

# Computer-Assisted Language Learning Materials in the Context of Second Language Acquisition and Pedagogy

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This paper discusses the role of materials, in general, in the language learning and teaching context. The paper then discusses some of the important characteristics of CALL materials and some of their potential advantages in comparison with conventional materials. Specifically noted are the potential ability of CALL materials to provide the learner with immediate, relevant, highly individualized feedback; the potential relationship of CALL materials to increased levels of motivation and language learning effectiveness and efficiency; the ability of CALL materials to lower the learner's "affective filter"; the ability of CALL materials to model the use of authentic language in context and to provide the learner with meaningful, communicatively motivated language practice; the ability of CALL materials, potentially, to provide highly cost-effective language instruction; and finally, the ability of CALL materials to allow the learner varying degrees of control over the language learning process, depending on the task and other factors. As with conventional materials, it is important for the language teacher to select or develop CALL materials that are compatible with program objectives and other elements of the instructional system.

## 0. Introduction

With the rapid advances that have occurred in personal computer hardware and software over the past decade or so, the field of foreign language teaching and learning has seen the introduction of an increasingly large number of educational software programs ("courseware") designed to be used by students and teachers of second or foreign languages. Some programs of this type have indeed been both innovative and effective. Far too

often, however, computer-assisted language learning (“CALL”)<sup>1</sup> courseware suffers from serious design flaws of one kind or another. The purpose of this paper is to explore some of the pedagogy-related design issues in the selection or development of effective language learning materials in general, and of CALL materials in particular. Reference will also be made to various types of CALL material in relation to those issues.

Particularly in the early years of CALL materials development, and to some extent even now, the field has suffered somewhat from what might be referred to as the “language lab syndrome”. As Underwood (1984: 33 ff.) notes, the language teaching profession in the 1950’s and 1960’s held great hope that language lab technology would “revolutionize” the teaching and learning of foreign languages. The language lab has failed, however, to fulfill the sometimes unrealistic expectations placed upon it, due in part to such factors as the lack of high quality materials, the inflexibility of the technology, insufficient attention given to pedagogical needs, and the inherently passive and non-communicative nature of the activities typically programmed for the language lab.

Echoing our experience with the language lab, many language teaching professionals in recent years have begun to hold similarly high, and often unrealistic, expectations that CALL courseware will indeed succeed where the language lab may have fallen short—in revolutionizing the teaching and learning of foreign languages. To be sure, the technology on which CALL is based is much richer and more sophisticated than that of the language labs of earlier years, but in both cases, there has been a sort of uncritical fascination with new technology which ends up being underused or even misused.

This uncritical fascination with technology has led too often to the development of CALL courseware that is primarily “technology-driven”, rather than “pedagogy-driven”. There are many examples of CALL programs designed and developed by computer programmers who, for all their proficiency in the use of technology, knew little about language teaching and learn-

<sup>1</sup> The terms CALI (computer-assisted language instruction) and CALL (computer-assisted language learning) are both widespread, although the latter is both more recent and probably now more commonly used. The latter term is also preferred in this paper, as it implies a focus on the learning side of the teaching/learning equation and on the role of the learner as an active agent in that process.

ing. There are, of course, equally numerous examples of programs developed by language teachers who, for all their experience in language pedagogy, were incapable of fully exploiting the technology in order to translate their pedagogical ideas into effective, professional-quality language courseware. In light of our brief and somewhat “checkered” experience with CALL courseware, it is now even more widely recognized that effective CALL materials must not only take full advantage of the rich features of the technology itself, but they must also be designed with full consideration of the pedagogical issues involved.

In the balance of this paper, we will first discuss the role of materials in general within the language learning and teaching process, and secondly, we will discuss some of the characteristics and potential advantages of CALL materials in comparison with conventional materials and classrooms. Reference will also be made in our discussion to some specific types of CALL courseware as they relate to the pedagogical issues being raised.

