COMPUTER ASSISTED LANGUAGE LEARNING IN ESL: CONCERNS, APPLICATIONS, AND FUTURE PROSPECTS

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CHAPTER ONE

INTRODUCTION

Using computers to supplement and enhance language teaching and language learning has moved beyond the realm of novelty to become an almost expected part of an effective second language program. The lower costs of computers, their increased simplicity of use and programming, the increased availability of software, the overall fascination of new educational technology, and the fact that computers are being put to use in almost all other disciplines make the increased use of computer applications to language teaching inevitable.

Naturally, when faced with this new onslaught of educational technology and all of its promises, many language teachers, educators, and theorists voice healthy questions, concerns, skepticism, and fears. In the field of teaching English as a second language (ESL) in particular, at the forefront of new trends in teaching and testing methodology, valid questions exist regarding the practical use of the computer as a teaching and testing aid.

In light of such questions concerning the use of computer assisted language learning (CALL) in ESL, the purpose of this thesis is to examine the compatibility of

CALL and current ESL methodology, to survey the current applications in hardware and software with an emphasis on what is needed and what is actually available in ESL CALL as of 1985, and to look at the possible applications and considerations of ESL CALL in the future.

CHAPTER TWO

BACKGROUND

The use of computers to supplement and enhance language teaching is approaching only its second decade, yet it has only been in the last five years that second language CALL has received serious attention from language teaching professionals as a whole. Previously, CALL language work was relegated to those institutions and programs at the forefront of the field, so to speak, those who had the ambition, finances, and infrastructure to support massive research projects. It just so happened that these early CALL research projects and programs were all in foreign languages--that was where the funds and interest lay. Similar work in ESL was initiated only in the middle to late 1970's, and predominately incorporated English into already existing CALL foreign language courseware, the assumptions concerning what language is and how it can be taught being universally applicable to all languages.

As with any educational program or method, regardless of the methodology, the technology available is a major determinant in the outcome of the final product. So it was (and still is) with CALL and language learning. And the equipment that shaped early foreign language (FL) and ESL

CALL was the mainframe computer, a large, very expensive computer tied in with numerous terminals with virtually unlimited space to store and work with inputted information.

Consequently, because of their expense, upkeep, and overall sophistication, very few institutions and/or language programs could afford and maintain language courses that incorporated CALL. However, with the advent of microcomputers the situation has changed. They are inexpensive and available, easy to use and to program, and--except for such mainframe CALL endeavors such as PLATO at the University of Illinios and its sister systems scattered elsewhere--have changed the entire scope, function, feasibility, and practicality of foreign language CALL.

At first, CALL language programs, with the help of mainframe computers, sought to totally replace the traditional language classroom, teacher and all, the two prime examples being the ambitious and expensive projects begun in 1968 at the University of Stanford and the University of Stony Brook with their Russian and German programs, respectively. As outlined by Van Campen, at the University of Stanford, the aim was to formulate a set of rules to optimize the utilization of the computer for language education, funded at $100,000 a year by the U.S. Office of Education (1968). At Stony Brook, IBM, donating both hardware and software, was looking for a commercially feasible German package (Adams et. al., 1968). Not surprisingly, most of the work in both cases was planned,

developed, and tested by non-language professionals: computer programmers, data analysts, company consultants and representatives, and psychologists.

In the early 1970's, there was a sift from massive, heavily funded experiments, like those at Stanford and Stony Brook where the goal was to replace classroom teaching, to a more realistic, balanced approach. For example, at Dartmouth College a CALL program in French was written by one of the French instructors (J. R. Allen, 1972), used existing hardware, and depended on no outside funding. But even more important, the CALL material was used only to supplement the traditional classroom, and was intended only for those students interested in developing skills outside of the classroom.

During the same time period there was also a focus on the technological hardware that could be incorporated into a CALL language course. Clausing and Wood describe one such program at the University of Minnesota in which a multi-media CALL German program was developed incorporating the computer, video-monitor, and the language lab, with only one hour spent in regular classroom instruction (1974). In this particular course, the computer was used as the initial and primary means of exposing grammatical structures to the students.

