are highly motivated by the use of technology. For adult immigrants, this motivation is tied very closely to specific uses, ones that meet their needs to settle in their new country, but maintain links with their country of origin. Therefore, sites with information they desperately need, such as the driver knowledge test, or news sites of their own countries or e-mail to friends and family are a focus when left to their own devices (Lever, 2004). Learners do not always make the same choices of useful sites as their teachers do. Murray and McPherson report a teacher action research project in which the teacher chose music as the theme for his adult immigrant learners, but students soon dissuaded him, choosing Australian animals as a topic of more interest to them (2004a).

Conclusion

Although much of the literature on technology in language teaching and learning claims it promotes learner autonomy, several studies have now emerged indicating that, far from the technology automatically causing autonomy, just as in other instruction, the teacher needs to support learners' progress toward autonomy; that is, teachers need to scaffold instruction using technology. In general school education, Lankshear, Snyder, and Green (2000) propose a three-dimensional model that includes literacy education with digital technologies. Their operational dimension includes how the language system operates and how to operate the technology, from computer literacy to online searches; their cultural dimension refers to the fact that the operation of both language and technological systems takes place "in authentic forms of social practice and meaning" (p. 45); their critical dimension refers to critically evaluating texts, software, and online information. For learners to be digitally literate in the 21st century, they need to master all three dimensions, often in more than one language. To achieve this requires teachers to carefully scaffold L2 literacy learning. In research, we need systematic investigations that examine both process and product (learning outcomes) of both the linguistic and cultural dimensions of online language learning and that account for the factors in addition to the technology that influence language learning.

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Belz examines intercultural competence in the e-mail discourse of two German university students of English and a U.S. university student of German. However, her analysis of intercultural competence is based on linguistic analyses, rather than the more usual content analysis or interviews of participants. To do this, she usees appraisal theory from systemic functional linguistics, a theory that describes and explains evaluative language, how interlocutors manage interpersonal relationships in interaction. She also analyses modality. Their telecollaboration was not sustained, largely because of an inability on the part of the three participants to understand the culturally appropriate linguistic norms of the other's culture.

Lam, W. S. E. (2004). Second language socialization in a bilingual chat room: Global and local considerations. *Language, Learning and Technology, 8*(3), 44–65.

Lam describes a study of two teenage Chinese immigrants to the United States, who engaged in chat room interactions with other bilingual Chinese and Cantonese teenagers around the world. The participants moved between both languages and co-constructed a mixed-code variety of English with features from Chinese. These two young people carved out identities for themselves in this hybrid English that they were not able to do in standard American English in face-to-face contexts, a blending of the local and global.

Murray, D. E., & McPherson, P. (Eds.). (2004b). *Navigating to read; reading to navigate*. Sydney, Australia: National Centre for English Language Teaching and Research.

This edited volume discusses research conducted with five teachers of adult ESL learners in Australia using a collaborative action research model. The chapters include a discussion of the research findings, discussion of reading on- and off-line, scaffolding and chapters by each of the teachers describing their educational context and the activities they used with learners. Samples of teacher-developed activities are included.

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