## 1. The Role of Materials in Language Learning/Teaching

Professional teachers typically use a wide range of materials in the process of teaching a foreign or second language.<sup>2</sup> In rare cases, the materials may consist only of chalk and eraser, textbook, or written handouts. Or, more often, the materials may also include pictures, maps, slides, audio tapes, video tapes, or other materials designed to enrich the learning process aurally or visually. Increasingly, a variety of CALL materials, from conventional drill-and-practice to sophisticated interactive video applications, are being used in the language classroom. In selecting appropriate materials for the classroom, it is important to identify explicitly the purpose(s) the materials are intended to serve and it is important to consider the intended role of the materials in relation to other factors in the teaching and learning process.

<sup>2</sup> Donna Brinton (1991) gives a useful overview of various media materials, both technical and non-technical, and offers guidelines for their use in the classroom (pp. 454 ff.).

### 1.1. Materials and Richards and Rodgers' "Method" Model

Jack Richards (1985) (together with Ted Rodgers) discusses the role of materials in the context of their "Method" model of instructional systems (pp. 16 ff.). According to their model, the overall Method consists of three components: Approach, Design, and Procedure. We will briefly review the structure of each component, paying particular attention to the role of materials.

The Approach component consists of two further elements: a theory of the nature of language itself and a theory of the nature of language learning. The Approach in any given system of language instruction, then, may be characterized in terms of the teacher's assumptions, explicit or otherwise, concerning the structure of language, the nature of linguistic competence, the process through which learners acquire that competence, the variables affecting the language acquisition process, and so on.

The Design component consists of four further elements: Content, Learners, Teachers, and Materials. Content includes a definition of the linguistic content to be taught, the objectives in relation to that content, criteria for selecting and organizing the content, the syllabus, and so on. The role of learners in this model may be specified in terms of the types of learning tasks to be set for them, the degree to which they are to be given control over content, the manner in which they are to interact with the teacher and with each other in the learning process, and so on. Similarly, the role of teachers may be viewed in terms of the functions they fulfill in relation to the students (task-setter, drill master, native model, counselor, consultant, etc.), the degree to which they exercise control over the content of learning, the manner in which they interact with students, and so on.

Finally, the role of materials within the Design component of an instructional system includes a specification of the goals and purposes for which the materials will be used, the form they will take (textbooks, pictures, realia, computer programs, etc.), the relation they will have to other sources of language input (will they serve as primary or supplementary sources of input?, will they be optional or required?, etc.), and so forth.

The Procedure component includes the actual techniques, activities, and exercises used by teachers in delivering language instruction to students. Different types of activities and exercises (drill, role play, simulation, trans-

lation, games, etc.) will be deemed to be more or less appropriate, for example, depending upon the approach, the content and learning objectives, and the teacher's assumptions about the respective roles of the teacher and learner. The Procedure component also makes reference to the equipment, time, and other resources available or required in carrying out the program of instruction.

Taken in the context of the model proposed by Richards and Rodgers, then, instructional materials should be selected or developed only after higher-level decisions concerning approach, content, learner/teacher roles, and procedures have been made. Materials selection or development thus becomes a top-down, "pedagogy-driven" process. Materials should be selected which are compatible with the teacher's assumptions about how learners acquire language, they should be consistent with the content objectives specified in the syllabus, and they should allow or encourage the learners to exercise the degree of control over the learning process that is assumed by the overall method to be optimal, a topic to which we shall return below.

## 1.2. Materials and Current Trends in Language Teaching Methods

Languages are, of course, taught and learned for a variety of purposes, and there is no reason to believe that any single method or approach will be appropriate for all purposes. But there are clear trends in language teaching methods that reflect our most current theoretical assumptions about the language learning process and that have important implications for language teaching materials.

One such trend is that, except for certain special-purpose courses, learning a foreign language has come most generally to mean learning the language as an instrument for real, oral communication, not just for the purpose of being able to read and translate.

At the same time, the strong preoccupation in many earlier teaching methods with grammatical structure is being replaced, increasingly, by an equally strong emphasis on comprehension and communication, on developing not only sentence-level grammatical competence but discourse-level communicative competence as well. Predominantly structure-based language syllabi are being replaced, increasingly, by notional-functional, situa-

tional, task-based, or other, sometimes integrated, forms of syllabus.

