
Technology in Language Use, Language Teaching, and Language Learning

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This article offers a capacious view of technology to suggest broad principles relating technology and language use, language teaching, and language learning. The first part of the article considers some of the ways that technological media influence contexts and forms of expression and communication. In the second part, a set of heuristic questions is proposed to help guide language teachers and researchers in determining how to incorporate technology into their teaching practice or research agenda and evaluate its suitability and impact. These questions are based primarily on the goal of helping learners to pay critical attention to the culturally encoded connections among forms, contexts, meanings, and ideologies that they will encounter and produce in different mediums, both traditional and new.

Keywords: technology; multiliteracies; computer-assisted language learning; electronically mediated communication; affordances

IN RECENT DECADES, ROBUST RESEARCH agendas have developed around various forms of Computer-Assisted Language Learning, accompanied by the development of professional organizations devoted to the applications of technology to language teaching such as CALICO, EUROCALL, and IALLT and specialized journals such as *Language Learning & Technology*, *ReCALL*, *CALL*, *System*, *Journal of Computer-Mediated Communication*, and *CALICO Journal*. This has been a very positive development. On the other hand, by defining technology narrowly in terms of computers and other digital devices, rather than as

a broad spectrum of mediational resources, it is easy to forget the great extent to which language teachers rely on many other forms of technology, ranging from writing to audio recordings, images, and film. One consequence is that much of the current technology scholarship risks limiting its shelf life, as specific hardware and software products come and go rather quickly. This article proposes a capacious view of technology in order to take stock of broad principles concerning technology and language use, language teaching, and language learning, in the hope that such principles will be applicable not only to today's current technologies but also to those yet to be invented.

Language teachers often find themselves caught in between contradictory discourses as they make decisions about how to use technology in their classrooms. On the one hand, technology

is often seen as a means to enhance intellectual capacity and creativity. Moreover, educators are increasingly under pressure to use technology to prepare students to live in a technologically interconnected, globalized world (even if it is not entirely clear what skills and competences students must have in order to function effectively in such a world). On the other hand, technology is sometimes portrayed as being detrimental to young people's thinking and literacy, with the 21st-century ethos of rapid access to bits of information leading to fragmented experience, compromised ability to focus on other people, and lessened ability to think critically or argue logically (Bauerlein, 2009; Carr, 2010). Other observers worry that technology is having a negative effect on language itself, viewing nonstandard forms in digital environments as a betrayal, distortion, and weakening of language (Thurlow, 2006). It is no surprise, then, that teachers often wonder whether they are making appropriate decisions about how to use technology in their classrooms. What is clear, however, is that it is not possible to 'opt out' of using technology: It is so pervasive and so interwoven with human activity that to teach language without some form of technology would create a very limited and artificial learning environment—if it were even possible at all.

The view adopted here is that teachers must pay attention to technology not because it is either a boon or a threat, but because technology inevitably affects language use. Technology shapes how people use language in particular instances, not as an autonomous, deterministic force, but in interaction with a range of factors including individual volition, social conventions, situational context, and material constraints (Kern, 2015). Since one of language teachers' key tasks is to help their students understand how linguistic and cultural norms operate, it is important for teachers to address how language is used in ways both old and new across different material mediums and technologies. The first part of this article will consider some of the ways technological media influence contexts and forms of expression and communication. We will then propose a set of heuristic questions to help guide language teachers and language researchers in determining how to incorporate technology into their teaching practice or research agenda and evaluate its suitability and impact. Our purpose is not to comprehensively review the research in these areas (for this we refer readers to the publications listed in the first paragraph, as well as Blake, 2013; Chapelle,

2009; Hubbard, 2009, and the December 2009 special focus issue of the *MLJ*). Instead, we reflect on some fundamental issues and decision-making processes related to the use of technology in language learning and teaching that are not commonly addressed in the research literature with the hope of extending the scope of future inquiry and teaching.

TECHNOLOGY AND THE SHAPING OF CONTEXTS AND FORMS

Language and technology have been deeply intertwined ever since the invention of writing some 5,000 years ago. By making language visible and preservable, writing enabled people to communicate across distance and time. Writing also made language an object of analysis, leading to the development of metalinguistic notions of words, parts of speech, and rules, which could be standardized in dictionaries and grammars and taught explicitly. The technology of writing gave new power to language not only by expanding the possibilities of human expression but also by providing a means for knowledge to be recorded and accumulated. Writing is the basis for much of our current-day electronic communication, and it is important to remember that it is as intrinsically bound to technological systems as it is to sign systems. The tools we use to write (and read) make a difference. Each one brings its own material properties, feel and techniques of use, affordances and limitations, and thereby establishes a particular relationship between writers (or readers) and texts. As Friedrich Nietzsche once wrote about a new typewriter, "Our writing instruments contribute to our thoughts" (Kittler, 1990, p. 195). Change the tool and you change the possibilities of communication. This is particularly evident in the age of digital media.¹

The cultural know-how needed to deal with technologized forms of language—whether as a producer or interpreter of meanings—is literacy, or plural *literacies* since language technologies vary dramatically and being literate in one mode does not imply being literate in all modes (Kern, 2015). Rather than attempting to distinguish between 'new' and 'old' literacies corresponding to 'new' and 'old' technologies, we propose an approach that focuses on how literacy practices always preserve some conventions from earlier technologies (e.g., we 'scroll' our electronic texts and often use 'paper' page layouts on our computer screens), while also developing novel medium-specific conventions (e.g., emoticons and ASCII art on

computer keyboards). When we ‘remediate’ earlier media (Bolter & Grusin, 2000) we influence the design of communication and express particular values and ideas about what communication is (Gitelman & Pingree, 2003; Manovich, 2001). The implication for language learners is clear: In addition to developing their grammar, vocabulary, and knowledge of pragmatics and genres, they also need to develop a disposition for paying critical attention to the culturally encoded connections among forms, contexts, meanings, and ideologies in a variety of material mediums.

Space, Time, and Presence

If speech originally required interlocutors to be present in the same place at the same time, the technologies of writing, telegraph, telephone, and radio made long distance communication possible. Today, digital technologies allow people to speak or write either synchronously or asynchronously, with participants either at a distance or in close proximity. These changes complexify the nature of spatial and temporal context in electronically mediated communication (Baron, 2008). With digital devices, people operate simultaneously in physical and symbolic spaces. They perform physical actions (e.g., typing, moving a mouse, swiping a screen or trackpad, or speaking and moving in a videoconference) in an embodied ‘here and now,’ but those actions are always transformed as they are projected into online spaces, where they operate symbolically at the level of the digital device. These actions sometimes take on further symbolic meanings at the ‘output’ stage when they are interpreted by others (e.g., a slip of a finger that produces a typo may be interpreted as a sign of carelessness or ignorance; a videoconferencing participant who glances repeatedly at an off-camera friend in the same room may seem nervous to his interlocutor who only sees his eyes look away from the screen but doesn’t know there’s someone else in the room).

Although presence still involves spatial and temporal dimensions in electronic communication, those dimensions function differently than they do in face-to-face communication. For instance, people talking on the phone or by Skype share an ‘interface space’ but not a physical place, and they may be occupying distinct psychological time frames or literally different time zones. The same applies when people text or email or use Facebook or leave a voicemail message, but in these cases, because they assume the other person will get their message at some later time,

they produce what Clark (1999) calls ‘disembodied’ language; that is, “language that is not being produced by an actual speaker at the moment it is being interpreted” (p. 43). In Clark’s analysis, all use of disembodied language demands the ability to deal with a layering of ‘real’ and ‘virtual’ operations. Texts, from Clark’s perspective, aren’t in themselves communicative acts, but *props* that get readers (or viewers or listeners) to *imagine* communicative acts between themselves and the ‘virtual agents’ they envision from the text. One thing language learners need, then, is experience in moving between the conventions of embodied and disembodied language use, moving between ‘real’ and ‘virtual’ operations. The use of new technologies—if they are sufficiently unfamiliar to users to draw explicit attention to their novel conventions—may be particularly helpful in raising learners’ consciousness of how such real/virtual shifts occur in all forms of technologized language use, including those which have become naturalized or normalized to the point of not seeming like technologies at all, such as writing (Kern, 2015).

