1 *Introduction*

Theory and practice of network-based language teaching

Richard Kern
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

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

Cognitive	*Sociocognitive*
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 interlanguage. 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).

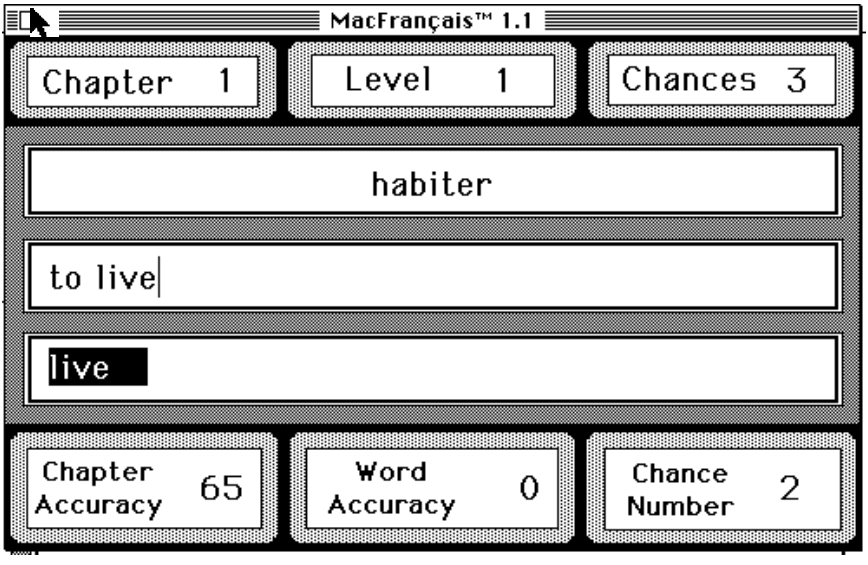

Figure 1 Screen shot from MacFrançais (Raymond, 1988).

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).

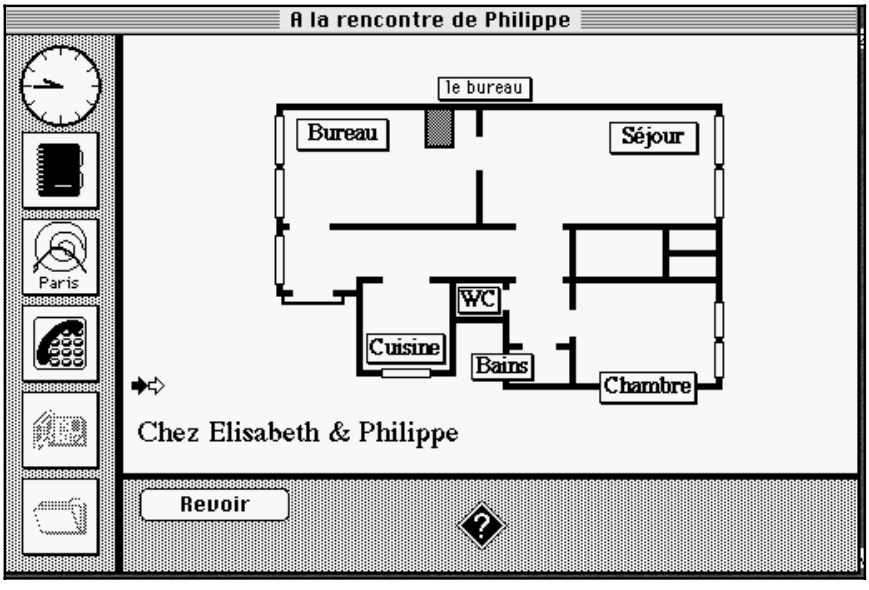

Figure 2 *Screen shot from* A la rencontre de Phillipe *(Furstenberg et al., 1993).*

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-