Also, as we have come to recognize more clearly the significant contribution of motivation and other learner variables to successful language acquisition, language teaching methods have accordingly tended to become more and more learner-centered, rather than teacher-centered, and have begun to take individual learners' needs more conscientiously into account.

And finally, nearly all language teaching methods that aim to develop communicative competence recognize the critical importance of natural, authentic, but comprehensible input in that process. Maximizing learners' exposure to authentic input in natural contexts has thus become an indispensable feature of communicative approaches to language teaching.

The relevance of these trends for language teaching materials is that it is not only important for such materials to be internally consistent with other elements of the instructional system, but if they are to be maximally effective, they should also be compatible with language teaching methods that are currently held to be pedagogically most sound— i.e., with methods that well reflect our most current theoretical understanding of the language acquisition process. Such materials should, in other words, provide language use and activities that are meaningful, communicative, authentic, highly motivating, and pedagogically sound.<sup>3</sup>

## 2. Characteristics and Advantages of CALL Materials

We have discussed the relationship of language teaching materials to the overall context of language instruction and learning. We have also identified some of the characteristics that effective language teaching materials of any kind should have. In this section we will outline some of the particular characteristics and potential advantages of computer-assisted language learning (CALL) materials in comparison with other, more conventional materials, the language lab, and the teacher.

<sup>3</sup> As Richards (1990) notes, for language teaching materials to be effective, they should be “based on theoretically sound learning principles,” should “arouse and maintain the learners' interest and attention,” should be “appropriate to the learners' needs and background,” should “provide examples of how language is used,” should “provide meaningful activities for learners,” and should “provide opportunities for communicative and authentic language use” (p. 15).

## 2.1. Immediate, Relevant, Individualized Feedback

It is well known that individual language learners have different cognitive styles and tend to employ different learning strategies in the process of acquiring a second language.<sup>4</sup> One of the positive characteristics most often cited in descriptions of CALL courseware is its potential ability to analyze the learner's input, to respond in a meaningful way to that input, and to branch to other appropriate activities according to the learner's particular interests, needs, or level of ability.

While human teachers are certainly capable of responding to learners in highly individualized ways, limited class time and large class sizes prevent teachers from engaging in the number and quality of interactions that would be ideal for promoting learning. A good CALL program, on the other hand, can provide feedback that is immediate, frequent, relevant, and individually tailored to each student's needs, and in a multi-user environment can do so simultaneously to a large number of students.

CALL courseware is thus, potentially at least, highly interactive. CALL materials differ crucially from conventional materials (such as textbooks, dictionaries, audio and video tapes) in that the latter permit only a *unidirectional* exchange of information (from the material to the learner), while CALL programs permit a *bidirectional* exchange of information based on the computer's instantaneous response to input from the learner (Bickes and Scott, 1989: 25). Furthermore, as we will discuss in section 2.8 below, the nature of the interaction is not limited to a linear, dialogue style of interaction, but may take the form of a more learner-controlled, exploratory style of interaction.

## 2.2. Motivation and Learning Effectiveness and Efficiency

The relationship of motivation to the second language acquisition (SLA) process has been a topic of great interest to researchers. Different types of motivation (e.g., instrumental vs. integrative) may have a greater or lesser impact on the SLA process depending upon the setting and upon other learner variables. It is also not entirely clear what the direction of the rela-

<sup>4</sup> For useful summaries of the research in these areas, see Ellis (1985) and Larsen-Freeman and Long (1990).

tionship is (i.e., whether high motivation produces successful learning or vice-versa, or perhaps even both). Although the issue is a complex one, most of the research that has been conducted so far leaves little doubt that high levels of motivation correlate positively with both a faster rate of SLA as well as with higher levels of ultimate success in SLA (Ellis, 1985: 116 ff.).