In virtual environments like MOOs (text-based multi-user object-oriented domains), Second Life (a user-generated virtual world based on three-dimensional modeling), and massively multiplayer games (Cornillie, Thorne, & Desmet, 2012; Sadler, 2012; Thorne, 2008), people from various parts of the world convene in common virtual spaces. Within those spaces, they use language to re-create themselves in interaction with others (sometimes in ways quite different from their ‘normal’ selves). In MOOs, they design their own rooms and artifacts through verbal description and they develop linguistic cues to compensate for the lack of visual cues that normally accompany face-to-face communication. Second Life and multiplayer games have rich graphics that allow participants to design online avatars, but creating a personal identity, entering into relationships, negotiating common rules of social conduct, and accomplishing collaborative action must all be done through language. In the process of interacting, participants fabricate a textual reality that stimulates the imagination and transcends the actual reality of individuals sitting in front of keyboards and luminescent screens.

These and other environments (such as instant messaging, chat, and texting) afford textualized presence, which in turn allows one to be a presence ‘trickster.’ In instant messaging, for example, one can make it ‘appear’ that one is offline, when one is not, by blocking the unwanted correspondent’s screen name. Conversely, one can

make it look like one is online when one really isn't simply by not logging off when one leaves. In chatrooms and in Second Life, 'bots' (avatars controlled by software) can be programmed to speak in one's absence without giving any overt sign of being an automated surrogate. The ability to make things seem to be what they are not is a key affordance of electronic communication, and this is something language learners must be prepared for, since it is not unreasonable to expect that much of their personal and professional use of their second language (L2) will be in online environments.

New technologies require new negotiations of interactional time frame conventions, and these negotiations are not necessarily universal but more likely to be particular to an institution or group or even an individual. How long can one wait to answer an email that includes a request? What constitutes a 'quick' response? What constitutes an excessive delay? In all communication mediums answers will depend to some extent on the nature of the request (what the stakes are), who the requestor is, who the beneficiaries of the request are, at what time of day or night and what time of year one receives the request, and so on, including cultural and community-based norms and conventions. But the medium has its effects too. The fact that a given request arrives by email versus voice mail versus postal mail will undoubtedly affect the 'horizon of expectation' of how soon the sender expects an answer. Time frames also affect discourse itself: how 'fresh' the communicative context is (or can be expected to be) in participants' minds affects how much information is perceived to be shared, which in turn has consequences for what information is made explicit in a given message, how one's interlocutor is addressed (if at all; "Dear ___" may be awkward in quick back-and-forth exchanges), and so forth. Language learners need to be aware of these negotiations, and how, as they move from one cultural context to another, the 'rules' may change significantly.

In some forms of electronically mediated communication, the medium itself puts a premium on speed. For example, in chat, texting, or instant messaging, people often break up turns in exchanges so they can keep the contact and communicative rhythm going at a stimulating clip. In chats involving multiple participants, participants need to read and respond quickly, since more people means an accelerated turnover of messages. Because messages may not remain on the screen for more than a few seconds, the goal is to say as much as one can in a minimum amount of space

and time, leading to abbreviations. In such cases, time pressure can have graphic consequences, such as the use of Roman script in character-based languages such as Chinese (Lotherington & Xu, 2004) or the incorporation of homophonic numerals (e.g., a2m1 in French for *à demain* = see you tomorrow) to accelerate writing. Different languages may use different abbreviation conventions. For example, English takes the first letter of each word in a phrase (btw = by the way), whereas German sometimes takes the first couple of letters of each word, perhaps to improve pronounceability, as in *dubido* = *du bist doof* (you are dumb).

However, acceleration has its limits, since cognitive processing of text requires time, especially for language learners. As Harris (1995) points out, "[c]ommunication has to be *slow* enough to work" (p. 42). One of the traditional hallmarks of writing was that it afforded greater processing time than speech did.² But in the age of electronic communication, this is not always the case. Synchronous communication, taking place in 'real' time, affords less processing time than asynchronous communication, which in theory gives both writer and reader the necessary time to think, find information, and compose a message deliberately. On the other hand, the fact that online writing usually leaves a recoverable trace means that users have access to previous utterances, unlike most forms of spoken communication. Chat, for example, in effect expands the present by making it possible to 'rewind' spontaneous interactive discourse—which also affords more processing time when compared with speaking—as well as to re-represent it in new contexts. This can be a potential help to language learners, but it also can mean that their own discourse may be taken out of its original context and have unintended meanings attributed to it.

Reshaping Texts, Genres, and Reader/Writer Roles

As new literacy technologies come along, they add new possibilities for the production and consumption of texts. Word processing applications, electronic networks, and visual display screens make texts easily modifiable and quite amenable to collaborative authoring. Software programs provide extensive tools for layout, editing, and grammar- and spellchecking, helping some writers perform beyond their actual competence. Authors are more involved in decision making with regard to not only written style but also visual style (e.g., questions of typeface, color, proportion, and arrangement). Readers too can resize texts and sometimes modify their layout to suit their

personal preferences. They can print them on paper or read them as 'scrolling' documents online. Texts can be distributed by authors or readers to thousands of recipients worldwide with a mere keystroke.

In addition to these new ways of dealing with traditional texts, digital technologies also make possible new kinds of texts, allowing writing to be combined with voice, images, music, sound, and video in a single document. Digital storytelling (Hull & Nelson, 2005; Lundby, 2008) is one example of a multimedia authoring form in which language is but one mode of signification among many others.³ Studying the respective logics of different modes and how they function synergistically in digital storytelling, Hull and Nelson conclude that "it would seem hugely important to widen our definition of writing to include multimodal composing as a newly available means" (p. 252). Language learners might well be asked to participate in digital storytelling in an L2 (see Oskoz & Elola, 2014).

As an extension of new text types, digital technology also makes possible new forms of narrative (Murray, 1997), in which multiple alternative episodes and conclusions exist in parallel, giving readers an unprecedented sense of control over story events and outcomes. *À la rencontre de Philippe* (Furstenberg et al., 1993) was an excellent early example of a branching narrative specifically designed for learners of French. Today, students might collaborate collectively in developing a narrative online through a wiki environment or an online game—not a narrative to be made public, but for the students themselves, where those narratives, by virtue of being interactive, can be emotionally gripping (Bissell, 2010) as well as educationally rewarding (Gee, 2003).

Because digital texts run the gamut from images of medieval codices to today's tweets, it is important not to confuse medium with text type or genre. Writing or reading an email message is very different from writing or reading a blog, which is in turn very different from writing instant messages or participating in a chat room, yet all can be done on the same digital device. Genre is therefore a key concept when analyzing forms of technology use. Genres, like all other discourse conventions, both enable and constrain communication. They are sometimes associated with particular mediums, but they are also influenced by the particular social function and cultural context of a given act of communication. Nevertheless, it is important to acknowledge that digital interfaces can affect genres. Take tweeting (or microblogging), for example. In 2006, when

Twitter was first developed, it was described on its Web site as "A global community of friends and strangers answering one simple question: What are you doing?" By late 2009, that prompt had changed to "What's happening?" Although this is a minor modification in the Web interface, it has implications for the genre of tweeting because it shifts the attentional focus from the individual self to a more outward-looking perspective, a shift that parallels the evolution of blogs from single-authored online personal journals to a broader range of content and formats, including multi-author sites. Getting learners to think about how genres mediate between language, social context, and medium of expression introduces a certain level of abstraction that is necessary for the development of a critical awareness of language in communication.

Multi-Layered Contexts

Language teachers are highly conscious of what Firth (1964) called the context of situation as well as the linguistic context (or co-text). But in technologically mediated language use (from writing to audio recordings to digital media) they must also be concerned with the context of mediation, that is, the context of the physical medium itself (e.g., paper, screen, mobile phone, computer software and hardware, etc.) and how it interacts with other types and layers of context. The 'same words' in one medium (e.g., print) may be experienced quite differently when embodied in another medium (e.g., blog, audiobook, mobile phone novella, or instant message). Furthermore, the 'same medium' may function differently in different contexts. As Haas (1996) points out, "empirical studies aimed at understanding the effect of 'the computer' on writing in classrooms, or in corporations, must begin with an awareness that 'the' computer does not exist; rather, it is instantiated in vastly different ways through use by people in classrooms, homes, offices, and corporations" (p. 31). Bell's (2006) research has shown that this variability is even greater when one takes different cultures into account.

Computer-mediated communication (CMC) has been a popular platform for telecollaborative projects for at least 20 years. What has been underexplored in the CMC research literature is the interplay of the multiple contexts in which participants act: their physical settings (and the interactions embedded in them), the computer-based settings (applications such as email or Skype where the principal interaction is occurring, but also other open applications, such as Facebook

or chat windows), and all the interactions embedded in these windows (see Holmes, 1995; Jones, 2004; Wasson, 2006). As Jones (2004) points out, distinctions between 'real' and 'virtual,' 'text' and 'context,' 'focal activity' and 'backdrop,' 'sender' and 'receiver' are often blurred in CMC situations. But language learners have not always been asked to reflect on these blurred distinctions.

