

Network-based Language Teaching

Concepts and Practice

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1 *Introduction*

Theory and practice of network-based language teaching

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Mark Warschauer

Since the early 1960s, language teachers have witnessed dramatic changes in the ways that languages are taught. The focus of instruction has broadened from the teaching of discrete grammatical structures to the fostering of communicative ability. Creative self-expression has come to be valued over recitation of memorized dialogues. Negotiation of meaning has come to take precedence over structural drill practice. Comprehension has taken on new importance, and providing comprehensible input has become a common pedagogical imperative. Culture has received renewed interest and emphasis, even if many teachers remain unsure how best to teach it. Language textbooks have begun to distinguish spoken and written language forms, and commonly incorporate authentic texts (such as advertisements and realia) alongside literary texts. It is in the context of these multifarious changes that one of the most significant areas of innovation in language education – computer-assisted language learning (CALL) – has come of age. Nowadays, audiotape-based language labs are gradually being replaced by language media centers, where language learners can use multimedia CD-ROMs and laser discs, access foreign language documents on the World Wide Web, and communicate with their teachers, fellow classmates, and native speakers by electronic mail. If language teaching has become more exciting, it has also become considerably more complex.

This book deals with one form of CALL, what we call *network-based language teaching* (NBLT). NBLT is language teaching that involves the use of computers connected to one another in either local or global networks. Whereas CALL has traditionally been associated with self-contained, programmed applications such as tutorials, drills, simulations, instructional games, tests, and so on, NBLT represents a new and different side of CALL, where human-to-human communication is the focus. Language learners with access to the Internet, for example, can now potentially communicate with native speakers (or other language learners) all over the world twenty-four hours a day, seven days a week, from school, home, or work. That learners can communicate either on a one-to-one or a many-to-many basis in local-area network conferences further multiplies their opportunities for communicative practice. Finally, the fact that computer-mediated communication occurs in a written, electronically

archived form gives students additional opportunities to plan their discourse and to notice and reflect on language use in the messages they compose and read.

Given these possibilities, it is not surprising that many language teachers have enthusiastically embraced networking technology and have developed creative ways of using networked computers with their students (see Warschauer, 1995, for 125 such examples). On the other hand, many other teachers remain skeptical of the value of computer use in general. A 1995 survey of instructional use of technology in twelve academic areas (Cotton, 1995), for example, showed that 59% of foreign language programs and 65% of ESL programs used no form of computer technology in their courses – placing language teaching at the bottom of the list of academic areas surveyed.

To date, there has been relatively little published research that explores the relationship between the use of computer networks and language learning. The simple question to which everyone wants an answer – Does the use of network-based language teaching lead to better language learning? – turns out not to be so simple. The computer, like any other technological tool used in teaching (e.g., pencils and paper, blackboards, overhead projectors, tape recorders), does not in and of itself bring about improvements in learning. We must therefore look to particular *practices of use* in particular contexts in order to begin to answer the question. Furthermore, these practices of use must be described as well as evaluated in terms of their specific social context. Who were the learners? What exactly did they do? For what purpose? In what setting? With what kinds of language? In what patterns of social interaction? What were the particular outcomes in terms of quantity/quality of language use, attitudes, motivation?

This book is written for researchers, graduate students, and teachers who are interested in research in the theory and practice of network-based language teaching. The book has two main purposes: (1) to frame a conceptual rationale for network-based teaching in terms of trends in language acquisition theory and educational theory, and (2) to present a variety of recent empirical studies that will help scholars and educators to make informed decisions about both pedagogical practices and future research.

In this first chapter, we situate NBLT within the history of approaches to second language education as well as the particular history of computer-assisted language learning. We also discuss some of the particular research issues associated with network-based language teaching, and identify gaps in our knowledge that chapters in this volume help to fill.

Shifting perspectives on language learning and teaching

Although the changes in language teaching described at the beginning of this chapter are often characterized in terms of a polar shift from struc-

tural to communicative perspectives on language teaching, we perceive a more complex overlapping of three theoretical movements – structural, cognitive, and sociocognitive – in the recent history of language teaching. Because each of these three theoretical perspectives has influenced how computer technology has been used in language teaching, we will begin by briefly tracing the development of these perspectives.