The results of research into questions concerning the relationship of CALL to motivational intensity and to learning effectiveness and efficiency are mixed. Numerous studies claim to have shown a positive relationship between the use of CALL on the one hand and favorable learner attitudes and increased levels of motivation on the other. Still other studies claim to have shown a relationship between the use of CALL materials on the one hand and effective, efficient learning on the other.<sup>5</sup> A number of other studies, however, suggest that, even where the use of CALL materials correlated positively with high levels of motivation, with favorable attitudes toward CALL, and with efficiency of learning, there was either no significant relationship, or in some cases, even a negative relationship between the use of CALL and gains in L2 proficiency (Chapelle and Jamieson, 1986; Stenson, et al., 1992).

The message that seems to be derivable from current research on the subject is two-fold: (1) that *some* learners will experience higher levels of motivation and achieve greater language learning success as a result of using CALL materials than will others, and (2) that high levels of motivation and language learning success resulting from the use of CALL materials may depend on learners' individual cognitive styles, preferred learning strategies, etc., as well as on the language skills being learned, the specific characteristics of the CALL materials being used, etc.. It is surely also true that *good* CALL materials (i.e., materials that make the best possible use of the unique features of the medium in response to specific learner needs) will likely produce *good* results, in the form of higher levels of motivation

<sup>5</sup> Studies which claim to have demonstrated the relative effectiveness and efficiency of CALL have produced distinctly mixed results. Many, if not most, of the studies that have been done lack experimental rigor. This seems due, in part at least, to the extreme difficulty of controlling all of the complex variables involved in comparing CALL and non-CALL treatments. For a review of the effectiveness research related to CALL and an excellent discussion of the issues involved in evaluating CALL effectiveness, see Dunkel (1991).

and increased learning efficiency and effectiveness, while *bad* CALL courseware will likely have the opposite effect.

### 2.3. Lower Affective Filter

According to the “affective filter hypothesis” (Dulay and Burt, 1977; Krashen 1982), the amount of comprehensible input the learner actually manages to “intake” or internalize depends, to some degree, on certain socio-affective factors. More specifically, when motivation and self-confidence are high and anxiety is low, the affective filter is said to be lower, thus allowing more comprehensible input to pass through to the “language acquisition device” (LAD). Conversely, when motivation and self-confidence are low and the level of anxiety is high, the affective filter is higher, preventing comprehensible input from reaching the LAD for internalization.

One of the strengths of the computer is that, properly programmed, it can be an infinitely patient, non-threatening tutor. If the materials are interesting and motivating, and if they are designed in such a way as to positively reinforce learners’ progress through the materials, they will have the effect of building the learner’s self-confidence. Moreover, since learners will usually be working individually or in small groups at the computer, anxiety resulting from having to perform in front of peers is eliminated, or at least minimized. This lowering of the affective filter can logically be expected to facilitate the acquisition process, provided the materials themselves are pedagogically sound in the sense described earlier.

### 2.4. Ability to Provide Expert Knowledge

Although many language teachers are knowledgeable and well-trained, and although human teachers in general possess qualities and knowledge that computers cannot, there are no teachers who have the amount and variety of certain kinds of knowledge that computers can be programmed to store. The computer can be programmed to store the knowledge of many expert teachers, and to use that knowledge in interacting with the learner, functioning, in effect, as a sophisticated expert system that, in some ways at least, may be better than any individual human teacher. Complete dictionaries and other reference works can easily be stored in the computer, and

lexical and grammatical information can be retrieved from such data bases, hypertext-style, much more rapidly and conveniently on-line than would be the case with materials in conventional hard copy form.

CALL courseware can be made not only to store detailed grammatical, lexical, and other structural information, but it can also be made to interact with the learner in such a way as to be able to diagnose his or her specific deficiencies and provide practice or instruction relevant to those deficiencies in a way that a language teacher without specialized training in linguistics might be unable to do.

Or the computer might, for example, be programmed to engage the learner in a shopping simulation, systematically manipulating such variables as money available, items required to be purchased, operating hours of stores, or other shopping-related factors, in such a way that the learner is made to focus on some non-linguistic task, the accomplishment of which requires use of the target language in the process.

While a well-trained human teacher using conventional materials would surely be able to provide learners with some of the same kinds of learning experiences, such teachers are not available to all learners. Even where they are available, they would be limited in the number of students they could interact with directly, while the computer can provide such experiences, complete with sophisticated graphics and visual images, for any number of learners simultaneously. Thus, especially in areas where conventional language learning resources are limited and there are few well-trained, highly qualified teachers available, CALL materials have the potential to bring relatively high-quality language instruction to students who would otherwise go without.