As Harris (2000) describes it, the computer is "the most powerful contextualization device ever known" because it not only integrates language with images and sound in variously manipulable configurations, but also because it links information across languages and cultures (p. 242). Collage, photomontage, and hypertext are all cases in which the original texts or elements thereof have been detached from their original context and then juxtaposed in new combinations or brought into contact with new elements to produce new meanings. The facility with which such manipulations can be done; the ability to dissimulate presence, absence, and identity; and the recontextualization power of the computer all raise a number of questions related to culture, values, and ethics.

Culture, Values, and Ethics

One question has to do with a certain culture of appropriation on the Internet. Many young people today consider what exists on the Internet as freely available raw material to be used however they see fit. Moreover, tools for copying and modifying this raw material are simple and abundant. What is distinctive about digital environments is not borrowing per se—for as Bakhtin (1986) reminds us, our texts are always filled with others' words—but rather the sense that borrowing does not require any acknowledgment. The world of Internet remixing and repurposing is largely anonymous and seemingly authorless. No doubt this ethos contributes to current debates about plagiarism and its cultural relativity even in nondigital environments (Chandrasoma, Thompson, & Pennycook, 2004; Ivanič, 1998; Pecorari, 2003). But multimodal texts take the debate to a new level in that they involve not only the borrowing of language, but of design more broadly, since the look, sound, and feel of a digital object can now be copied and pasted just as easily as language can (Perkel, 2007, 2008). Wertsch (1998) reminds us that our values related to original creation are a figment of the copyright age, that we tend to think of creative acts as arising ex nihilo, attributable solely to the genius of the

particular individual, and that we tend not to think about the mediational means and the cultural resources the creator relied on to produce the work (pp. 18–19). All this provides grist for the mill in language classrooms, where cultural conventions can be dissected, analyzed, and compared in order to glimpse the social values that underlie them. What is crucial, however, is that students have a clear understanding of the values and conventions that operate in the culture(s)—and particularly the academic and professional cultures—in which they live and work, as well as some sense of how those values and conventions came to exist.⁴

Another question has to do with personal presentation in technology-mediated environments. Participants in text-only online communication have greater control of their self-image and expression than they do in face-to-face settings, and Walther (1996) coined the term *hyperpersonal communication* to describe the phenomenon of people expressing themselves more fully or experiencing stronger affect in CMC environments than in face-to-face settings. This curation of the self can lead people to idealize and overestimate others' qualities. This is not necessarily a bad thing, but it is something language learners should be aware of as they interact with foreign key pals, since these interactions are often an important source of students' impressions and generalizations about the target culture. On the negative side, the relative anonymity and distance afforded by text-based electronic communication can increase the risk of misunderstandings, interpersonal tensions, and even verbal attacks. Few incidents of actual verbal attacks are reported in the language learning research literature (see Belz, 2003; Hanna & de Nooy, 2009; Kern, 2000; Kramsch & Thorne, 2002; Ware, 2005, for examples), but the general prevalence of linguistic violence online would suggest that the potential is greatest in interactions not organized or supervised by teachers. At the very least, learners should be aware that anonymity can be a double-edged sword. While it can be liberating, Zhao (1998) points out that in the case of student peer reviews, anonymity leads to more critical reviews—and less effort expended—than when reviewers are identifiable, presumably because anonymity reduces one's sense of social obligation and responsibility.

A related issue is what Ware (2005) calls 'missed communication.' In a study of online exchanges between German students of English and American students of German, Ware found that the nature of CMC exchanges, which tend to

encourage speed and brevity over sustained discourse, sometimes led to disengagement and missed opportunities for intercultural learning. Kramsch and Thorne (2002) argued that it is not just the technological medium or linguistic misunderstandings that can make intercultural CMC exchanges go awry, but also clashes in cultural frames and stylistic conventions of particular genres (and the discourse systems to which the genres belong). Hanna and de Nooy (2003, 2009) underscore the importance of communicative genres in their case study of learners of French who participated in an online forum sponsored by the newspaper *Le Monde*. The learners realized that the genre called ‘discussion’ was not universal but varied with the culture and the medium. In the context of French online forum discussions, politeness and linguistic accuracy were much less important than a willingness to be socialized into and follow the online community’s discourse rules. Genre and culture therefore interact to shape the conditions and constraints of communicative contexts and, by extension, communicative competence. Intercultural CMC studies underline the fact that online contact does not automatically produce intercultural understanding, which requires sustained negotiations of differences in genres, interaction styles, local institutional cultures, and culture more broadly.

Literacies always have political dimensions, and digital literacies are no exception. As Marvin (1988) puts it, new communications technologies present new “arenas for negotiating issues crucial to the conduct of social life; among them, who is inside and outside, who may speak, who may not, and who has authority and may be believed” (p. 4). The Internet has, of course, been a boon to commerce and cultural diffusion, and it has tremendous potential benefits for education, social inclusion, and political participation. On the other hand, the Internet can also be a tool for manipulation, domination, and exploitation. If the Internet serves intercultural dialogue, it also serves cultural imperialism. It is incumbent on today’s language learners to reflect on these issues. For example, learners need to think about how the representations of culture they see and hear on the Internet may be filtered and how they may be serving particular interests other than their own (Pariser, 2011). They also need to be sensitive to how other people, living in different cultures, may perceive and value technologies and literacy practices quite differently than they do. Most of all, they need to be responsible for their online actions, realizing that what might seem ‘virtual’

on their screen may have quite real and human consequences for those with whom they are communicating.

HEURISTIC QUESTIONS

Based on the previous discussion of how technology has changed and will continue to change the semiotic space within which learning takes place, we now offer a set of heuristic questions that are intended to help guide language teachers and language researchers in determining how best to incorporate technology into their teaching practice or research agenda. These four questions will be discussed in the balance of this article:

- Q1. What learning goals do I have for my students?
- Q2. What language, culture, and instructional resources do I have available?
- Q3. How can these resources be used and combined most effectively to serve the established learning goals?
- Q4. How will I assess how effective students’ use of these resources is in their attainment of the established learning goals?

1. Learning Goals: What Learning Goals Do I Have for My Students?

In terms of the learning goals that we have for our second/foreign language (L2) students, we begin with broad goals of being able to use language (L2) for communication and for meaning-making. To varying degrees, these goals are in line with ACTFL’s (1996) *Standards for Foreign Language Learning*, ACTFL’s 21st Century Skills Map (Theisen et al., 2011), the MLA’s (2007) promotion of *translingual and transcultural competence*, the Conseil de l’Europe’s (2001) *Common European Framework of Reference* project and the subsequent focus on *plurilingual and intercultural education* (Zarate, Lévy, & Kramsch, 2008), and calls to move beyond communicative competence, such as Kramsch’s (2006, 2009) notion of *symbolic competence*, the Douglas Fir Group’s proposal (this issue), and Lotherington and Ronda’s (2014) notion of *communicative competence 2.0*, which is conceived to match shifting technological and social trends and encompasses multimedia competency, collaborative communication, agentive participation, and multitasking competency (p. 19).

Commonly proposed concepts that encompass these goals are *multiliteracies*, *new literacies*, and *21st century literacies*. In general, these terms are typically used to suggest, as the National Council of Teachers of English (2013) does, that “Literacy

has always been a collection of cultural and communicative practices shared among members of particular groups. As society and technology change, so does literacy" (n.p.).

Since literacy is rapidly changing and transforming as new information and communication technologies emerge, learners (and teachers) need to understand that new types of discourses, social practices, and skills are required to make use of these technologies (Baker, 2010; Lankshear & Knobel, 2006; Leu et al., 2014). Moreover, due to the ever-changing technologies available, literacy is not just new today; it is new every day, as new technologies for literacy appear regularly and rapidly (Leu, 2000). This contributes to what Leu characterizes as the 'deictic' nature of literacy, making prediction and planning extremely difficult for teachers. We therefore propose an approach that relieves teachers of being constantly either 'predictive' or 'reactive' by focusing on the 'big picture' of literacy, preparing students to deal with whatever new technologies they encounter in their lifetimes. Specifically, as suggested in the first part of this article, one critical goal for our students is that they pay attention to the culturally influenced relations among semiotic forms, social contexts, material mediums, and meanings.