Structural perspective

For much of the twentieth century (as well as preceding centuries), language teaching emphasized the formal analysis of the system of structures that make up a given language. The grammar-translation method, for example, trained students to memorize verb paradigms, apply prescriptive rules, parse sentences, and translate texts. From the 1920s through the 1950s, influenced by the work of American structural linguists (e.g., Bloomfield, 1933), various structural methods of language instruction were developed, culminating in the audiolingual method of the 1940s and 1950s. Although audiolingual teaching focused on spoken rather than written language skills, it shared two principal assumptions with the grammar-translation method: that language teaching syllabi should be organized by linguistic categories and that the sentence was the primary unit of analysis and practice. Strongly influenced by the work of behavioral psychologists such as John Watson and B. F. Skinner, structural methodologists conceived of language learning as habit formation and thus saturated students with dialogues and pattern drills designed to condition learners to produce automatic, correct responses to linguistic stimuli. Contrastive analyses of the structural differences between the native and target languages (e.g., Lado, 1957; Moulton, 1962; Stockwell, Bowen, & Martin, 1965) provided the basis for the careful selection, gradation, and presentation of structures. Practice, not abstract knowledge, was the key.

Approaches to the teaching of reading and writing also reflected the emphasis on structure. During the audiolingual period, reading was largely seen as an aid to the learning of correct structures; students were instructed to read out loud in order to practice correct pronunciation. Second-language writing instruction focused on students' production of formally correct sentences and paragraphs. At more advanced levels, contrastive rhetoric was used to provide examples of L1/L2 essay structure differences. In sum, the emphasis in speaking, reading, and writing was on the achieved linguistic product, not on cognitive or social processes.

Cognitive/constructivist perspective

By the early 1960s, the audiolingual method began to be criticized as being overly mechanical and theoretically unjustified. Noam Chomsky

(1959) had rejected B. F. Skinner's behaviorist notion of language learning, arguing that because a speaker of a language can produce (and understand) an infinite number of well-formed utterances, language competence could not possibly be explained by a model based on imitation and habit formation. Instead, Chomsky (1957; 1965) proposed a transformational-generative grammar that mediated between deep structures and surface structures of language. The development of an individual's grammatical system was guided by innate cognitive structures – not behavioral reinforcement. In the language teaching world, Chomsky's theory contributed to a gradual shift in goals from instilling accurate language habits to fostering learners' mental construction of a second language system. Errors came to be seen in a new light – not as bad habits to be avoided but as natural by-products of a creative learning process that involved simplification, generalization, transfer, and other general cognitive strategies. Language learning had thus come to be understood not as conditioned response but as an active process of generating and transforming knowledge.

Although this new perspective at first led to renewed attention to the teaching of grammar rules (e.g., the cognitive code learning method), it later led to an emphasis on providing comprehensible input in lieu of an explicit focus on grammar (Krashen, 1982). Yet the purpose of providing comprehensible input, at least in Krashen's view, was not to foster authentic social interaction (indeed, Krashen felt that learners' speech was largely irrelevant to language learning), but rather to give individuals an opportunity to mentally construct the grammar of the language from extensive natural data.

The influence of cognitive approaches was seen quite strongly in the teaching of reading and writing. Following developments in first language reading and writing research, second language educators came to see literacy as an individual psycholinguistic process. Readers were taught a variety of cognitive strategies, both *top-down* (e.g., using schematic knowledge) and *bottom-up* (e.g., using individual word clues), in order to improve their reading processes. Second language writing instruction shifted its emphasis from the mimicking of correct structure to the development of a cognitive, problem-solving approach, focused on heuristic exercises and collaborative tasks organized in staged processes such as idea generation, drafting, and revising.

Sociocognitive perspective

At about the same time that cognitively oriented perspectives on language acquisition were gaining popularity, Dell Hymes, an American sociolinguist, and Michael Halliday, a British linguist, reminded educators that language is not just a private, "in the head" affair, but rather a socially

constructed phenomenon. Hymes, who coined the term *communicative competence* in response to Chomsky's mentalistic characterization of linguistic competence, insisted on the social *appropriateness* of language use, remarking, "There are rules of use without which the rules of grammar would be useless" (Hymes, 1971, p. 10). For Hymes, syntax and language forms were best understood not as autonomous, acontextual structures, but rather as meaning resources used in particular conventional ways in particular speech communities. Grammaticality was not separable from social acceptability, nor was cognition separable from communication.