It was in this milieu of developing and changing technologies that the famous PLATO system was begun, for French, at the University of Illinios (Ariew, 1974),

combining different media such as television, video, slides, and tape players, all of which are controlled by the mainframe computer. In 1979 the University of Alberta instituted a very similar system called FRAND (McEwen, 1977), combining in the same manner different media under the control of one large mainframe computer. Both of these macro systems were intended to function adjunctly in introducing grammatical concepts in the classroom, unlike the program at Minnesota.

Conversely, two modest programs were written by two German professors at Ohio State University called TUCO (Tutorial Computer) and DECU (Deutscher Computer-Unterricht) (Taylor, 1979). These two programs were tutorial, written for first year German students to assist them in learning elementary grammar.

There were other CALL projects developed in the late 1970's; however, they were usually funded, developed, and incorporated for the unique language programs of the university involved, thereby having limited effects on the foreign language teaching profession as a whole. In addition, according to Holmes and Kidd, problems from the delicate nature of the machinery, reduced industry financing, the high cost of program development, inconclusive empirical evidence about the effectiveness of CALL over traditional methods, and the realization that many CALL materials and programs merely duplicated instruction that could be performed better and more cheaply by other

means all contributed to hesitancy amoung foreign language teachers and administrators in adopting CALL for their language programs (1982).

Coincidentally, it was during this hesitancy to continue investing in large-scale CALL programs based on the mainframe that the microcomputer emerged, changing forever, it would seem, the direction of CALL development and research: programs moved from huge to small, grand to modest, expensive to economical, and more importantly, affordable and workable not only for institutions, but for individuals as well. Contemporary language teachers are becoming computer literate; even some FL job descriptions ask for computer skills. In additon, relevant literature concerned with CALL in foreign languages has increased tremendously over the last five years. The emerging concensus is that it is the microcomputer that will shape foreign language CALL in the future (Davies, 1982; Alatis, 1983; Roberts, 1984).

The interest and use of CALL in language teaching reached such levels that a journal was formed in 1983 as an attempt to "amalgamate the fields of high technology and language learning and teaching" (CALICO Journal, June, 1983, p. 3). The CALICO Journal--Computer-Aided Language Learning Instruction Consortium- "exists to establish an international consortium on computer-assisted instruction and its applications to language instruction" (Otto, 1983, p. 5).

Within the brief history of foreign language CALL, the history of ESL CALL is even shorter. The University of Arizona has been using ESL programs to teach reading and writing on their PLATO system since 1974 (Dunkel and Vance, 1981). At the University of Illinios, in 1979, the students of a graduate course in "Methods and Materials in TESOL" were assigned to investigate the possibilities of CALL in English on the existing PLATO system. As a result of their work, CALL now supplements ESL classroom work (Leidy et al., 1980).

It has only been in the last few years that CALL has been a major topic of discussion at the TESOL conventions. Yet, by 1983 work and concern and questions regarding CALL and ESL reached such a point that the previous acronym CAI (Computer-Assisted Instruction) was deemed obsolete and unreflective of the types of programs incorporating computers in the field of language learning and teaching (Wyatt, 1984). Hence, the current one--CALL (Computer Assisted Language Learning)--reflects more accurately the computer's potential role as an aid in aspects of language learning other than instruction.

Also important is the increasing compatibility of hardware and software. Whereas in early years the impossibility of interchanging software written for one system for use on another hindered acceptance of second language CALL; now with many microcomputers able to use each others' programs, course work written on one system can be

used on a number of others. There are even translator programs available that can enable a computer to understand a program written in an operating system that ordinarily would be inoperable on that particular computer.