In addition, in line with the social turn in foreign language education and the Douglas Fir Group's suggestions (this issue), we might wish to view literacy learning as a process by which the L2 learner is socialized for group membership in specific L2 literate communities, as suggested by Lam (2000). Lam cites the goals of New Literacy Studies (e.g., Gee, 1996), which illuminate the contextual nature of reading and writing and views literacy as intimately bound with particular sociocultural contexts, institutions, and social relationships. In other words, language learners must be flexible in moving from one cultural context to another, no matter the medium or the technology.

In the context of foreign language pedagogy, we suggest the compatibility of literacy-based approaches (e.g., Byrnes, 2005; Kern, 2004; Paesani, Allen, & Dupuy, 2015; Swaffar & Arens, 2005; Swaffar & Urlaub, 2014) with uses of technology, defining literacy as the ability to deal with technologized forms of language use. One of the goals of literacy-based language teaching is to reconcile communicative language teaching (CLT), with its focus on face-to-face verbal interaction, with helping learners develop the ability to read, discuss, reflect on, and write critically about texts in all modalities. Thus, rather than differentiate

between 'old' and 'new' technologies we look for continuities as well as innovations across time and mediums.

In addition, we would like learners to produce or create text (as in essays, written chats), visuals (as in pictorial glossing, photos or graphics interspersed with text), audio (as in recordings, audio chats), and video (as in videoclips, video chats, digital storytelling). They should be able to critique, analyze, and evaluate both the meanings they want to convey as well as the meanings produced by others.

Fostering the aforementioned abilities leads to a related question of how to guide learners to be critically aware of and to reflect critically on the symbolic and virtual realities of technologies. Just because the millennial generation has grown up using technologies does not mean that they are capable of critical reflection. For example, they must be aware that crowdsourced material (e.g., Wikipedia) might be the first source they consult but should not be the last. In addition, they must realize that the words or images used in one medium may be used and experienced differently in another medium, so careful thought is required when using different technological mediums.

Similarly, Web 2.0 introduced forums for virtually everything, from esoteric topics to product reviews and entertainment. The language of forums also varies widely, and if forums in L2 are being used as authentic input for learners, teachers and learners must be aware of distinguishing different registers of language found in different types of forums, for example, academic and professional forums that might be used in formal intercultural exchanges as compared with informal social venues such as Facebook.

One final question in setting goals is how we decide to use (or not to use) new genres. For example, if teachers themselves aren't tweeting, can they teach this skill or expect their students to tweet? Do we also have to teach the protocols and norms for tweeting in different languages? Likewise, how important is it for learners to participate in new kinds of social groups, such as Facebook, online communities, and forums? What do L2 learners (and their teachers) need to know about the syntax and pragmatics of communicating in these different types of communities? Do we believe that agentive participation is essential to language learning, by having students access, join, and become involved in sites of interest, or asking them to access, create, share, and remix purposeful content (Lotherington & Ronda, 2014, p. 19)?

Does developing multiliteracies mean that learners must be able to access and master *all* of the available communication media?

2. Language, Culture, and Instructional Resources Available

Asking the question “What language, culture, and instructional resources do I have available?” entails considering *both* the traditional resources that teachers have used for decades as well as familiarizing oneself with what is available through new media and digital resources, and more importantly, being open, flexible, and critical with respect to what will be available in the future that we cannot anticipate or predict.

The approach we are proposing focuses on how different mediums and instructional resources influence the way we design communicative tasks for learners. In addition to the traditional linguistic aspects (e.g., grammar and vocabulary) and genre knowledge (which has changed and expanded with the new media available), we must also acknowledge the importance of learners and teachers alike becoming critically aware of the new connections between forms, contexts, meanings, and ideologies in a wide and growing array of media. We as teachers must think about how we might creatively use new technologies for language and culture learning tasks that go beyond the ‘default’ mode and that help students develop the particular types of communicative competence that we desire for them.

As discussed in the first section, technologies broadly include more traditional media and instructional resources including print media (textbooks, workbooks, literature), which include words, texts, illustrations, graphics, photographs; audio media (e.g., recorders and players in language labs); video media (e.g., film clips and films); writing media (paper and pen, typewriters); classroom technologies (black boards, white boards, overhead projectors). Newer media resources generally refer to computer-based (and now mobile) technologies, many of which are tied integrally to the Internet. *Multimedia* denotes the ability to combine text, graphics/visuals, audio, and video altogether in the same instructional program, application, or Web site.

Historically, the so-called Web 1.0 applications are described with the following qualities: one-to-one; static, read-only pages; having the vast majority of users mostly content consumers; individuals (or groups) owning content, that is, personal (or business) Web sites. In contrast, Web 2.0 applications are characterized as being: one-to-many

or bi-directional; dynamic, read-and-write pages; ‘participatory,’ where the vast majority of users are content creators and share their content; ‘collaborative,’ ‘interactive,’ with a strong social component (e.g., Facebook, wikis, blogs, podcasts, Wikipedia, Flickr, YouTube, Vimeo). There are also the many forms of CMC: texting, instant messaging, SMS; chatting (text, audio, video); social media (Facebook, *tuente* for Spanish, *renren* for Chinese, Instagram, Twitter, Friendster, MySpace, Ello, Diaspora). Of particular relevance to language teachers and learners is the Twitter hashtag #langchat, which marks tweets related to language teaching and learning. As discussed earlier, the lines are blurring between those types of CMC that are *asynchronous* and those that are *synchronous*.

Moving forward, the features of Web 3.0 that have been predicted and are emerging are: personal and portable (what smartphones are: a personal assistant); having an individual focus of taking a user’s previous actions to interpret and make connections with this information; the ‘semantic’ web, consolidating content; and augmented reality (e.g., Google Earth, the London Underground augmented reality app, now called “London Tube”). Understanding the *affordances* of these different types of technologies forms the underlying rationale for selecting particular ones for language teaching and learning, and this is true of older technologies as well as future technologies, whatever they may be.

In addition to the technologies previously discussed, there are many types of digital games, from individual games for mobile devices (e.g., for vocabulary learning) to massively multiplayer online games (e.g., for role-playing, simulations, sports). Virtual environments and virtual realities are currently trending. Automatic speech recognition (ASR) technologies and automated writing evaluation (AWE) tools are continually improving, as are text-to-speech applications. Corpora for many languages, both written and spoken, are being compiled, and tools are being developed so that they can be used by learners, teachers, and researchers alike. For any of these current or future resources, the critical question is how they can be adopted and adapted for literacy-based language learning, teaching, and researching purposes, leading to the next section.⁵

3. Using and Combining Available Instructional Resources to Achieve One’s Goals

Developing multiliteracies requires an understanding of how the contexts in which

communication takes place have been changed by technology. In this section we consider heuristic 3—“How can these resources be used and combined most effectively to serve the established learning goals?”—and we discuss these goals in relation to traditional and new(er) technological resources that can be used to achieve them.

To consider some specific L2 skills, in terms of conversational speaking abilities, if the goals are for learners to converse with native speakers (or others who speak the language), then opportunities can be provided with CMC technologies, with more and varied options to speak with geographically distant (native) speakers than in the classroom or where one lives. However, sometimes technical problems, such as the lag in the transmission, or the fact that one must look at the computer's camera rather than into the interlocutor's eyes, can make the conversational experience less natural and possibly less comfortable (Kern, 2014). Caution must be exercised when new technologies emerge: For example, a new Skype Translator (<http://www.skype.com/en/translator-preview/>) allows a speaker of one language to ‘converse’ with a speaker of another language with the help of a real-time virtual translator. In addition, simply being able to converse with anyone anywhere does not mitigate the potential awkwardness of talking with a complete stranger or exchanging more than general pleasantries. If the goal is communicating effectively and intelligently about multimodal texts, then it is imperative to carefully develop tasks that take advantage of the affordances of technologies while understanding some of their limitations.

Similarly for listening, if the goals are to comprehend naturalistic speech, many resources are readily available online for listening at any time and in any place. For example, the abundance of videos online (YouTube, Vimeo) provides examples of speech in many languages and also in many varieties/dialects of the same language. For real-time conversations, CMC technologies allow for audio- and videoconferencing. However, the same caveats with regard to speaking apply to listening. Specifically, being able to comprehend what an interlocutor is saying in a videoconference requires adjusting to the reduced audio quality as compared with face-to-face conversation. When it comes to interacting with a stranger, in the case of conversations in Livemocha (a free online language learning community whose Web site provides instructional materials and opportunities for learners to interact with each other online) or in virtual worlds, there is undoubtedly a need to adjust to each individual's accent and

personal speech, which likely contains many elisions and colloquialisms. Some research exists on the benefits of using software to slow speech as a way for learners to ‘practice’ and improve their listening abilities (East & King, 2012; McBride, 2011). But it is the teacher's decision as to whether this is an effective tool. As always, the learners' proficiency level must be taken into account when deciding whether or not to use a particular technology.