Halliday posited three principal functions of language use – ideational, interpersonal, and textual. In doing so, he brought attention to the fact that language teaching had really only dealt with the first of these – ideational (i.e., use of referential language to express content) – while the interpersonal function (i.e., use of language to maintain social relations) and the textual function (i.e., to create situationally relevant discourse) had largely been neglected.

During the 1980s, communicative competence became the buzzword of the language teaching profession. What needed to be taught was no longer just linguistic competence but also sociolinguistic competence, discourse competence, and strategic competence (Canale and Swain, 1980; Canale, 1983). With interactive communicative language use as the call of the day, communicative processes became as important as linguistic product, and instruction became more learner-centered and less structurally driven. In a sociocognitive approach, learning is viewed not just in terms of changes in individuals' cognitive structures but also in terms of the social structure of learners' discourse and activity (Crook, 1994, p. 78). From this point of view, cognitive and social dimensions overlap in a "dialectical, co-constitutive relationship" (Nystrand, Greene, & Wiemelt, 1993, p. 300). Or, as Holquist (1990) puts it, "Discourse does not reflect a situation, it *is* a situation" (p. 63).

From this perspective, language instruction was viewed not just in terms of providing comprehensible input, but rather as helping students enter into the kinds of authentic social discourse situations and discourse communities that they would later encounter outside the classroom. Some saw this to be achieved through various types of task-based learning, in which students engaged in authentic tasks and projects (see, for example, Breen, 1987; Candlin, 1987; Prabhu, 1987; Long & Crookes, 1992). Others emphasized content-based learning, in which students learned language and content simultaneously (e.g., Snow, 1991; Flowerdew, 1993).

In sociocognitive approaches, reading and writing came to be viewed as processes embedded in particular sociocultural contexts. Reading instruction focused not only on individual learning strategies but also on

TABLE 1. PEDAGOGICAL FOCI IN STRUCTURAL, COGNITIVE, AND SOCIOCOGNITIVE FRAMEWORKS

	<i>Structural</i>
<i>Who are some key scholars?</i>	Leonard Bloomfield, Charles Fries, Robert Lado
<i>How is language viewed?</i>	As an autonomous structural system.
<i>How is language understood to develop?</i>	Through transmission from competent users. Internalization of structures and habits through repetition and corrective feedback.
<i>What should be fostered in students?</i>	Mastery of a prescriptive norm, imitation of modeled discourse, with minimal errors.
<i>How is instruction oriented?</i>	Toward well-formed language products (spoken or written). Focus on mastery of discrete skills.
<i>What is the primary unit of analysis?</i>	Isolated sentences.
<i>How are language texts (spoken or written) primarily treated?</i>	As displays of vocabulary and grammar structures to be emulated.
<i>Where is meaning located?</i>	In utterances and texts (to be extracted by the listener or reader).

helping learners become part of literate communities through extensive discussion of readings and the linking of reading and writing (see, for example, Bernhardt, 1991; Eskey, 1993; Leki, 1993). Writing instruction focused not only on the development of individual strategies but also on learning appropriate ways to communicate to particular audiences. In the field of English for academic purposes, for example, there has been a shift in emphasis from expressive writing toward helping students to integrate themselves into academic discourse communities through discussion and analysis of the nature of academic writing (e.g., Swales, 1990). Literacy has been increasingly seen as a key to developing not only language knowledge but also sociocultural and intercultural competence.

Table 1 summarizes the respective instructional foci commonly associated with structural, cognitive, and sociocognitive approaches to language teaching.

<i>Cognitive</i>	<i>Sociocognitive</i>
Noam Chomsky, Stephen Krashen	Dell Hymes, M. A. K. Halliday
As a mentally constructed system.	As a social and cognitive phenomenon.
Through the operation of innate cognitive heuristics on language input.	Through social interaction and assimilation of others' speech.
Ongoing development of their inter-language. Ability to realize their individual communicative purposes.	Attention to form (including genre, register, and style variation) in contexts of real language use.
Toward cognitive processes involved in the learning and use of language. Focus on development of strategies for communication and learning.	Toward negotiation of meaning through collaborative interaction with others. Creating a discourse community with authentic communicative tasks.
Sentences as well as connected discourse.	Stretches of connected discourse.
Either as "input" for unconscious processing or as objects of problem solving and hypothesis testing.	As communicative acts ("doing things with words").
In the mind of the learner (through activation of existing knowledge).	In the interaction between interlocutors, writers and readers; constrained by interpretive rules of the relevant discourse community.

