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CALL--English as a Second Language

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Abstract
CALL for English as a second language is an interdisciplinary area of inquiry which has been influenced primarily by educational technology (Reiser, 1987) but also by fields such as computational linguistics and recently by applied linguistics as well. These related fields contribute diverse epistemologies which shape CALL research questions and methods. The diversity in CALL research can also be explained in part by the current variety of approaches to CALL development and use. Through the 1970s and early 1980s, pedagogical objectives in CALL were focused primarily, although not exclusively, on improving specified areas of learner’s grammatical knowledge through approaches borrowed from educational technology (Hart 1981, Hope, Taylor and Pusack 1984, Wyatt 1984). Today, in contrast, CALL is used for a variety of pedagogical objectives through many different types of software such as microworlds (Coleman 1985, Papert 1980), grammar checkers (Hull, Ball, Fox, Levin and McCutchen 1987), pronunciation feedback systems (Anderson-Hseih 1994, Pennington 1991), intelligent tutoring systems (Chanier, Pengelly, Twidle and Self 1992), concordancer programs (Johns 1986, Tribble and Jones 1990), word processing (Pennington 1993), and software for computer-mediated communication (Kaye 1992). These diverse approaches to CALL are predicated on different beliefs about teaching and learning (Higgins 1995, Kenning and Kenning 1990, Sanders and Kenner 1983, Stevens 1992). Rather than reviewing these 'CALL philosophies,' this article will focus on the evolution of research traditions dedicated to the empirical study of CALL use for ESL. Accordingly, the term CALL research is employed to refer to empirical research on the use of CALL.

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CALL—ENGLISH AS A SECOND LANGUAGE

Carol A. Chapelle

INTRODUCTION

CALL for English as a second language is an interdisciplinary area of inquiry which has been influenced primarily by educational technology (Reiser, 1987) but also by fields such as computational linguistics and recently by applied linguistics as well. These related fields contribute diverse epistemologies which shape CALL research questions and methods. The diversity in CALL research can also be explained in part by the current variety of approaches to CALL development and use. Through the 1970s and early 1980s, pedagogical objectives in CALL were focused primarily, although not exclusively, on improving specified areas of learner’s grammatical knowledge through approaches borrowed from educational technology (Hart 1981, Hope, Taylor and Pusack 1984, Wyatt 1984). Today, in contrast, CALL is used for a variety of pedagogical objectives through many different types of software such as microworlds (Coleman 1985, Papert 1980), grammar checkers (Hull, Ball, Fox, Levin and McCutchen 1987), pronunciation feedback systems (Anderson-Hseih 1994, Pennington 1991), intelligent tutoring systems (Chanier, Pengelly, Twidale and Self 1992), concordancer programs (Johns 1986, Tribble and Jones 1990), word processing (Pennington 1993), and software for computer-mediated communication (Kaye 1992). These diverse approaches to CALL are predicated on different beliefs about teaching and learning (Higgins 1995, Kenning and Kenning 1990, Sanders and Kenner 1983, Stevens 1992). Rather than reviewing these “CALL philosophies,” this article will focus on the evolution of research traditions dedicated to the empirical study of CALL use for ESL. Accordingly, the term CALL research is employed to refer to empirical research on the use of CALL.

Because CALL has been minimally reviewed in previous issues of The Annual Review of Applied Linguistics, I will begin by providing a brief historical perspective on CALL research, which has its roots in the field of educational...
technology, but which has been impacted by second language classroom research. This impact of second language classroom research has led to inquiry into the process of CALL use in context, particularly through the discourse occurring during CALL use. The next section describes the recent work which has built on the suggestions of early CALL researchers in three areas: 1) learners’ psycho-linguistic and strategic processes in CALL, 2) learners’ discourse within CALL contexts, and 3) CALL use within its sociocultural context. Finally, the article describes what are likely to be three primary challenges for CALL research in the immediate future: linking process data to learning outcomes, systematizing the relationship between observed discourse and the contexts of CALL use, and understanding the cross-cultural implications of CALL.