As for L2 reading, if the goals go beyond comprehending written texts to include multimodal texts and materials, then a combination of traditional and new media resources is in order. It is already common in L2 education to have learners read material on the Internet, in part for its authenticity and current/topical interest, but also because understanding content on the Internet is part and parcel of 21st century life. In reading online, however, simply having access to dictionaries or translation tools does not necessarily promote long-term learning of a word or overall comprehension. Many teachers strongly discourage the use of online translation tools, but instead of categorically forbidding students to ever use translation tools, perhaps it might be prudent to teach them how to use such tools to produce an even better understanding of a text than they would have been able to by using the more traditional tools and strategies for L2 reading. The reading process itself may be transformed from an individual practice into a new, social one, as suggested by Blyth (2014). E-reading devices, such as the digital social reading program *eComma*, allow readers to annotate a text and to share those annotations with others, exemplifying the ‘participatory culture’ that is typical of Web 2.0.

It is also essential to teach L2 learners how to fully understand and appreciate multimedia materials. Graphics, images, photos, and videos that accompany texts can aid in the reading comprehension process, but by the same token can also be distracting and misleading. Learners must be able to critically assess whether and how meaning is enhanced or detracted from by multimodal information. Becoming critical users of technological tools and media is an important aspect of new media literacies. Some learners might be aided by a text-to-speech program that ‘reads’ a text to them. Other learners might be helped by hyperlinks leading to other relevant information about a text. But in all cases, learners must be made aware of the ways in which multimedia can help with comprehension as well as the ways in which it could be deleterious. In other words, learners should be sensitive to the cultural relevance of

language and multimodal information (e.g., a photo that is not culturally appropriate may give the learner a false sense of the actual meaning of a word or concept).

With regard to L2 writing, if the goals are for learners to be able to make meaning using all of the technologies available to them (including analog as well as digital technologies), then learners must also be taught about different discourse styles and registers depending on the medium, purpose, and context. They can first be exposed to new genres with reading activities (e.g., blogs, wikis, fan fiction), and when they have become familiar with them as readers, they can be asked to create their own content (see Sauro, 2014). One of the challenges will be for teachers to assign writing activities that combine traditional and new media activities to promote new literacies. For example, as mentioned earlier, teachers could discuss 'cut-and-paste' literacy with their students, along with how Google Translate might be used effectively, or students could be asked to create their own digital stories, which could entail not just writing, but speaking/narrating as well, and using visuals and graphics to convey messages and meaning.

For comprehension on the sentence and discourse levels, if the learner's native language (L1) uses different types of discourses than the L2, learners must first be aware of typical discourse in the L1 before being able to notice and understand similar discourse in the L2. For example, if Facebook is used for L2 learning, then it would be necessary for *both* teachers *and* learners to be familiar with the norms of its use in both the L1 and the L2. It is conceivable that, while having students use Facebook may have its benefits in terms of engaging students in dialogue with peers or in familiarizing them with social media in an L2, there may also be (unexpected) misunderstandings if the discourse styles between the L1 and the L2 are different (Ware & Kramsch, 2005). The ultimate goal in rectifying misunderstandings is Kramsch's (2009) symbolic competence, which is "an ability to draw on the semiotic diversity afforded by multiple languages to reframe ways of seeing familiar events" (p. 201).

Finally, developing L2 learners' pragmatic and intercultural communicative competence is a lengthy process of cultivating cultural awareness, understanding, and changes in attitudes and perceptions about one's own and other cultures. Some studies on intercultural exchanges have found that advanced learners do indeed demonstrate the use of appropriate pragmatic strategies while others with similar linguistic

competence are not successful in carrying out meaningful online conversations (Chun, 2011). Technologies can play a role in this evolution, and no single technology will be responsible for making this happen. Rather, online tasks, such as watching videoclips or films, or conducting different types of intercultural exchanges (e.g., using chats, forums, email, and creating one's own videos or blogs) *must* be combined with targeted and extensive follow-up discussions in face-to-face classes to ensure that misunderstandings are minimized and new stereotypes are not created. In addition, careful attention must be paid to what is considered 'timely' in terms of response times, as well as the degree of trust and comfort the students have in online discussions. In a study by Chun and Wade (2004), students in a 2nd-year German class who participated in an online intercultural exchange with students in Germany who were learning English were much more polite and tactful in their online postings than they were in their class discussions about how they perceived their German exchange partners.

The choice and combination of technologies will depend on one's overall goals and pedagogical approach. If multiliteracies are desired, the affordances of the different technologies must be considered for their ability to focus on language use in particular social contexts, and teachers must integrate tasks requiring critical reflection about how particular discourses are constructed, how they are used to communicate and achieve various social ends, and how they are related to the culture(s) in which they are embedded.

4. Evaluating Language Learning Resources and Assessing Students' Use of Them

Assessing students' use of digital resources in meeting the established goals is a challenging, multifaceted, and dynamic process, one that goes beyond the 'effective/ineffective' dichotomy often present in assessments of learning outcomes. Certainly, language learning outcomes are important measures of a digital tool's value, but one must establish that those outcomes are based at least in part on students' effective use of the digital tool being investigated. Before we can really talk about assessing students' use of a given resource we need to address the larger issue of digital tool evaluation in general. Keeping heuristics 1–3 in mind, if we opt for a digital tool, then we need to look (at a minimum) at the tool's *affordances*; the *experiences and expectations of our particular students*; and the *language learning environment* itself, both inside and outside the classroom. Only

then does it make sense to explore how learners engage with a tool and determine the extent to which this engagement has helped them reach their teacher's or their own language learning goals.

Affordances of Digital Tools. Digital tools are not neutral. Rather, like all tools, they have specific affordances and constraints, which can actively shape what teachers and learners can do with them. Ignoring the specific affordances and constraints of computer-assisted language learning (CALL) tools is likely to result in incompatibility between goals and tools, as well as more generally between pedagogy and technology, which can severely limit the effectiveness of technology as an educational tool. In an examination of the affordances of various computer-mediated communication (CMC) tools, Smith, Alvarez-Torres, and Zhao (2003) suggested four qualities that are fundamental in distinguishing one CMC tool from another: temporality, anonymity, modality, and spatiality. In terms of *temporality*, the amount of time expected for a message to reach its audience has considerable impact on the discourse and behavior of the interactants. For example, synchronous computer-mediated communication (SCMC) discourse via chat programs has unique structural, interactional, and participatory patterns (Kern, 1998; Smith, 2003; Zhao, 1998). The immediacy of message transmission has an effect on the way topics are explored as well as the amount of student and teacher production (Chun, 1994; Kern, 1995). *Anonymity* has been argued to contribute to an atmosphere of critical receptivity (Kern, 1998) and decreased inhibition (Herring, 1996). *Modality* features include the availability of text, audio, video, and graphics, which certainly influence a tool's potential for achieving a specific goal. For example, Chun and Plass (1996) found a significant effect for annotation type on lexical retention. Finally, CMC technologies possess varying capacities for manipulating *spatial* distance during communication. For example, avatar proximity has been shown to affect conversational appropriateness among participants as well as one's social attraction in a virtual world environment (Krikorian et al., 2000).

Student Experiences and Expectations. Evaluating the effectiveness of language learning resources (LLRs) should begin with the question "effective for whom?" In order to answer this question we need to consider learner variables such as age, proficiency level, L1, educational experiences, interests, and technolog-

ical sophistication. Hubbard (2011) offers a flexible evaluation framework that encompasses the notions of affordances discussed previously and explicitly takes into account the *experiences* and *expectations* of both the teacher and the learners. Key to the current discussion are Hubbard's rubrics of teacher and learner fit. 'Teacher fit' is essentially a combination of her language teaching approach coupled with her beliefs regarding the computer as a delivery system in terms of content and pedagogy and also how well the LLR is compatible and consistent with these two elements. For example, if presenting language in context is part of a teacher's beliefs about language learning, then resources that rely primarily on a decontextualized 'drill and kill' approach are not a good fit. 'Learner fit' refers to the degree to which an LLR is compatible with the learner variables described earlier. It also encompasses the linguistic objectives and language skills of the target course and the extent to which the LLR is a good match.