Changing nature of computer use in language teaching

It is within this shifting context of structural, cognitive, and sociocognitive orientations that we can understand changes in how computers have been used in language teaching, and in particular the role of network-based language teaching today. Interestingly, shifts in perspectives on language learning and teaching have paralleled developments in technology from the mainframe to the personal to the networked computer. As will be seen, they also correspond roughly to three metaphors of computer-based educational activities posited by Charles Crook (1994): namely, a tutorial metaphor (computer-as-tutor), a construction metaphor (computer-as-pupil), and a toolbox metaphor (computer-as-tool).

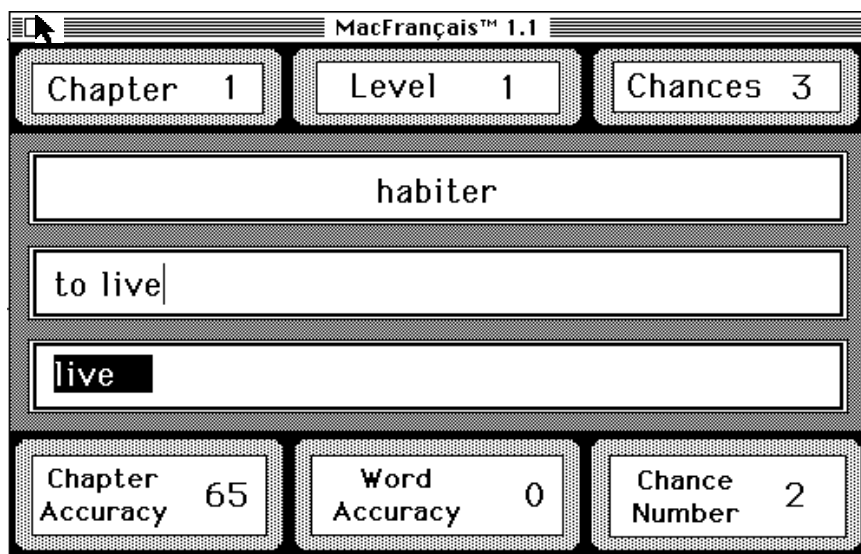


Figure 1 Screen shot from *MacFrançais* (Raymond, 1988).

Structural approaches to CALL

The earliest CALL programs, consisting of grammar and vocabulary tutorials, drill and practice programs, and language testing instruments, strictly followed the computer-as-tutor model. Developed originally for mainframe computers in the 1960s and 1970s, though still used in different variations today, these programs were designed to provide immediate positive or negative feedback to learners on the formal accuracy of their responses. This was consistent with the structuralist approach, which emphasized that repeated drilling on the same material was beneficial or even essential to learning.

As an example of a simple drill program, consider *MacFrançais* shown in Figure 1. The student selects the appropriate chapter, level, and number of desired chances. A target French word appears in the first line (here *habiter*), and the student types in a translation in line 2 (“live”). The program does not accept this answer, however, so it highlights the student’s initial response in line 3, leaving line 2 blank again. The student then types in the full infinitive “to live” in line 2, which is accepted, and the prompt then changes to the next word to be tested.

Drill programs of this type generally stirred little excitement among learners and teachers, however, because they merely perpetuated existing instructional practices, albeit in a repackaged form. Moreover, until recently, these programs tended to be technically unsophisticated, gener-

ally allowing only one acceptable response per item. These factors, combined with the rejection of purely behavioristic approaches to language learning at both theoretical and pedagogical levels, as well as the development of more sophisticated personal computers, propelled CALL into its second generation.

Cognitive approaches to CALL

In line with cognitive/constructivist views of learning, the next generation of CALL programs tended to shift agency to the learner. In this model, learners construct new knowledge through exploration of what Seymour Papert has described as microworlds, which provide opportunities for problem solving and hypothesis testing, allowing learners to utilize their existing knowledge to develop new understandings. Extending a tradition of thought popularized by John Dewey and Alfred Whitehead that learning occurs through creative action, Papert (1980) and his colleagues at the MIT Media Laboratory flip the earlier *computer-as-tutor* metaphor on its head, seeing computers as things to be controlled by, rather than controlling, learners. The computer provides tools and resources, but it is up to the learner to *do* something with these in a simulated environment (e.g., in Papert's Turtle Logo program, learners program a turtle to carry out their instructions).