A BRIEF HISTORY OF CALL RESEARCH

Influenced by research in educational technology, early CALL researchers typically attempted to demonstrate CALL’s effectiveness using quasi-experimental research designs; this research typically compared cognitive and affective outcomes of learners who participated in computer-based instruction with those who participated in regular classrooms. Much like researchers in educational technology (e.g., Kulik, Kulik and Schwalb 1986), CALL researchers have attempted to synthesize results of individual studies to discover trends in the effects of instructional computer use across different settings (Dunkel 1991). Both the research design focusing on outcomes and the meta-analyses of such research have been criticized by educational-technology researchers such as Clark (1985; 1994) who for over a decade has argued that the concept of investigating “computer effects” is conceptually flawed. Somewhat more sympathetic to the investigation of “CALL effects,” Dunkel draws the following conclusion:

Systematic evaluation of the effectiveness of all aspects of CALL must continue; however, new focuses as well as methods of research inquiry will need to be developed if we are to gauge correctly the power of the computer to affect different aspects of second language acquisition (1991: 23-24).

By the mid 1980s, as Dunkel noted, some departure from the orthodox quasi-experimental design had occurred. During the 1980s, researchers began to examine the role of individual differences in the cognitive and affective outcomes of CALL (e.g., Abraham 1985, Chapelle and Jamieson 1986). Moreover, new objects of inquiry had emerged through the use of different research methods. These new objects included the learners’ cognitive processes and strategies, and the research methodologies included observing selected aspects of learner performance while students worked with CALL (Bland, Noblit, Armington and Gay 1990, Chapelle and Mizuno 1989, Curtin, Avner and Provenzano 1981, Doughty 1987, Garrett 1982, Jamieson and Chapelle 1987, Legenhausen and Wolff 1990). The longitudinal observed data from such studies was then used to make inferences about the effects of CALL on learners. For example, Johnson and Esling’s (1983) longitudinal data demonstrated that learners with (American) English as their L1 acquired second language grammatical features through more sensitive feedback and more extensive use of CALL. In contrast, learners with (American) English as their L2 learning context received less feedback and less extensive use of CALL.
make inferences about learners' strategies or interlanguage development. For example, in a study observing students' use of an on-line dictionary, Bland, Noblitt, Armington and Gay (1990) interpreted the form of students' queries as an indication of their stage of lexical development.

These process-oriented studies represented a shift toward more SLA-sensitive research designs, and yet, as Johnson (1991) pointed out, the CALL research of the 1980s needed to evolve in another way:

The bulk of research on computers and learning in educational environments has focused on the cognitive aspects of learning. Yet, theory in second language acquisition and research in second language acquisition classrooms indicate that the social interactive environments of the classroom are also crucial factors that affect language learning in important ways (1991:62).

Johnson's suggestion to expand CALL research to social-interactional environments was consistent with the ethnographic tradition of classroom research which investigates the sociocultural and classroom contexts in which second language acquisition occurs (Watson-Gegeo 1988). In fact, at that time, an ethnographic study of CALL which had been conducted in an L1 classroom pointed toward the value of examining the role that computers play within the larger culture of the classroom (Cazden, Michaels and Watson-Gegeo 1987).

Focusing on the discourse aspect of the classroom context, Esling (1991) suggested that it may also be valuable to examine the oral and written texts learners produce in the context of CALL use:

One area in the evaluation of the effectiveness of CALL with immediate and potentially powerful research possibilities involves the assessment of the types of discourse generated during a CALL activity, and its similarities and differences to the discourse found in non-CALL classroom activities (1991:114).

Esling’s goal was to improve understanding of the instructional value of various types of CALL activities; more specifically, he wanted to view these activities through the lens of familiar discourse types as outlined by Brown and Yule (1983). While much work in this area remains to be done, past research describing the oral discourse of students working on computer-based activities has shown that the number and types of discourse functions students produce while they are working depends, in part, on the type of programs the students work with (Abraham and Liou 1991, Piper 1986).