Consequently, in any case, computers as a language teaching aid are becoming less and less of a novelty. However, in spite of CALL's increasing availability and feasibility, there are still valid questions regarding its use. Language teachers are quite familiar with the language lab, its associaton with the audio-lingual method and the less than encouraging results and are, reasonably, somewhat skeptical of the growing influx of computers in language teaching. Two questions needing answers are whether or not the computer can actually teach language skills or, more importantly, whether the capabilities of the computer are even compatible with what is known about second language learning and the second language learner.

CHAPTER THREE

COMPATIBILITY OF CONTEMPORARY LANGUAGE THEORY AND METHODOLOGY AND COMPUTER ASSISTED LANGUAGE LEARNING

Review of Contemporary Language Learning Theory and Methodology

Probably the single most important question a teacher needs to answer in regard to ESL and CALL is that of compatibility between current ESL methodology and the attributes of CALL. In other words, given what is now known about second language acquisition and learning, can the computer be used effectively to help students become proficient in the target language? Or, as a result of the computer revolution in the language field, is CALL nothing more than language conformed, limited, and taught according to the capabilities of the computer? There is a crucial difference between these two approaches, with correspondingly serious ramifications. In one, the computer's capabilities are used as an auxilary aid in teaching language; it is a tool, comparable to a blackboard or filmstrip, that can enhance the learning experience. In the other, the computer conforms language teaching, and language itself, to its own capabilities, effective or not, determining what is taught and how it is

taught. Frank Smith (1982) grapples with this very issue; for the question is no longer if we want computers in the language classroom,

> but how computers are to be employed and what the resulting circumstances will be. More specifically, it is whether computers are to be used by language teachers and students, or whether computers will use them" (p. 12).

Current ESL methodology is based, in many aspects, upon the work of Stephen Krashen (1977, 1978, 1979, 1980) and his several hypotheses concerning language learning: The distinction between acquisition and learning-- acquisition being subconscious and innate, learning being conscious and learned; the input hypothesis, which states the language learner's need for comprehensible input that contains grammatical structures a bit beyond the learner's present ability; the Monitor model, which maintains that the language learner uses learned information, as opposed to acquired information, to 'monitor' his or her output; and the natural order hypothesis, in which learners acquire grammatical structures in a predetermined order.

In addition, ESL methodology has taken on an overall communicative approach, one in which the teaching is student-centered rather than teacher-centered, flexible rather than rigid, and communication oriented rather than focused on form and syntax (Taylor, 1983).

Dulay, Burt, and Krashen in Language Two (1982, pp. 261-263) synthesize current language learning theory and

language learning research into fourteen characteristics of second language learning. They are paraphrased below.

First, there appears to be innate learning processors which guide second language acquisition, which function like a filter, organizer, and monitor. The filter and organizer function subconsciously, while the monitor functions consciously.

Second, for the subconscious processors--the filter and organizer--to work well, natural communication in the target language is necessary. The richer the learner's exposure to the natural communication, the more rapid and comprehensive learning is likely to be.

Third, comprehension on the content of natural communication in the new language is necessary for acquisition. If comprehension does not take place, neither will acquisition.

Fourth, at the beginning of language learning, a silent phase has seemed to prove very helpful in limiting interlingual errors and enhancing pronunciation. This phase can last anywhere from a few weeks to several months.

Fifth, language learners have an affective filter--a term used to indicate emotions, motives, and attitudes--that screen what is presented in the language classroom, or outside it. It is highly individual and results in different learning rates and results.

Sixth, the native language of the learner has the greatest negative effect in pronunciation, the least effect

in grammar. In this respect, adults are more apt than children to fall back on their native language.

Seventh, subconscious systematic organization of the target language takes place in language learners. As a result, basic error types and the order of structures learned have a certain uniformity and predictability.

Eighth, conscious learning and application of grammatical rules is quite different from the subconscious learning which produces native-like fluency. In this light, grammar instruction has a role to play in second language learning.

Ninth, learners who are self-confident and relaxed learn faster than those who aren't.

Tenth, language learners achieve greater second language proficiency if they begin before puberty.