A more recent and sophisticated application in this tradition is the multimedia videodisc program *A la rencontre de Philippe* (Furstenberg, Murray, Malone, & Farman-Farmaian, 1993), developed by the Athena Language Learning Project at the MIT Laboratory for Advanced Technology in the Humanities. *Philippe* is a game for intermediate and advanced French learners that incorporates full-motion video, sound, graphics, and text, allowing learners to "walk around" and explore simulated environments by following street signs or floor plans, as shown in Figure 2. Filmed in Paris, the video footage creates a sense of realism, and the branching of the story lines maintains the player's interest. To help language learners understand the sometimes challenging spoken French, the program provides optional comprehension tools, such as transcriptions of all audio segments and a glossary, as well as a video album that includes samples of many of the language functions one would teach in a communicative approach such as expressing feelings, saying hello and goodbye, and using gestures appropriately. Students can easily create their own custom video albums, which they store on their own computer diskettes.¹

1 Other multimedia programs using high-quality video and branching technology to create vivid microworlds for language learning include *Dans un quartier de Paris* (Furstenberg, in press), *Nouvelles dimensions* (Noblitt, 1994), and *Nuevas dimensiones* (Noblitt, Rosser, & Martínez-Lage, 1997).

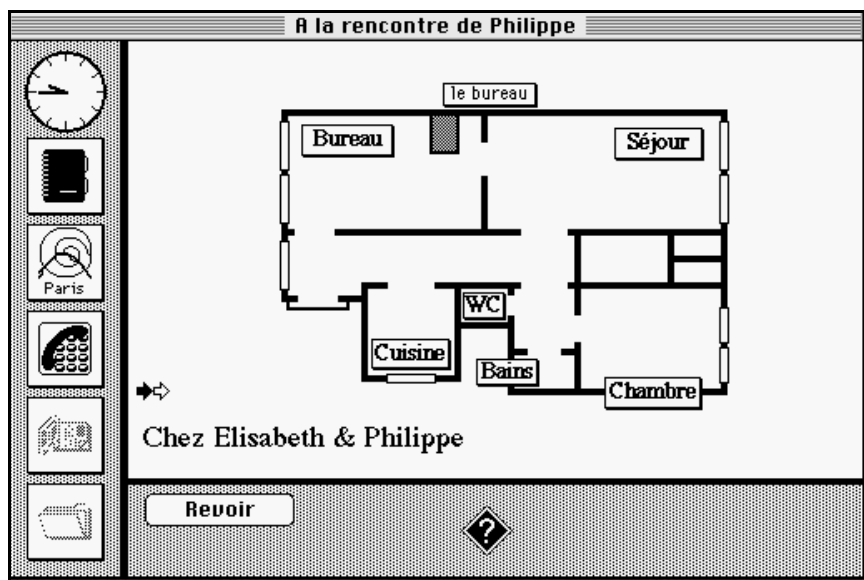


Figure 2 Screen shot from *A la rencontre de Phillippe* (Furstenberg et al., 1993).

This cognitive, constructivist generation of CALL was a significant advance over earlier tutorial and drill programs. But by the early 1990s, many educators felt that CALL was still failing to live up to its full potential (Kenning & Kenning, 1990; Pusack & Otto, 1990; Rüschoff, 1993). Critics pointed out that the computer was being used in an ad hoc and disconnected fashion and thus was “making a greater contribution to marginal rather than to central elements” of the language teaching process (Kenning & Kenning, 1990, p. 90). Moreover, as Crook (1994) points out, computer activities based on either a tutor or a pupil metaphor potentially distance the teacher from what students are doing individually and autonomously and can thus compromise the collaborative nature of classroom learning. Despite the apparent advantages of multimedia CALL, today’s computer programs are not yet intelligent enough to be truly interactive. Although programs such as *Philippe* put the learner in an active stance and provide an effective illusion of communicative interaction, the learner nevertheless acts in a principally consultative mode within a closed system, and does not engage in genuine negotiation of meaning. Computer programs that are capable of evaluating the appropriateness of a user’s writing or speech, diagnosing learner difficulties, and intelligently choosing among a range of communicative response op-

tions are not expected to exist for quite some time.² Thus, although Intelligent CALL (Underwood, 1989) may be the next and ultimate usage of computers for language learning, that phase remains a distant dream.