Chapelle (1990) extended Esling’s basic concept by applying classroom discourse analysis (Sinclair and Coulthard 1975) to the “communication” that
occurs between the learner and the computer program (Hirst 1991, Luff, Gilbert and Frohlich 1990):

Depending on the program, the interaction allowed can render possible a variety of functional acts. A precise description of an activity could be formulated by specifying the types of acts possible within a given CALL program, which acts can be used as each type of move, [and] how moves fit together to form legal exchanges, until a grammar of the CALL activity is defined. This grammar, then, provides an unambiguous statement of the parameters of student-computer interaction within a CALL program. The grammar of possible discourse forms a framework for describing actual acts of the students as they work, as well as a basis for comparison with the acts allowed in other CALL and classroom activities (Chapelle 1990:207).

In short, by the early 1990s important conceptual links had been made between CALL research and other types of second language classroom research (e.g., Allwright 1988, Allwright and Bailey 1991, Chaudron 1988, Long 1980, van Lier 1988). Yet there remained significant progress to be made in understanding how research might best be applied to the various forms of CALL. For example, Legenhausen and Wolff (1990) raised the following point:

It seems quite obvious that computer software, serving several diverse functions in the foreign language classroom, cannot be evaluated according to any single methodological principle. What we are trying to do, therefore, is to systematically vary the evaluative principles and techniques according to different CALL software types (1990:2).

Their solution employed discourse analysis to evaluate learners' use of simulation programs, and cognitive psychological methods to evaluate text reconstruction programs. Within the past few years, other investigators have contributed additional research approaches to expand the field of inquiry into CALL.

CURRENT APPROACHES TO CALL RESEARCH

Taking up some of the suggestions outlined above, recent research in CALL has strengthened to some extent the links between CALL and second language classroom research. Rather than following the strict product-oriented paradigm of the past, recent CALL research has focused on learners' outcomes by taking on a more process-sensitive approach. For example, in a study comparing writing quality of hand-written vs. word-processed essays, Lam and Pennington (1995) evaluated not just one product at the end of the semester but multiple essays produced by the two groups throughout the semester, finding that the group using wordprocessing performed consistently better. Another study of the use of text-critiquing programs indicated no significant differences in total scores on computer-aided instruction vs. traditional interviews (Chapelle 1993). The flexibility of CALL, and the process-oriented nature of the research, has led CALL researchers to be more psycholinguistic in their approaches to the field.

1. The use of CALL in classroom as evidenced by the incorporation of CALL into a case study of a foreign language program. The program was designed for on-line learning of selected vocabulary through engaging interactive instruction. The students were able to use the program to assist their teachers and the use of CALL was positively reviewed by the students (1994:4).
on compositions produced by the control and experimental group, but it did provide information about the learners' use of the critiquing program as well as interview data that described their opinions about the instructional program (Liou 1993). In both of these cases, the researchers were careful to describe the process of CALL use within classroom contexts, thereby clarifying the meaning of the results. This new-look for the quasi-experimental research design in CALL research has been accompanied by additional work in three other areas: psycholinguistic and strategic processes in CALL, the oral and written texts produced in CALL contexts, and the sociocultural context of CALL use.

1. The study of psycholinguistic and strategic processes in CALL

Over the past few years, researchers have continued to examine the psycholinguistic and strategic processes of learners as they work on CALL. Two somewhat distinct research objectives—psycholinguistic and pedagogical—are apparent in this recent research. An example of the former is Hulstijn (1993); he investigated EFL learners' use of an on-line dictionary during an assignment to read and complete either comprehension questions or a summary. His results included findings relevant to second language (L2) reading research, documenting individual differences in both the amount and the sequence of lexicon look-up. "Strategic" rather than random use of the lexicon was also evident from the data, which showed that students looked up words relevant to the task they were asked to perform (i.e., responding to questions or writing a summary). Although one of the objectives of this study was to examine the influence of "task" variables (a pedagogical variable), task was operationally defined here as indicating comprehension through summarizing or responding to questions; the tasks were not set up to reflect specific pedagogical goals.