Eleventh, the differences between adults and children affect their rates of language acquisition. Adults are less likely to take chances in front of others, but are more able to apply learned grammatical rules. Children are just the opposite.

Twelfth, language learners learn the most from those they consider their peers and those with whom they most identify.

Thirteenth, the correction of students' grammatical errors provides no help in avoiding them.

And fourteenth, a language learner's exposure to a new structure is no guarantee that it is learned; students

learn at individual rates and certain language structures are learned only when the learner is mentally ready. Over-exposure can contribute to a fossilized grammar.

The preceding language learning characteristics generate the following practical applications in teaching a second language, again as found in Language Two by Dulay, Burt, and Krashen (1982, pp. 263-269).

The student should have maximum exposure to Natural Communication. The learner is focused on the message being conveyed rather than on the form of the message. This enhances the creative construction process and the operation of the organizer.

Also, a Silent Phase should be incorporated at the beginning of the instruction process, a time when learners listen and watch, and perhaps respond in their native language or through physical activities. In any case, they are not forced to speak the Target Language at the beginning of their instruction.

In addition, concrete referents should be used to make the new language understandable to beginning students: any thing or activity that can be seen, felt, or smelled as it is being verbally described.

Specific techniques to relax students and protect their egos should be devised. Students learn more easily under these conditions, especially adults who are more concerned with errors in front of their peers and those in authoritative positions who don't want to sound strange

before others.

Some formal grammar lessons should be included for adults. These lessons help them feel like they are actually learning a language and most adult learners do apply simple grammatical rules to produce simple sentences.

Also, the motivations of the students should be understood and this knowledge incorporated into the lessons. It is important for the teacher to be aware of whom the students want to sound like and associate with.

At the same time, an atmosphere should be created where students are not embarrassed by their errors. Embarrassment only hinders second language acquisition.

And if dialogues are taught, current and socially useful phrases should be incorporated. Second language learners pick up socially relevant phrases early on.

Certain grammatical structures are learned before others; consequently students should not be expected to learn "Late Structures" early and should be given time to acquire these structures at their own rate.

And ideally, teachers should not refer to a learner's first language when teaching the second. Successful second language learners keep the first and second languages separate and distinct.

These two lists--one of language learning characteristics, the other of teaching implications based on those learning characteristics--are fairly representative of current ESL methodology and are consistent with contemporary

language learning theory. The learning characteristics reflect what is believed to be the underlying processes of language learning and the common characteristics of those who acquire a second language, a process that on one hand is complex and unfanthomable yet on the other is simple in the extreme. A scholar can spend a life-time codifing a grammar that fills volumes yet is still incomplete of the same language that he acquired completely, without knowing it, as a child. Yet, by looking at what characterizes the successful second language learner, one can try to replicate those situations and circumstances that seem to encourage, instead of hinder, second language acquisition. It is at this juncture that the preceding teaching implications come into play: the methods of second language teaching should be consistent with what characterizes second language learning process. The issue of concern for CALL in the ESL environment is how well it fits into this process; are the capabilities of the computer compatible with the process of language learning?

Students have been learning languages for centuries without the help of these technological wonders, and they will continue to do so. There are many things that computers can do, however, that can possibly make teaching languages a lot easier and potentially even more effective, but in light of contemporary language learning theory and current ESL methodology the question that must be considered is whether or not that which the computer can do, and even

that which the computer can do well, can help someone become proficient in a second language.

Review of the Capabilities of the Computer

Even without a background in computer science or electronic engineering, a language teacher can still grasp the basic workings of a computer. Computers are storage devices initially developed to facilitate the manipulation of numbers. The language that they understand is the language of mathematics. What is of special interest to language teachers and all others who work with the written form of language, such as developers of word processors for example, is the machine's ability for alpha-numeric storage--numbers being given alphabetical equivalents. For example, as found in Hope (1984), if within a particular program the computer must distinguish between the two words "cat" and "dog," then the computer is actually charged with deciding whether a pattern like

010000110100000101010100

is the same as

010001000100111101000111 (p. 15).