Language Learning Environment. Related to both teacher and learner fit is the fact that teachers attempt to achieve curricular goals with the resources that are available to them. Indeed, one's resources and accessibility may very well limit a teacher's initial list of potential LLRs to begin with. For example, if the school in which a teacher works does not have a computer lab or even an Internet connection for that matter, but rather two computers in each classroom, there will certainly be no need to evaluate a Web-based LLR such as Mango Languages (which provides online lessons, films, and other materials) for in-class use. However, students may very well all have cellphones, which would make an evaluation of the Mango mobile app potentially useful. The *TESOL Technology Standards* (Healey et al., 2008) provide goals, standards, and performance indicators for technology use for both teachers and students. Particularly helpful are vignettes for each standard that show examples of how one might achieve these in limited, medium, and high technology settings. Teachers should keep in mind that even in the most technologically advanced classroom, the best learning may not come from the most sophisticated tools.

Assessing Students' Use of Language Learning Resources (LLRs). Whereas affordances speak to an LLR's potential for success in meeting our goals, a large part of choosing the right LLR for particular curricular goals requires an evaluation of how learners (and teachers) manage to successfully

use technological resources. In order to conduct such an evaluation, one needs to have a clear and compelling record of actual process data. That is to say, capturing a record of what learners are actually doing while engaged with an LLR can provide more direct evidence of the LLR's efficacy. Such data may be collected via input logging software, video screen capture programs such as Camtasia, or eye-tracking technology. These data can show us the choices learners make when interacting with a program or interlocutor via an LLR and the effect of these choices on their interlocutor. They also show us *when* they make these choices, and, to some degree, the *process* they engage in when arriving at these choices. Such process data are important as relying purely on outcome data can be very misleading. Pre- and posttest scores, for example, may provide us with important correlational data on the effectiveness of a particular LLR, but such gain scores alone typically cannot tell us the extent to which the LLR played a significant role in any observed gains. Further, they tell us nothing about *how* learners are actually engaging with a tool (or not) or *why* they are making the choices they do. While self-report data, such as student surveys, questionnaires, and interviews, may do a good job regarding the *why* question, they have been shown to be quite limited in providing empirical information regarding *what* learners do during human-computer or human-human interaction via a computer (Fischer, 2007, 2012). To answer these questions one needs to employ some sort of tracking technique. In terms of human-computer interaction the tracking research has shown that students often use the software quite differently from how developers intended (Pujola, 2002) and that there is much individual learner variability in interaction with CALL programs and in the amount of material learned (Chun, 2013; Chun & Payne, 2004; Collentine, 2000; Heift, 2007).

Screen Capture. Tracking user behavior with screen capture software allows researchers to actually see how learners are engaging with a program or with one another. For example, as suggested earlier, chat software affords the possibility for learners to 'rewind' during a synchronous discussion. Whether learners actually do this, however, is an empirical question. Smith (2009) found that, depending on the task type, learners are not inclined to capitalize on this affordance. Using the screen capture software Camtasia, researchers have also established that relying on chat logs alone is insufficient in explorations

of important second language acquisition (SLA) constructs such as learner self-repair (O'Rourke, 2008, 2012; Smith, 2008). They have also shown the effect such self-repair has on the complexity of subsequent learner output (Sauro & Smith, 2010; Smith & Sauro, 2009).

Eye Tracking. Though eye tracking has been used for many years in human-computer interaction, CALL scholars have only recently begun to use this technology in their research. Researchers have explored the relationship between L2 (teacher) recasts, noticing, and learning during task-based SCMC (Smith, 2010, 2012; Smith & Renaud, 2013). This work has provided new insights into the nature and efficacy of teacher provided recasts in CMC environments. Stickler and Shi (2015) combined eye tracking with stimulated recall interviews to investigate online language tutorials, looking not only at learners' online reading processes but also their speaking interactions with other learners and the teacher.

In choosing the best LLRs to meet their students' needs, teachers must take into account the tools' affordances, learner/teacher fit, available institutional resources, and Internet accessibility. They must also assess students' use of potential and adopt LLRs in terms of reaching their goals. The former is best done by employing existing frameworks for LLR evaluation, whereas the latter can be achieved through a combination of subjective and objective measures of LLR palatability and effectiveness coupled with process-oriented measures such as eye tracking. In this way we can both evaluate LLRs and assess students' use of these resources to achieve our established pedagogical and learning goals.

CONCLUSION

Technology provides new ways for languages, cultures, and the world to be represented, expressed, and understood. But those new ways of representing, expressing, and understanding cannot be counted on to develop automatically. Young people today learn digitally mediated modes of expression largely from one another outside of school, and they engage with digital technologies in ways that are often more varied and more sophisticated than those they encounter at school (Jenkins et al., 2009). This raises the question of how teachers should approach the incorporation of technology in their teaching. In this article, we have outlined some of the issues related to technology and language use in order to set the stage for a series

of heuristic questions to guide teachers and researchers in determining for themselves how best to incorporate technology in their teaching and research. Our message has been that the use of technology should not be seen as a panacea, or a goal in and of itself, but rather as one means to support specific learning goals. How a given form of technology is incorporated will vary, depending partly on the learning goals but also on the learners' abilities and interests, the kinds of resources available, and the academic culture of the institution. Assessment of student learning can similarly take many forms, but should focus on the *process* of meaning making and learning with the technology, and not just a set of posttest scores.

When teachers and learners use technology purposefully, and not just for its own sake, they will inevitably engage in some degree of critical reflection. Just as the technology of writing made language an object of analysis, today's communication technologies provide a means for language learners to become aware of, and actively reflect on, their own and others' communicative practices. What is important for language teachers and learners alike is to attend to the particular ways technologies influence how they use language, what communicative consequences follow those uses of language in terms of understanding and learning, and what social consequences might come of using one form of technology versus another. We believe that reflection on these matters is key to fostering communicative proficiency in a second/foreign language.

NOTES

¹ Think, for example, of writing in Twitter as compared to blogging, writing an email message, conversing in a chat room, or writing a handwritten note.

² Unless, of course, one was transcribing speech in real time.

³ Even in 1996, Kress and van Leeuwen argued that "The place of language in public forms of communication is changing. Language is moving from its former, unchallenged role as *the* medium of communication, to a role as *one* medium of communication, and perhaps to the role of the medium of comment, albeit more so in some domains than in others, and more rapidly in some areas than in others" (1996, p. 34).

⁴ We refer readers to the evolving fair use guidelines for educational multimedia (<http://fairuse.stanford.edu/overview/academic-and-educational-permissions/proposed-fair-use-guidelines/>) and to basic information about Creative Commons licenses (<http://www.docs.is.ed.ac.uk/docs/data-library/user-guides/multimedia-dl-plus.pdf>).

⁵ Digital repositories abound online, such as the Department of Education's Title VI Language Resource Centers (<http://nflrc.org/login/scripts/materials.php>), the Center for Open Educational Resources and Language Learning (<https://coerll.utexas.edu/coerll/>), the World Languages portal of MERLOT (Multimedia Educational Resource for Learning and Online Teaching) (<http://worldlanguages.merlot.org/>), and individual language teacher associations (e.g., AATSP's <http://www.aatsp.org/?page=ClassResourcesPublic>; AATJ's <http://www.aatj.org/classroom-resources>).