Research investigating pedagogical questions relies on process data to act as evidence about the quality of a CALL activity in meeting an instructional objective. For example, Goodfellow and Laurillard (1994) reported the results of a case study investigating learners' use of a CALL program for vocabulary acquisition intended for English speakers who were learning Spanish. The program allowed learners to select, group, and practice vocabulary contained in on-line texts in order to achieve real pedagogical objectives (i.e., learning the selected vocabulary). The research method examined CALL use processes through observation of learners' choices made while using the program and engaging in think-aloud protocols. The results indicated that learners were not able to use the program effectively for vocabulary learning, and results were interpreted in terms of their implications for future research and program design. The authors point out, on the basis of their results, that such programs which assist learners in their language acquisition "demand a degree of sophistication in the user/learner which cannot be taken for granted" (Goodfellow and Laurillard 1994:44).
A CALL program used in another pedagogically-oriented study (Hsu, Chapelle and Thompson 1993) seemed to demand a level of learners’ interest in exploration which also cannot be taken for granted. Hsu, Chapelle and Thompson (1993) examined whether CALL could successfully provide an environment in which learners would test their hypotheses about grammatical features of the target language (Higgins 1995, Higgins and Johns 1984). Specifically, they investigated learners’ use of an exploration strategy (defined as experimenting with and hypothesis-testing about the target language). Exploration was inferred on the basis of two types of interaction behaviors; however, one of the behaviors revealed extensive variance among learners, and the other provided no evidence of exploration. Overall, the results of these studies are informative for future software development and use; they demonstrate the need to examine empirically the extent to which the hypothesized potential of CALL actually benefits intended learners.

Of course, psycholinguistic and pedagogical questions are not mutually exclusive. Hulstijn’s study showed that learners were able to use the on-line dictionary successfully as needed to complete the experimental task, and therefore results might inform future instructional design in reading comprehension software. Goodfellow and Laurillard’s approach illustrated the complement: The ways in which the researchers summarized their performance data was guided by their psycholinguistic theory of vocabulary acquisition. In both of these cases, however, the researchers used their primary research purpose to summarize and interpret the large amount of process data obtained through observation of learners’ work on CALL. As work continues in this area, we are likely to see a variety of solutions to this problem, including solutions intended to summarize process data for the benefit of the learner, as Scott and New (1994) have begun to explore for their French learners.

2. The study of learner-constructed texts within the context of CALL

Researchers have continued to use discourse analysis in both of the ways suggested above—examining the discourse among learners working in computer mediated contexts and investigating the “discourse” between learners and computer programs. In both cases, researchers attempt to identify relevant systematic aspects of texts that occur in CALL contexts; the analysis of systematic text features provides evidence about the quality of CALL as a context for language acquisition.

Discourse analysis of texts produced by learners in computer-mediated contexts has examined both written and oral texts. Chun (1994) investigated computer-assisted class discussion (i.e., written language transmitted over a network) in a first-year German class to seek evidence of the functions that learners used. She found that learners used a number of interactional speech acts, for example, asking questions and requesting clarifications, and she concluded that the called behavior as positive for language acquisition (without quantitating the various components) and that the positive and negative social stimulation that some computer systems provide without the learner’s cognitive effort may be more effective. Yet the latter data are not yet in.
that the computer-assisted class discussion format created a context which was positive for the acquisition of these acts. Mohan (1992) investigated both quantitative and qualitative aspects of ESL learners’ conversations during work on various computer programs and in conversation in a non-computer context. The quantitative analysis found that learners talked significantly more without the computer present. In a qualitative comparison of the texts occurring with and without the computer, he found evidence for contextual embeddedness and cognitively demanding discourse in the computer tasks. He concluded that the latter data:

...show computer users engaged in the cognitive discourse of problem-solving discussion. Sometimes the reasoning involved is implicit, but sometimes it is explicit and discussed in considerable detail. It looks likely, then, that the computer can offer communication tasks with high cognitive demands and high contextual support. To say this is to begin to see computer use as an activity that relates action, knowledge, and discourse (1992:124).