Sociocognitive approaches to CALL

Sociocognitive approaches to CALL shift the dynamic from learners' interaction *with* computers to interaction with other humans *via* the computer. The basis for this new approach to CALL lies in both theoretical and technological developments. Theoretically, there has been the broader emphasis on meaningful interaction in authentic discourse communities. Technologically, there has been the development of computer networking, which allows the computer to be used as a vehicle for interactive human communication.

Many uses of networked computers fit into Crook's (1994) computer-as-toolkit model. This metaphor emphasizes the role that computers can play as mediational tools that shape the ways we interact with the world (e.g., accessing and organizing information through databases, spreadsheets, and word processors). Word processors, for example, facilitate the invention, revision, and editing processes of writing, allowing quick, easy (and reversible) reshaping of text. In the 1980s, John Higgins developed a series of text reconstruction programs such as Storyboard and Double-Up, which allowed learners to manipulate texts in various ways. The purpose of these programs was to allow learners to reconstruct the original texts and, in the process, to develop their own constructions of language. Hypertextual writing assistants such as *Atajo* (Domínguez, Noblitt, & Pet, 1994) and *Système-D* (Noblitt, Pet, & Solá, 1992), and concordancers such as MicroConcord (Scott and Johns, 1993) have been valuable tools for helping learners to use language with greater lexical and syntactic appropriateness.

Computer networking allows a powerful extension of the computer-as-tool in that it now facilitates access to other people as well as to information and data. Computer networking in the language classroom stems from two important technological (and social) developments: (1) computer-mediated communication (CMC) and (2) globally linked hypertext.

CMC has existed in primitive form since the 1960s, but its use has become widespread only since the late 1980s.³ CMC allows language

2 Artificial intelligence (AI) of a more modest degree does currently exist, but the cost and technical demands of implementing AI in language learning software have so far exceeded available resources.

3 For in-depth discussion of the linguistic and interactional characteristics of computer-mediated communication, as well as historical background, see Herring (1996) and Murray (1995).

learners with network access to communicate with other learners or speakers of the target language in either asynchronous (not simultaneous) or synchronous (simultaneous, in real time) modes. Through tools such as e-mail, which allows participants to compose messages whenever they choose, or Internet Relay Chat or MOOs, which allow individuals all around the world to have a simultaneous conversation by typing at their keyboards, CMC permits not only one-to-one communication but also one-to-many communication. It therefore allows a teacher or student to share a message with a small group, the whole class, a partner class, or an international discussion list involving hundreds or thousands of people. Participants can share not only brief messages but also lengthy documents, thus facilitating collaborative reading and writing.

Globally linked hypertext and hypermedia, as represented in the World Wide Web, represents a revolutionary new medium for organizing, linking, and accessing information. Among its important features are (1) informational representation through multilinear strands linked electronically, (2) integration of graphic, audio, and audiovisual information together with texts, (3) rapid global access, and (4) ease and low cost of international publication. The World Wide Web offers an abundance of informational resources whose utility for language learning is just beginning to be tapped. Using the World Wide Web, students can search through millions of files around the world within minutes to locate and access authentic materials (e.g., newspaper and magazine articles, radio broadcasts, short videos, movie reviews, book excerpts) that correspond to their own personal interests. They can also use the Web to publish their texts or multimedia materials to share with partner classes or with the general public. These features can facilitate an approach to using technology in which authentic and creative communication is integrated into all aspects of the course. Furthermore, the World Wide Web has tremendous potential for creating and providing access to multiuser, interactive multimedia environments, although so far there have been few development projects in this area (see Chun & Plass, this volume).