All computers work on this binary system and even the most complex of problems is broken down into a myriad of simple operations like the one above. However, it is the bigger computers that perform these simple operations faster and more efficiently.

The computer has been designed for primarily three functions: storing, presenting, and manipulating data. Data is stored a number of ways, the most common being the 5.5 inch floppy disk, a vinyl disk on which information can be stored magnetically. However, hard disks and magnetic tape are also used, particularly with machines that have larger storage capacities. Another size disk has recently entered the computer market, the 3.5 inch disk and is rapidly gaining popularity.

Information that has been stored by any of these different retaining methods can then be displayed using a number of different devices, all of which are quite appealing to educators. The two most common are the printer, a computer connected "type writer" though more sophisticated, and the CRT, a TV screen converted for computer use. Generally, CRTs have no trouble displaying the graphic capabilities of a particular computer; that is not true, however, of all printers. In conjunction with these two units, there can be several peripherals, as outlined in Holmes and Kidd: a cassette deck, a video cassette player with monitor, a slide projector, and even a film strip (1982). Most computers also have some sound capabilities, and with the rapid development of the new synthetic voice chips and voice digitizers it is even possible to produce a good facsimile of the human voice (computer hardware and its capabilities, including voice replication and production are dealt with in greater detail in chapter 4).

As far as what the computer can do with inputted information, the possibilities are somewhat open-ended, depending on the power of the computer, the efficiency and ability of the particular programming language, and the skill of the computer program or software author. As found in Roberts, some basic abilities include comparing information for correctness, both individual characters such as the letter "e," and strings of characters such as the word group "Make my day"; searching for particular units of information; selecting correct information and presenting it at the correct time or for a certain length of time; and branching and looping, the ability to repeat any information in full or in part and to skip others (1984).

Inherent with the properties under which a computer operates is the way in which it interacts with the user. No matter if the person using the machine is an accountant or a second semester history student, each must be able to respond with the desired information as foreseen by the programmer, information that is very specific or that is within a permitted range of programmed options, in order to move from one part of the program to another. In a sense, the user of the computer must be able to "communicate" with it.

Given these aspects of the computer--data storage, presentation, and manipulation--and the way in which a computer interacts with the user, it is no wonder that the machines are becoming more and more entrenched in the

educational process. For according to Frank Otto, "the computer cannot be excelled as an information processing machine. The computer is to information processing what printing is to information transmission" (Otto, 1980, p. 58). In light of the earlier stated language learning characteristics and their associated teaching implications, however, it should be evident that there are some areas in language teaching in which the computer is just not applicable, and even though applicable, areas that are not entirely beneficial.

Compatibility of CALL with ESL Methodology

The computer is a very powerful and efficient information processing device, yet when applied to the teaching of language, the computer's capabilities must be examined in light of contemporary language learning methodology.

In the first place, because of the limitations of the technology and the medium, CALL materials and capabilities focus primarily on the written form of language. Consequently, the computer in itself cannot expose the learner to natural communication, the type that is needed, as expressed earlier, for second language acquisition. After all, the computer is only a machine; that which occurs between two individuals--the striving to be understood, to comprehend, the ability to anticipate the other's response,

the whole milieu of language, intelligence, and cognition--all this, which expresses itself primarily in speech, is foreign to the capability and function of a computer. It is one thing to present information (here the computer is unrivaled); it is another to engage in meaningful communication. Also, even if the technology available gives the computer the ability to replicate speech, which even now is quite good and can help with pronunciation, the source is still the same programmable machine that cannot carry on a free, open-ended, unrestrained conversation.

The computer's failure in this area is a moot point; language teachers will meet with nothing but frustration if they try to use the computer for something that it just is not able to do. Consequently, CALL is limited in contributing to the learner's exposure to natural communication or in helping the learner comprehend the content of natural communication. The closest CALL can come to contributing to these two areas is in the type of communication involved in preparing the learner to use the machine and the particular programs in use, and if the user is not alone but has one or more participants, than in the interaction between them as they go through the particular program. These activities can in truth be communicative and, if in the target language, contribute to both the exposure to and the content of natural communication.