## 2.5. Ability to Model Authentic Language in Context

There are, of course, many theoretical differences among the various approaches to second language teaching and learning. As alluded to above, however, there is widespread agreement concerning the importance of maximizing the learner's exposure to natural, authentic, comprehensible examples of the target language being used in actual situations in the target culture (at least among those whose main objective is the development of communicative competence). Unfortunately, however, many learners in foreign

language classrooms have little or no realistic opportunity to go to the country where the language is spoken, to live and study there, and to further their mastery of the language in that environment. In many cases, learners' access to native speakers of the target language, whether inside or outside of the classroom, is quite limited.

Video-taped material from the target culture can compensate in part for the foreign language learner's lack of exposure to the target language in its natural context. Interactive video-based CALL courseware can take the learner a step further, not only by presenting her with authentic discourse in context, but by engaging her, interactively, in a variety of comprehension and other learning activities designed to bring the target culture to her and to facilitate her acquisition of language skills in a natural (albeit simulated) environment.

## 2.6. Ability to Provide Meaningful Language Practice

Language learning exercises in general can be characterized according to their level of "intelligence" or "meaningfulness" along a continuum ranging from "mechanical" (least intelligent) at one extreme, through "meaningful" (somewhat intelligent), to "communicative" (most intelligent) at the other end of the continuum.<sup>6</sup>

Exercises of a mechanical nature tend to focus on the learner's suppli-ance or manipulation of individual words, phrases, or even sentences, but without discourse context to give any sort of communicative meaning to the exercise. Too many of the CALL programs that have thus far been de-

<sup>6</sup> Chun and Brandl (1992) discuss their Macintosh-based CALL materials for German as a second language in the context of a similar continuum, ranging from "Form Restricted" at one extreme, through "Meaning Enhancing," to "Meaningful Communication" on the other end of the continuum. Their "Communicative Gap Exercises" for German fall in the intermediate category of "Meaning Enhancing"— i.e., not based solely on isolated forms devoid of communicative context on the one hand, nor completely capable of free, fully contextualized human communication with the learner on the other hand. Rather, their CALL exercises are claimed to be able to engage learners in "meaningful interaction or negotiation with the computer" in which the computer accepts and responds to learners' input in the form of complete sentences, at least within relatively limited semantic domains and thematic contexts.

veloped are essentially of this type—so-called “Drill and Practice” programs, or perhaps more cynically, “Drill and Kill” programs. These types of programs are relatively easy to develop, but they are of limited benefit to the learner in terms of building communicative competence.

Even CALL programs that provide routine drill and practice, however, can contribute *indirectly*, at least, to the learner’s development of communicative competence. By providing the learner with opportunities to practice grammar, pronunciation, and other routine, form-oriented tasks *outside* of class, CALL programs can free the teacher to devote precious class time to more valuable communicative activities. And where even a minimal amount of context and meaningfulness can be injected into the exercises, some benefit may well be achieved.

Exercises that are “meaningful” go beyond the manipulation of isolated words and phrases and engage the learner in discourse that is contextually motivated—that is, they present the learner with sentences, for example, that are related to each other in the form of a dialogue, a narrative, or some other type of meaningful discourse. Meaningful CALL exercises may attempt to elicit information from, or negotiate meaning with, the learner (as in the “communicative gap exercises” described by Chun and Brandl, 1992), or they may involve the learner interactively in the solution of some essentially non-linguistic problem or task. Although the domain of the discourse may be artificially limited in both semantic and grammatical terms, “meaningful” exercises are very different from “mechanical” exercises in that the former focus on meaning and discourse in context as opposed to the mere manipulation of forms. There are already available many, relatively good CALL programs that achieve meaningfulness at this level, including a variety of task-oriented simulations, problem-solving games, exploratory “adventure” games, interactive video-based dialogues, and so on.