These new technologies do not only *serve* the new teaching/learning paradigms, they also help *shape* the new paradigms. The very existence of networked computers creates possibilities for new kinds of communication. Because these new forms of communication are now so widespread, it is imperative that language students be exposed to them in the classroom. This is particularly important in English-language teaching, because so much international on-line communication is conducted in that language, but it is likely to become increasingly important in the teaching of other languages as well, as cyberspace continues to become more multilingual. A pedagogy of networked computers must therefore take a broad view, examining not only the role of information technology in language learning but also the role of language learning in an in-

TABLE 2. THE ROLE OF CALL IN STRUCTURAL, COGNITIVE, AND SOCIOCOGNITIVE FRAMEWORKS

	<i>Structural</i>	<i>Cognitive</i>	<i>Sociocognitive</i>
<i>What is the principal role of computers?</i>	To provide unlimited drill, practice, tutorial explanation, and corrective feedback.	To provide language input and analytic and inferential tasks.	To provide alternative contexts for social interaction; to facilitate access to existing discourse communities and the creation of new ones.

formation technology society. If our goal is to help students enter into new authentic discourse communities, and if those discourse communities are increasingly located on-line, then it seems appropriate to incorporate on-line activities for their social utility as well as for their perceived particular pedagogical value.

To summarize, the computer can play multiple roles in language teaching. It originated on the mainframe as a tutor that delivers language drills or skill practice. With the advent of multimedia technology on the personal computer, it serves as a space in which to explore and creatively influence microworlds. And with the development of computer networks, it now serves as a medium of local and global communication and a source of authentic materials. This multiplicity of roles has taken CALL far beyond the early "electronic workbook" variety of software that dominated the second and foreign language marketplace for years and has opened up new avenues in foreign language teaching. These trends are summarized in Table 2.

Research on network-based language teaching

Just as the paradigms of CALL have changed, so has research on the role of computers in the language classroom. Early CALL research focused mostly on the language performance of students who had used CALL programs, attempting to determine whether those programs were superior to other methods for maximizing structural accuracy. The cognitive paradigm engendered research that looked at the development of individual processes, strategies, and competencies, using measures such as motivational surveys, observations, recordings of keystrokes, and think-aloud protocols. The sociocognitive paradigm and an emphasis on learning through computer networks have brought about a focus on the way that

TABLE 3. RESEARCH IMPLICATIONS FOR VARIOUS CALL APPROACHES

	<i>Structural</i>	<i>Cognitive</i>	<i>Sociocognitive</i>
<i>Orientation</i>	product	cognitive processes	social and cognitive processes
<i>Methodology</i>	quantitative: experimental-control comparisons	both quantitative and qualitative	principally qualitative: discourse analysis, analysis of socio-cultural context
<i>Principal kinds of data</i>	quantities/frequencies of words, errors, structures	think-aloud protocols, questionnaires, computer-recorded data (e.g., keystrokes)	transcriptions of social interactions, ethnographic observations, and interviews

discourse and discourse communities develop during use of computer networks.

Table 3 summarizes the implications for research methods of the various CALL approaches. Research on network-based language teaching, while potentially spanning all of these approaches, has so far been largely limited to structural goals and methods.

Because NBLT is an emerging area, the corpus of NBLT research includes few published studies that examine in depth the development of discourse and discourse communities in on-line environments. Those studies that have been published have tended to focus on the most quantifiable and easily measured aspects of on-line communication. For example, a number of studies (e.g., Kern, 1995; Sullivan & Pratt, 1996; Warschauer, 1996) have quantitatively compared amount of participation in face-to-face and computer-assisted discussion and have found more balanced participation among students (and between students and teacher) in the computer mode. Other studies have attempted to quantify the language functions used in on-line communication, concluding to little surprise that learners use a variety of functions in computer-mediated communication (Chun, 1994; Warschauer, 1996). Researchers have also quantitatively examined the linguistic features of on-line discussion and found that it is lexically and syntactically more complex than face-to-face discussion (Warschauer, 1996). These are all examples of a product-oriented, structuralist approach to NBLT research.

This volume attempts to expand the body of NBLT research into several important areas that have been so far relatively neglected. These areas are *context*, *interaction*, and *multimedia networking*.

The contexts in which networked-based teaching and learning occur have not, by and large, been studied in sufficient depth. As Gee (1996) explains, discourse represents not just language but “saying(writing)-doing-being-valuing-believing combinations” (p. 127). To understand the full impact of new forms of interacting in the language classroom, we must look beyond the texts of interaction to the broader contextual dynamics that shape and are shaped by those texts. This entails holistic, qualitative research that goes beyond inventories of linguistic features and attempts to account for the way classroom cultures take shape over time. Although a number of educators have attempted to look at such phenomena, much of the published work to date in this regard has consisted of informal reports by teachers of what they have observed in their classes.