REFERENCES

- American Council on the Teaching of Foreign Languages (ACTFL). (1996). *Standards for foreign language learning: Preparing for the 21st century* (executive summary). Yonkers, NY: ACTFL.
- Baker, E. A. (2010). *The new literacies: Multiple perspectives on research and practice*. New York: Guilford.
- Bakhtin, M. M. (1986). *Speech genres and other late essays* (V. W. McGee, Trans.). Austin, TX: University of Texas Press.
- Bauerlein, M. (2009). *The dumbest generation: How the digital age stupefies young Americans and jeopardizes our future (or, don't trust anyone under 30)*. New York: Tarcher/Penguin.
- Baron, N. (2008). *Always on: Language in an online and mobile world*. Oxford: Oxford University Press.
- Bell, G. (2006). The age of the thumb: A cultural reading of mobile technologies from Asia. *Knowledge, Technology, & Policy*, 19, 41–57.
- Belz, J. A. (2003). Linguistic perspectives on the development of intercultural competence in telecollaboration. *Language Learning & Technology*, 7, 68–99.
- Bissell, T. (2010). *Extra lives: Why video games matter*. New York: Pantheon.
- Blake, R. J. (2013). *Brave new digital classrooms: Technology and foreign-language learning* (2nd ed.). Washington, DC: Georgetown University Press.
- Blyth, C. S. (2014). Exploring the affordances of digital social reading for L2 literacy: The case of eComma. In J. Guikema & L. Williams (Eds.), *Digital literacies in foreign language education: Research, perspectives, and best practices* (Vol. 12, pp. 201–226). San Marcos, TX: CALICO.
- Bolter, J. D., & Grusin, R. (2000). *Remediation: Understanding new media*. Cambridge, MA: The MIT Press.
- Byrnes, H. (2005). Literacy as a framework for advanced language acquisition. *ADFL Bulletin*, 37, 11–15.
- Carr, N. G. (2010). *The shallows: What the Internet is doing to our brains*. New York: W. W. Norton.
- Chandrasoma, R., Thompson, C., & Pennycook, A. (2004). Beyond plagiarism: Transgressive and nontransgressive intertextuality. *Journal of Language, Identity & Education*, 3, 171–193.
- Chapelle, C. A. (2009). Computer-assisted language teaching and testing. In M. Long & C. Doughty

- (Eds.), *The handbook of language teaching* (pp. 628–644). Malden, MA: Wiley-Blackwell.
- Chun, D. M. (1994). Using computer networking to facilitate the acquisition of interactive competence. *System*, 22, 17–31.
- Chun, D. M. (2011). Developing intercultural communicative competence through online exchanges. *CALICO Journal*, 28, 392–419.
- Chun, D. M. (2013). Contributions of tracking user behavior to SLA research. In P. Hubbard, M. Schulze, & B. Smith (Eds.), *Learner-computer interaction in language education* (pp. 256–262). San Marcos, TX: The Computer Assisted Language Instruction Consortium.
- Chun, D. M., & Payne, J. S. (2004). What makes students click: Working memory and look-up behavior. *System*, 32, 481–503.
- Chun, D. M., & Plass, J. L. (1996). Effects of multimedia annotations on vocabulary acquisition. *Modern Language Journal*, 80, 183–198.
- Chun, D. M., & Wade, E. R. (2004). Collaborative cultural exchanges with CMC. In L. Lomicka & J. Cooke-Plagwitz (Eds.), *Teaching with technology* (pp. 220–247). Boston: Heinle & Heinle.
- Clark, H. H. (1999). How do real people communicate with virtual partners? *Proceedings of 1999 AAAI Fall Symposium, Psychological Models of Communication in Collaborative Systems* (pp. 43–47). Falmouth, MA: AAAI.
- Collentine, J. G. (2000). Insights into the construction of grammatical knowledge provided by user-behavior tracking technologies. *Language Learning Technology*, 3, 44–57.
- Conseil de l'Europe. (2001). *Un cadre européen commun de référence pour les langues: apprendre, enseigner, évaluer* [A common European framework of reference for languages: learning, teaching, evaluating]. Paris: Didier.
- Cornillie, F., Thorne, S. L., & Desmet, P. (2012). Digital games for language learning: From hype to insight? *ReCALL*, 24, 243–256.
- East, M., & King, C. (2012). L2 learners' engagement with high stakes listening tests: Does technology have a beneficial role to play? *CALICO Journal*, 29, 208–223.
- Firth, J. R. (1964). *The tongues of men and speech*. London: Oxford University Press.
- Fischer, R. (2007). How do we know what students are actually doing? Monitoring students' behavior in CALL. *Computer Assisted Language Learning*, 20, 409–442.
- Fischer, R. (2012). Diversity in learner usage patterns. In G. Stockwell (Ed.), *Computer-assisted language learning diversity in research and practice* (pp. 14–32). Cambridge: Cambridge University Press.
- Furstenberg, G., Murray, J. H., Malone, S., & Farman-Farmaian, A. (1993). *A la rencontre de Philippe*. New Haven, CT: Yale University Press.
- Gee, J. P. (1996). *Social linguistics and literacies: Ideology in discourses* (2nd ed.). London: Taylor & Francis.
- Gee, J. P. (2003). *What video games have to teach us about learning and literacy*. New York: Palgrave Macmillan.
- Gitelman, L., & Pingree, G. B. (Eds.). (2003). *New media, 1740–1915*. Cambridge, MA: The MIT Press.
- Haas, C. (1996). *Writing technology: Studies on the materiality of literacy*. Mahwah, NJ: Lawrence Erlbaum.
- Hanna, B. E., & de Nooy, J. (2003). A funny thing happened on the way to the forum: Electronic discussion and foreign language learning. *Language Learning & Technology*, 7, 71–85.
- Hanna, B. E., & de Nooy, J. (2009). *Learning language and culture via public internet discussion forums*. Basingstoke, UK: Palgrave Macmillan.
- Harris, R. (1995). *Signs of writing*. London: Routledge.
- Harris, R. (2000). *Rethinking writing*. Bloomington, IN: Indiana University Press.
- Healey, D., Hegelheimer, V., Hubbard, P., Ioannou-Georgiou, S., Kessler, G., & Ware, P. (2008). *TESOL Technology Standards Framework*. Alexandria, VA: TESOL.
- Heift, T. (2007). Learner personas in CALL. *CALICO Journal*, 25, 1–10.
- Herring, S. C. (Ed.). (1996). *Computer-mediated communication: Linguistic, social and cross-cultural perspectives*. Philadelphia/Amsterdam: John Benjamins.
- Holmes, M. E. (1995). Naming virtual space in computer-mediated conversation. *ETC: A Review of General Semantics*, 52, 212–221.
- Hubbard, P. (Ed.). (2009). *Computer assisted language learning: Critical concepts in linguistics* (Vols. I–IV). New York: Routledge.
- Hubbard, P. (2011). Evaluation of courseware and websites. In L. Ducate & N. Arnold (Eds.), *Present and future perspectives of CALL: From theory and research to new directions in foreign language teaching* (pp. 407–440). San Marcos, TX: CALICO.
- Hull, G. A., & Nelson, M. E. (2005). Locating the semiotic power of multimodality. *Written Communication*, 22, 224–261.
- Ivanič, R. (1998). *Writing and identity: The discursive construction of identity in academic writing*. Philadelphia/Amsterdam: John Benjamins.
- Jenkins, H., Purushotma, R., Weigel, M., Clinton, K., & Robison, A. J. (2009). Confronting the challenges of participatory culture: Media education for the 21st century. *The John D. and Catherine T. MacArthur Foundation Reports on Digital Media and Learning*. Cambridge, MA: The MIT Press.
- Jones, R. H. (2004). The problem of context in computer-mediated communication. In P. LeVine & R. Scollon (Eds.), *Discourse and technology: Multimodal discourse analysis* (pp. 20–33). Washington, DC: Georgetown University Press.
- Kern, R. (1995). Restructuring classroom interaction with networked computers: Effects on quantity and quality of language production. *Modern Language Journal*, 79, 457–476.
- Kern, R. (1998). Technology, social interaction, and FL literacy. In J. Muyskens (Ed.), *New ways of teaching*