Finally, genuinely “communicative” exercises are essentially those that engage the learner in relatively free communication of the sort in which humans normally participate. As in “meaningful” exercises, the focus is on exchanging information, negotiating meaning, self-expression, and other normal communicative functions associated with human speech. Interaction with the learner involves exchanges that are essentially unrestricted in semantic domain, grammatical structure, or pragmatic function.

CALL exercises that aspire to achieve true communicative capacity in

this sense require sophisticated speech recognition, parsing, and other artificially intelligent, natural language processing capabilities in order to analyze the learner's input to the computer and to be able to respond in grammatically, semantically, and pragmatically appropriate ways. Needless to say, in spite of significant advances both in our theoretical understanding of natural language and in the application of artificial intelligence programming techniques to the problems of natural language understanding, we are still far from being able to simulate full, free, natural, human communication between computer and language learner.<sup>7</sup>

## 2.7. Cost-Effectiveness

Initial development costs, especially for more sophisticated "meaningful" or "communicative" CALL programs, may be very high indeed. Clearly, a significant investment of resources is required in order to design and develop CALL programs that make use of interactive videodisc and other leading-edge technology, and that require project teams of hardware, software, subject-matter and other specialists. There is increasing evidence, however, that the instructional return on those costs is also potentially very high. Based on a comprehensive analysis of the use of interactive videodisc technology in education and training, a Department of Defense report concludes, for example, that interactive video instruction was not only "less costly than conventional instruction" but was also found to be "more cost-effective than conventional instruction" (Fletcher, 1990).

As multimedia hardware and software costs continue to fall, even high-end interactive video-based CALL courseware will become more and more affordable to the end-user, and as the quality of such materials continues to improve, there is every reason to believe that they will become more and more cost-effective. While an increasing number of university language

<sup>7</sup> There have been, however, some very interesting attempts to develop CALL programs that begin to approach the level of communicative ability described here. See, for example, Janet Murray's description of an "Advanced Language System" which will present the learner with "simulation exercises, some of which include the use of artificial intelligence to create 'conversations' on the computer by giving students an imaginary interlocutor with whom to carry on keyboard-based dialogues" (1991: 2).

learning centers already offer their students the use of multimedia-based CALL courseware, it will not be too long before there is a substantial increase in the number of individual learners who will be able to afford to purchase multimedia instructional programs.

Another development that promises to make CALL programs more affordable and cost-effective is the emergence of sophisticated, yet inexpensive, authoring systems such as Toolbook, an object-oriented, Windows-based application development system running on IBM-compatible computers. By their nature, authoring systems unavoidably place some restrictions on the types of instructional designs that can be supported, but restrictions have become fewer and less constricting as the systems have become more powerful and sophisticated. In spite of some such limitations, Toolbook and other, similar systems have become potentially very useful because of the ease with which they permit the prototyping and development of even rather sophisticated multimedia courseware, and equally importantly, because of their extremely low cost in comparison with other, better established authoring systems.

## 2.8. Learner-Controllability

The final aspect of CALL courseware that we will discuss concerns the degree of control the learner is given over his interaction with the program. As we noted above, CALL materials differ from conventional materials in that the flow of information in the former is bidirectional. That is, the computer queries, or presents options to the learner and the learner responds, or vice-versa. While all CALL programs are interactive in this general sense, the specific style of interaction varies from one CALL program to the next.

The different styles of interaction that may be seen in CALL materials vary along a "controllability continuum," ranging from low-learner-control over the interaction and the resulting learning path at one end of the continuum to high-learner-control at the other end.

At the low-learner-control extreme, which may be referred to as the "Socratic Dialogue Approach," the computer typically engages the learner in a simulated dialogue, in which the computer asks the learner a question, accepts his input, then branches to the next question based on its analysis

of the learner's response. This linear, dialogue-style interaction continues until the learner has completed the programmed sequence of instruction. Because of the dialogue metaphor, this approach gives the learner a strong sense of interactivity, but the computer remains firmly in control of the path taken by the learner through the material, anticipating possible "correct" and "incorrect" responses along the way and branching to appropriate modules of instruction based on its analysis of the learner's responses. By its nature, this style of interaction is best-suited to a pedagogical approach that assumes that the learner, in general, does *not* know what he or she must learn at any given point in the process.