Probing the nature of various computer uses through discourse analysis, researchers have also continued to explore whether or not texts produced through learner-computer interactions might provide indications of second language acquisition. In designing their CALL system, Renie and Chanier (1995) conceptualized the computer as a collaborator with the French learner who participates in goal-directed scenarios such as making a reservation at a restaurant. Their approach to understanding the collaboration between learner and computer seeks to characterize the type of "utterances" (i.e., the acts) each can contribute to the collaboration. They are then able to speculate on the potential value of particular collaborative sequences for second language acquisition on the basis of a Vygotskian theory of collaboration and "exolingual interaction" theory, a theory which hypothesizes the nature of "potentially acquisitional sequences" during collaborative interactions.

On the basis of Long’s (1985) theory of interactional modifications, Hsu (1994) conducted a focused discourse analysis of interactions between learners and the computer to identify their requests for modified input within a listening comprehension program. The normal interaction in this part of the program consisted of learners’ requests for continuation of a story with accompanying pictures on one computer screen after another. The researcher counted as “interactional modification” those sequences in which this normal interaction was interrupted by the learners’ requests for modified input (which could be in the form of repetitions, written transcriptions, or written definitions for words in the input). Among the findings was a significant relationship between interactional modifications and acquisition of the specific lexical phrases with which the modifications had occurred. Working from the same theoretical perspectives, Chapelle (1994a) attempted to formulate systematic hypotheses about sequences of
interactions that might be expected to be good for second language acquisition. Such interactions would contain appropriate linguistic input in the target language (Krashen 1982) as Underwood (1984) hypothesized, requests for modifications (Long 1985), or production of target language grammatical output (Swain 1985). These hypotheses, like those of Renie and Chanier (1995), should be useful in framing theoretically-grounded empirical research questions.

Discourse analysis of both types of texts—those produced by learners working together or those produced through computer-learner interaction—share the objective of ultimately linking characteristics of the observed texts to the nature of the contexts in which the computer plays a role. This issue will be revisited in the final section.

3. Study of CALL use within its sociocultural context

Little work has been done to probe questions about the sociocultural and classroom contexts of CALL use. One recent study (Park 1994), however, used qualitative methods to investigate the classroom culture of ESL learners using hypermedia language learning software in an intensive English program in the U.S. The research highlighted factors in the language program and classroom contexts that influenced learners’ experiences with CALL. Edwards (1994) also conducted a study using survey research methods to investigate how the teachers’ attitudes and knowledge of CALL influenced their CALL use. This research in an intensive program in the U.S. offers some insight into the multiple contextual layers working together to affect CALL use. However, as Bowers (1988) pointed out several years ago, important questions remain about the cross-cultural implications of educational technology and its associated ideologies. Clearly, much work remains to be done in this area and cross-cultural issues must be included as a key challenge for CALL research in ESL.

CURRENT CHALLENGES IN CALL RESEARCH IN ESL

As we approach the year 2000, it is clear that research in CALL will continue to develop in diverse directions. Even those CALL researchers who wish to remain within the tradition of educational technology will find that work in that field has evolved to include a number of different perspectives including “a cultural constructivist approach” (Crook 1994, Scott, Cole and Engel 1992) with roots in Vygotskyan cultural psychology (Wertsch 1985). This approach “makes sense of ‘learning’ by reference to the social structure of activity rather than by reference to the mental structure of the individual” (Crook 1994:78). A cultural constructivist approach hypothesizes that individual cognitive development takes place through interaction with others, and therefore key evidence for the quality of a learning activity should be found in the discourse that occurs in the collaborative environment. In other words, researchers in educational technology are also concerned with investigating the process of computer use through e-mail, bulletin boards, and newsgroups. For example, Ku (1992) and Ku and Lin (1992) increase their research to test the effectiveness of CALL in a cross-cultural context. However, a crucial challenge for CALL researchers in ESL is to investigate the sociocultural and classroom contexts that influence learners’ experiences with CALL. In this regard, research on the cross-cultural implications of educational technology and its associated ideologies remains a key challenge for CALL research in ESL.
through examination of the texts occurring in computer-mediated contexts (Henri 1992, Kumpulainen 1994, Mason 1992). As researchers across disciplines increase their interest in learning through language, applied linguists are ideally suited to provide leadership in methods of discourse analysis. At the same time, however, CALL researchers continue to be challenged by three primary issues facing research on L2 development.