- and learning: *Focus on technology and foreign language education* (pp. 57–92). Boston: Heinle & Heinle.
- Kern, R. (2000). *Literacy and language teaching*. Oxford: Oxford University Press.
- Kern, R. (2004). Literacy and advanced foreign language learning: Rethinking the curriculum. In H. Byrnes & H. Maxim (Eds.), *Advanced foreign language learning: A challenge to college programs* (pp. 2–18). Boston: Heinle & Heinle.
- Kern, R. (2014). Technology as Pharmakon: The promise and perils of the Internet for foreign language education. *Modern Language Journal*, 98, 330–347.
- Kern, R. (2015). *Language, literacy, and technology*. Cambridge: Cambridge University Press.
- Kittler, F. (1990). The mechanized philosopher. In L. A. Rickels (Ed.), *Looking after Nietzsche* (pp. 195–207). Albany, NY: State University of New York Press.
- Kramsch, C. (2006). From communicative competence to symbolic competence. *Modern Language Journal*, 90, 249–252.
- Kramsch, C. (2009). *The multilingual subject: What foreign language learners say about their experience and why it matters*. Oxford: Oxford University Press.
- Kramsch, C., & Thorne, S. L. (2002). Foreign language learning as global communicative practice. In D. Block & D. Cameron (Eds.), *Globalization and language teaching* (pp. 83–100). London: Routledge.
- Kress, G., & van Leeuwen, T. (1996). *Reading images: The grammar of visual design*. London: Routledge.
- Krikorian, D. H., Lee, J., Chock, T. M., & Harms, C. (2000). Isn't that spatial? Distance and communication in a 2-D virtual environment. *Journal of Computer-Mediated Communication*, 5(4).
- Lam, W. S. E. (2000). L2 literacy and the design of the self: A case study of a teenager writing on the Internet. *TESOL Quarterly*, 34, 457–482.
- Lankshear, C., & Knobel, M. (2006). *New literacies: Everyday practices and classroom learning* (2nd ed.). Maidenhead, UK: Open University Press.
- Leu, D. J. (2000). Literacy and technology: Deictic consequences for literacy education in an information age. In M. L. Kamil, P. B. Mosenthal, P. D. Pearson, & R. Barr (Eds.), *Handbook of reading research* (Vol. III, pp. 743–770). Mahwah, NJ: Lawrence Erlbaum.
- Leu, D. J., Forzani, E., Rhoads, C., Maykel, C., Kennedy, C., & Timbrell, N. (2014). The new literacies of online research and comprehension: Rethinking the reading achievement gap. *Reading Research Quarterly*, 50, 37–59.
- Lotherington, H., & Ronda, N. (2014). 2B or not 2B? From pencil to multimodal programming: New frontiers in communicative competencies. In J. Guikema & L. Williams (Eds.), *Digital literacies in foreign language education: Research, perspectives, and best practices* (pp. 9–28). San Marcos, TX: CALICO.
- Lotherington, H., & Xu, Y. (2004). How to chat in English and Chinese: Emerging digital language conventions. *ReCALL*, 16, 308–329.
- Lundby, K. (Ed.). (2008). *Digital storytelling, mediatized stories: Self-representations in new media*. New York: Peter Lang.
- Manovich, L. (2001). *The language of new media*. Cambridge, MA: The MIT Press.
- Marvin, C. (1988). *When old technologies were new: Thinking about electric communication in the late nineteenth century*. New York: Oxford University Press.
- McBride, K. (2011). The effect of rate of speech and distributed practice on the development of listening comprehension. *Computer Assisted Language Learning*, 24, 131–154.
- MLA Ad Hoc Committee on Foreign Languages. (2007). Foreign languages and higher education: New structures for a changed world. *Profession*, 12, 234–245.
- Murray, J. H. (1997). *Hamlet on the holodeck: The future of narrative in cyberspace*. New York: Free Press.
- National Council of Teachers of English. (2013). The NCTE definition of 21st century literacies. Accessed 10 October 2014 at <http://www.ncte.org/positions/statements/21stcentdefinition>
- O'Rourke, B. (2008). The other C in CMC: What alternative data sources can tell us about text-based synchronous computer mediated communication and language learning. *Computer Assisted Language Learning*, 21, 227–251.
- O'Rourke, B. (2012). Using eye-tracking to investigate gaze behaviour in synchronous computer-mediated communication for language learning. In M. Dooly & R. O'Dowd (Eds.), *Researching online interaction and exchange in foreign language education: Theories, methods and challenges* (pp. 305–342). Frankfurt am Main, Germany: Peter Lang.
- Oskoz, A., & Elola, I. (2014). Integrating digital stories in the writing class: Towards a 21st century literacy. In J. P. Guikema & L. Williams (Eds.), *Digital literacies in foreign language education: Research, perspectives, and best practices* (pp. 179–200). San Marcos, TX: CALICO.
- Paesani, K., Allen, H. W., & Dupuy, B. (2015). *A multiliteracies framework for collegiate foreign language teaching*. Upper Saddle River, NJ: Prentice Hall.
- Pariser, E. (2011). *The filter bubble: What the Internet is hiding from you*. New York: Penguin.
- Pecorari, D. (2003). Good and original: Plagiarism and patchwriting in academic second-language writing. *Journal of Second Language Writing*, 13, 317–345.
- Perkel, D. (2007). *Everyday creativity: Appropriation before, during, and after dissemination*. Paper presented at the Supporting Creative Acts Beyond Dissemination Workshop (Creativity & Cognition 2007), Washington, DC.
- Perkel, D. (2008). Copy and paste literacy? Literacy practices in the production of a MySpace profile. In K.

- Drotner, H. S. Jensen, & K. C. Schroeder (Eds.), *Informal learning and digital media* (pp. 203–224). Newcastle, UK: Cambridge Scholars Press.
- Pujola, J. (2002). CALLing for help: Researching language learning strategies using help facilities in a web-based multimedia program. *ReCALL*, 14, 235–262.
- Sadler, R. (2012). *Virtual worlds for language learning: From theory to practice*. Bern: Peter Lang.
- Sauro, S. (2014). Lessons from the fandom: Task models for technology-enhanced language learning. In M. González-Lloret & L. Ortega (Eds.), *Technology-mediated TBLT: Researching technology and tasks* (pp. 239–262). Philadelphia/Amsterdam: John Benjamins.
- Sauro, S., & Smith, B. (2010). Investigating L2 performance in text chat. *Applied Linguistics*, 31, 554–577.
- Smith, B. (2003). Computer-mediated negotiated interaction: An expanded model. *Modern Language Journal*, 87, 38–57.
- Smith, B. (2008). Methodological hurdles in capturing CMC data: The case of the missing self-repair. *Language Learning & Technology*, 12, 85–103.
- Smith, B. (2009). The relationship between scrolling, negotiation and self-initiated self-repair in an SCMC environment. *CALICO Journal*, 26, 231–245.
- Smith, B. (2010). Employing eye-tracking technology in researching the effectiveness of recasts in CMC. In F. M. Hult (Ed.), *Directions and prospects for educational linguistics* (pp. 79–97). Amsterdam: Springer.
- Smith, B. (2012). Eye tracking as a measure of noticing: A study of explicit recasts in SCMC. *Language Learning & Technology*, 16, 53–81.
- Smith, B., Alvarez-Torres, M., & Zhao, Y. (2003). Features of CMC technologies and their impact on language learners' online interaction. *Computers in Human Behavior*, 19, 703–729.
- Smith, B., & Renaud, C. (2013). Eye tracking as a measure of noticing corrective feedback in computer-mediated instructor-student foreign language conferences. In K. McDonough & A. Mackey (Eds.), *Interaction in diverse educational settings* (pp. 147–165). Philadelphia/Amsterdam: John Benjamins.
- Smith, B., & Sauro, S. (2009). Interruptions in chat. *Computer Assisted Language Learning*, 22, 229–247.
- Stickler, U., & Shi, L. (2015). Eye movements of online Chinese learners. *CALICO Journal*, 32, 52–81.
- Swaffar, J., & Arens, K. (2005). *Remapping the foreign language curriculum: An approach through multiple literacies*. New York: Modern Language Association.
- Swaffar, J., & Urlaub, P. (Eds.). (2014). *Transforming postsecondary foreign language teaching in the United States*. New York: Springer.
- Theisen, T., Fulton-Archer, L., Smith, M. J., Sauer, T., Small, H., & Abbott, M. (2011). 21st century skills world languages map. Accessed 31 December 2014 at https://www.actfl.org/sites/default/files/pdfs/21stCenturySkillsMap/p21_worldlang_uagesmap.pdf
- Thorne, S. L. (2008). Transcultural communication in open Internet environments and massively multiplayer online games. In S. S. Magnan (Ed.), *Mediating discourse online* (pp. 305–327). Philadelphia/Amsterdam: John Benjamins.
- Thurlow, C. (2006). From statistical panic to moral panic: The metadiscursive construction and popular exaggeration of new media language in the print media. *Journal of Computer-Mediated Communication*, 11.
- Walther, J. B. (1996). Computer-mediated communication: Impersonal, interpersonal, and hyperpersonal interaction. *Communication Research*, 23, 3–43.
- Ware, P. (2005). “Missed” communication in online communication: Tensions in a German–American telecollaboration. *Language Learning & Technology*, 9, 64–89.
- Ware, P. D., & Kramsch, C. (2005). Toward an intercultural stance: Teaching German and English through telecollaboration. *Modern Language Journal*, 89, 190–205.
- Wasson, C. (2006). Being in two spaces at once: Virtual meetings and their representation. *Journal of Linguistic Anthropology*, 16, 103–130.
- Wertsch, J. V. (1998). *Mind as action*. New York: Oxford University Press.
- Zarate, G., Lévy, D., & Kramsch, C. (Eds.). (2008). *Précis du plurilinguisme et du pluriculturalisme*. Paris: Editions des Archives Contemporaines.
- Zhao, Y. (1998). The effects of anonymity on computer-mediated peer review. *International Journal of Educational Telecommunications*, 4, 311–345.