At the high-learner-control end of the continuum, which may be referred to as the "Hypermedia Approach," the interaction typically takes a more menu-driven, exploratory form. The computer serves as an expert consultant and places its resources at the disposal of the learner, who, depending on her own perceived needs and interests, selects the path she will take through the material. This approach assumes that the learner, in general, *does* know what she must learn at any given point in the process, and allows her greater latitude in navigating through the material.

In practice, few programs take either extreme approach to interaction. Rather, they will tend to lean more or less heavily in one direction or the other. Nor is either extreme necessarily the "right" way to approach interaction between the learner and the computer under all conditions. Some combination of different levels of learner controllability will often be required within the same program, depending on the particular activity or task, its objectives, and so on. An adventure game or a simulation, for example, might require a higher degree of learner control over the interaction, while a comprehension test might require a higher degree of computer control.

Furthermore, different learners may well prefer, and perform better under, different levels of control, depending again on the task. In a tutorial, for example, it may be that a strong, highly motivated learner will prefer a more exploratory, learner-controlled style of interaction, while a weaker, less highly motivated student might perform better in a more highly computer-controlled style of interaction. At either end of the controllability continuum, however, safeguards must be built into the program to avoid the pitfalls inherent in each extreme.

At the low-learner-control end, there is the danger (especially common in CALL applications) of misanalyzing the learner's input, resulting in disrupted dialogue, branching to irrelevant sections of instruction, or worse. When the programmer or lesson designer lists the responses the computer should accept, there are bound to be responses that cannot be fully anticipated, leading either to problems of *not accepting* learners' *valid* responses or of *erroneously accepting* learners' *invalid* responses. To safeguard against such problems and to minimize their effects when they do occur, programs should be developed which have at least some degree of natural language processing capability, which make questions directed to the learner as specific and unambiguous as possible, and which not only respond to the learner's input, but also model the "correct" or intended responses as confirmation or disconfirmation.

At the high-learner-control end of the continuum, if the material is complex enough, there is the danger that even strong, highly motivated learners may become "lost" while exploring their way through the material unless they are given some guidelines as to what should be accomplished and in what recommended order, perhaps, and unless feedback is given to them so that they will know what they have or have not yet accomplished.

Whether there is relatively little or great learner control over the specific direction of the process, however, the interaction that occurs between the learner and the computer is significant and represents one of the most appealing and motivating features of CALL courseware in comparison with conventional materials.

### 3. Conclusion

We have discussed the role of materials in the language learning and teaching context. We have also examined some of the important features and potential advantages of CALL materials in particular. As more and more sophisticated CALL courseware becomes available to language learners, it seems clear that the role of CALL materials in language teaching and learning will only continue to grow in importance.

Many teachers have been reluctant, however, to embrace CALL materials in their own teaching. In some cases, this has been due to the unavailability or prohibitive cost of such materials, or to the lack of certain-

ty as to the effectiveness of CALL in general. In other cases, it has been due to a lack of sophistication or other inadequacies in the CALL materials themselves. In still other cases, however, it may be due to a fear, albeit groundless, that the demand for human teachers will somehow decline as computers begin to be relied upon in more and more areas of language instruction.

It seems true enough that computers have the potential to add new and rich dimensions to the language learning experience. The computer may even be able to perform some language teaching functions more efficiently and effectively than human teachers. The role of the teacher, however, will continue to be of great importance, even though the nature of that role may well change as our understanding of the SLA process evolves and as increasingly sophisticated CALL materials become available. Frank Borchardt, the Executive Director of CALICO, may well have been right when he said, "computers will not replace teachers, but teachers who use computers will replace teachers who don't" (1991: 24).

Indeed, there is no reason to believe that skillful, caring, well-prepared teachers will be replaced by computers at any time in the foreseeable future. There are many reasons to believe, however, that teachers who are able to recognize good, effective CALL courseware and who are able to integrate it into their programs of instruction will have a significant advantage over those who fail to understand its potential.

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