First, despite the value of examining process-oriented data in CALL research, there remains a need to assess the outcomes of CALL use. Ultimately, a crucial question for researchers is whether or not learners’ interaction with CALL programs is related to subsequent ability in the target language. Mohan (1992) expressed the need to assess outcomes when he noted that it is not possible to test the use of CALL for developing context-embedded and cognitively demanding language proficiency “until language measures of context-embeddedness and cognitive demand are developed” (122). Hsu (1994) did assess outcomes through a post-test (and pre-test) which were constructed specifically for her research, focusing on precisely the vocabulary the learners were expected to recognize in the software she used. Similarly, Doughty (1992) was able to assess outcomes through the use of post-tests which were designed specifically for her research on acquisition of relativization by ESL learners. Construction of a test for a specific research setting, however, requires knowledge on the part of the researcher in the area of language testing. In short, to design and justify appropriate measures of outcomes in CALL research, the researcher must be able to use principles of validity, or usefulness, in language testing (Bachman 1990, Bachman and Palmer in press, Chapelle 1994b, Grotjahn 1986).

Second, in order to study better the observed texts occurring in CALL contexts, these texts need to be interpreted in terms of the features of their associated CALL contexts. In specifying important features of CALL contexts, it is necessary to identify those which help to explain the relationship between aspects of a context and the language that occurs in it. To do so in other settings, applied linguists have adopted various analytic categories for characterizing the contexts in which speech events occur. In SLA research, for example, Duff defined characteristics of a research task with terms such as “nature of gap between subject and interviewer” and “opportunities for extended discourse” (1993:65). For pedagogical tasks, Skehan (1992) suggested three basic descriptors, “code complexity,” “communicative stress,” and “cognitive complexity,” each of which is further specified. While these specific-purpose schemes for analysis may prove useful within their intended domains, it would be useful to look for similarities across schemes to examine CALL as a context for instructed SLA. Moreover, as Hasan and Perrett (1994) suggest, ideally theoretical motivations (e.g., Martin 1993) would underlie such analytic schemes:

...[At] a practical level, task-based [and other pedagogical] approaches...all call for a theory of language description that models the
close relation between context, meaning, and linguistic form. If context is defined by the meanings at risk in it, if form is seen as a resource for meaning, this permits a language-based understanding of which tasks, which situations, which texts are alike, which different in what way, and how they can be used profitably with what kind of learner (1994:221; emphasis added).

Given the global community that can be created by networked CALL, CALL contexts provide a unique challenge to a theory of context in applied linguistics.

Third, the contexts of CALL use need to be investigated at all layers, from the immediate task parameters of the CALL context to the sociocultural contexts which support values relevant to the use of technology. The contexts in which CALL tasks play a part are important because of their close relationship to texts that learners produce. However, any given task is embedded within a classroom context which, in turn, represents one of the institutional norms of a sociocultural context. Thus, the values and priorities of a culture will influence decisions concerning technology use within classrooms (Olson 1987) and, therefore, affect the tasks and texts learners participate in. Given the cross-cultural contact inherent in ESL, probing the cross-cultural perspectives on CALL should be a primary research objective.

These three challenges, although particularly pertinent to CALL for ESL, are not unique to this domain. The problem of measuring appropriate outcomes in a defensible manner is a key problem more generally in current educational research (e.g., Mandinach and Linn 1986). Researchers in other areas of educational technology (e.g., Clark 1994, Papert 1987) have argued the need for conceptualizing classroom computer use as it is impacted by contextual factors, and this need has been explored by some non-linguists (e.g., Crook 1987, Fulk, Schmitz and Schwarz 1992). From a larger perspective, it is only by examining the interface between Western technology and the values of other cultures that one may clarify the ideologies inherent in various educational computer uses. As CALL researchers work to meet the challenges of the 1990s, other areas of educational technology are likely to participate in the endeavor and benefit from the accomplishments.