Chapters 2 and 3 of this book present descriptive studies that discuss the overall context of network-based language teaching in foreign and second language contexts. In Chapter 2, Carla Meskill and Krassimira Ranglova present research on the implementation of new technology-enhanced EFL teaching in Bulgaria. They show that the use of computer networks was part of a broader reconceptualization of the language program that resulted in a more “sociocollaborative” approach to learning. The chapter is a sterling example of the fact that technology is not just a machine, or even just the use of a machine, but rather a broad form of social organization. In Chapter 3, Mark Warschauer presents the results of an ethnographic study of four computer-intensive language and writing classes in Hawaii: two ESL classes, one indigenous language class, and one English class (in which the majority of students were second language learners). Warschauer’s study shows that the particular implementation of network-based teaching is highly dependent on sociocultural context, including, but not limited to, the attitudes and beliefs of the teacher. The study also illustrates the significance of new conceptions of literacy when considering network-based teaching.

The nature of interaction has been one of the most important areas of research in second language learning (for a review, see Pica, 1994). It has been suggested that computer-mediated communication provides an ideal medium for students to benefit from interaction, because the written nature of the discussion allows greater opportunity to attend to and reflect on the form and content of the communication. Yet most of the research on the linguistic nature of CMC has focused on counting or categorizing individual students’ comments rather than qualitatively analyzing how and in what ways students actually negotiate meaning with each other.

Chapters 4, 5, and 6 begin to overcome this shortcoming. In Chapter 4, Jill Pellettieri uses a framework from Gass and Varonis to examine task-based real-time computer interaction between adult learners of

Spanish. By analyzing the modifications that learners make in response to negotiation signals as well as corrective feedback, she provides evidence that computer-mediated interaction provides a useful mechanism for helping learners achieve higher levels of metalinguistic awareness. Whereas Pellettieri uses frameworks developed from oral interaction, Boyd Davis and Ralf Thiede in Chapter 5 use frameworks derived from writing research. They examine the interaction among L2 and L1 writers in asynchronous computer conferences to investigate the nature and degree of language learners' imitation and accommodation of writing styles. Their linguistic analysis indicates that L2 students shifted their style in response to L1 interlocuters.

In Chapter 6, Jean Schultz focuses not so much on the linguistic interaction itself during electronic conferencing, but rather on its results, comparing how L2 learners make use of peer editing feedback that has been provided in computer-mediated or oral discussion. The results indicate a complex interrelationship of students' level, activity, and medium, rather than a simple conclusion of superiority or inferiority for computer-mediated feedback. She concludes with thought-provoking observations regarding the differences between written and oral communication.

A final area that has been insufficiently investigated to date is the particular impact of combining a variety of media in networked-based learning. This area is so new that almost no research has yet been published. Authors in this book examine this issue from several angles: in Chapter 7, Dorothy Chun and Jan Plass examine concepts of networked multimedia in light of theory and research in second language acquisition. They then discuss criteria for the design of networked multimedia environments, illustrating with a prototype project under development based on SLA theory and research. In Chapter 8, Heidi Shetzer and Mark Warschauer return to the earlier theme of new on-line literacies, providing a theoretical framework for how literacy and communication practices change in on-line and hypertextual environments. They also provide discussion of pedagogical implications of adopting an electronic literacy approach to language teaching. In Chapter 9, Christoph Zähler, Agnès Fauverge, and Jan Wong present the results of a pilot study on the use of broadband audio- and audiovisual conferencing to help college students learn French. Their study indicates the potential of audiovisual networking for long-distance task-based learning. These three papers bring us full circle, back to the issues of context and interaction, now redefined in terms of multimedia environments.

Finally, in Chapter 10, Carol Chapelle situates the studies in this volume and previous research on network-based language teaching within the broader perspective of the history and future of how we conduct research on computer-assisted language learning.

Conclusion

Network-based language teaching does not represent a particular technique, method, or approach. It is a constellation of ways by which students communicate via computer networks and interpret and construct on-line texts and multimedia documents, all as part of a process of steadily increasing engagement in new discourse communities. How that engagement takes place depends on a number of factors, including the nature of interaction via computer, the sociocultural context that shapes that interaction, and the way that students communicate and learn in multimedia modes. We hope that the chapters in this volume provide some initial steps toward a better understanding of these issues.

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