NOTES

1. I have selected work which is methodologically relevant to research in CALL in ESL/EFL even though some of the studies reported investigate learners of languages other than English. For examples and discussion of ESL/EFL applications see CAELL Journal.

3. For reviews of research on CALL outcomes see Chapelle and Jamieson (1989; 1991) and Dunkel (1991).

**ANNOTATED BIBLIOGRAPHY**


Despite its age, this volume remains important for CALL in ESL because of its critical appraisal of the cultural assumptions underlying the use of technology in education. In particular, the author examines what he sees as the cultural components of a technology which is often assumed to be culturally neutral, and he questions the types of thinking that are included and excluded from the curriculum when computer programs are chosen as a means of instruction. His examples rely primarily on instructional programs and approaches from the 1980s; however, his approach to critical analysis of the cultural dimensions of educational computing remains current.


This paper argues that effective use and study of CALL requires that teachers and researchers assess the degrees of similarity and difference among CALL activities and consider the significance of this variation for language learning. This paper explains how the concept of genre is useful for investigating similarities among the types of language produced in CALL activities (i.e., CALL texts). Examples of CALL texts are provided to demonstrate how their functional elements might be analyzed and how their significant features might be identified in light of hypotheses about second language acquisition.

This paper reports the results of a study investigating the use of computer-assisted class discussions in a first-year German class. The author used discourse analysis methods to seek evidence for learners' functional use of language, evidence which might indicate their development of interactional competence. She found that learners used a number of interactional speech acts, for example, asking questions and requesting clarifications. She concluded that the computer-assisted class discussion format created a context which was positive for the acquisition of these acts.


This paper provides a classic account of product-oriented effectiveness research on CALL and situates the foundations of this type of research in the educational technology of the 1980s. It reviews the methodological and substantive findings of the past decade and outlines directions for future inquiry.


This paper attempts to characterize significant features of learning environments for second language learning and reports results of learners' use of one such environment. Making a general distinction between types of learning environments, it introduces the terms "illocutionary" and "non-illocutionary" learning environments, the former to denote environments in which the computer interprets and acts upon the learners' linguistic input, the latter to signify environments in which the computer acts upon primarily non-target-language input (e.g., key strokes or mouse clicks). ESL learners in the study exhibited little exploration in the non-illocutionary environment used in the research.


This paper investigates learners' use of an on-line dictionary for an EFL reading assignment requiring completion of reading comprehension questions or a summary. Results include individual differences in both the amount and the sequence of lexicon use. Results also revealed "strategic" rather than random use of the lexicon; students looked up
words most relevant to the task they were asked to perform (i.e., responding to questions or writing a summary).


This paper identifies the relevant features of computer-mediated contexts for second language acquisition by depicting the computer as taking on various roles within instructed language acquisition. It describes the computer as language teacher, as a stimulus for talk, and as a context for cognitive language development. Importantly, the author distinguishes between the latter two on the basis of observed language use within the two settings, illustrating the use of discourse analysis to help understand CALL contexts.


This paper provides a good introduction to the research literature on issues pertaining to computer-assisted writing instruction for ESL learners. It begins with a background on computer-assisted writing for native speakers and summarizes the implications for ESL writers. It then discusses potential influences of word processing on various aspects of ESL writing (e.g., planning and prewriting) and notes the need to investigate the conditions under which the identified potentials can be realized in ESL classrooms.


This edited volume contains papers on CALL research-related topics. The first section contains general perspectives on CALL, and the last section contains discussion of more technical aspects of software that might be used in CALL (e.g., analyzed corpora and speech technology). The second section, however, consists of four studies of CALL: a text analysis program for ESL writing, an instructional program on relative clauses, several programs as stimulation for conversation, and several ESL games. Each of these studies is well-contextualized and clearly described.

This volume assembles an international collection of descriptions from some of the most ambitious and elaborate CALL projects. The focus, as the title suggests, is on the systems themselves, which use artificial intelligence techniques to provide instruction in a number of languages. However, it also includes papers which describe empirical research on CALL use, and which discuss general issues in intelligent tutoring for foreign languages.

UNANNOTATED BIBLIOGRAPHY


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