In the second place, that which the computer does the

best and which, incidentally, is the easiest type of program to write--presenting information in a systematic way--has tailored its use to language learning activities that have in recent years become somewhat questionable: specifically, drill and practice routines that focus solely on structure and form as separate from meaning or, as some have coined the phrase, the "electronic workbook" (Wyatt, 1984). These are very real concerns given the work done in examining the role that learning and application of grammatical rules and the correction of grammatical mistakes have in second language acquisition (Dulay, Burt, and Krashen, 1982). In fact, because of the capabilities of the computer in this area and the ease of writing these types of programs, CALL materials are looked upon by many language teachers as being intrinsically behavioristic in nature (Marty, 1982; Smith, 1983; Wyatt, 1984). Yet for some proponents of CALL, this characteristic is one of the enhancements for using computers in second language teaching:

> Many of the positive feelings CAI [CALL] frequently engenders can be traced to a single factor: the computer's liveliness. While the screen may present nothing more in terms of content than a workbook does, by having each item pop up as though from no where, and by responding in some way to the student's answer, the program transforms otherwise inert exercises into active material. Language study is particularly suited to a dynamic context like this; some of the mind-numbing effects of written language exercises are changed into lively and engaging qualities by the computer (Hope et al., 1984, p. 3).

It is the relevancy, need, and place for "mind-numbing"

exercises that is in question; just because the computer can accomplish them better, faster, and more efficiently does not justify their use. The growing consensus among language learning theorists is that grammar lessons have a place, but a much more limited place than previously supposed (Dulay, Burt, and Krashen, 1982). What is of concern to language teachers is that through the avenue of CALL and the nature of the medium, these type of exercises can proliferate, hence possibly even hindering students' ability to successfully learn and acquire a second language (Smith, 1983; Baker, 1984). At the same time, it is understood that grammar lessons do play a role in second language learning, no matter how indistinct, and there is no question as to the efficiency of the computer regarding these exercises; therefore, in spite of the very real reservations concerning the use of the computer in this role, CALL can have positive applications in the instruction of grammatical rules, particularly with adults.

Consequently, just as it is evident that there are some areas of language learning in which CALL is inapplicable and possibly even a hindrance, it is also clear that in other areas, many scholars contend, CALL can be used effectively in teaching a second language. And in the areas where CALL is applicable, its contribution in most respects revolves around its inherent ability to demand interaction from the user (Leidy et al., 1980; Marty, 1981; Kidd, 1982; Roberts, 1984; Wyatt, 1983a, 1984; Hope et al., 1984). The

interactive nature of CALL, with the computer's program containing loops and branches--the ability to skip, return to, and repeat information--makes the computer an ideal tool for individualized instruction (Leidy et al., 1980; Marty, 1981; Kenning, 1983). Students can move at their own pace, slower students getting all the exposure needed, faster students skipping ahead to more relevant and challenging material (Leidy et al., 1980); at the same time, students receive instant feedback on their responses, which gives the computer very effectual capabilities as a tutor (Otto, 1980; Russell, 1982; Higgens and Johns, 1984; Chapelle and Jamieson, 1983a; Pusack and Otto, 1984; Wyatt, 1983a and 1984). In many respects, the computer becomes the ideal teacher: patient, consistent, unbiased, and unaffected by mood swings (Kenning, 1983).

Given the computer's ability for individualized instruction, CALL can be very applicable regarding the silent phase advocated at the beginning of language learning. Working at a computer, students are not forced to produce speech (although pronunciation practice can be incorporated into CALL) yet they can be exposed to certain aspects of the language at their own time and their own speed.

Also intertwined in the computer's individual instruction capabilities is the positive effect they can have on a student's affective filter. By working alone on a particular lesson, a student's fears concerning ridicule, embarrassment, and a host of other emotive factors that are

involved in the language learning process can be somewhat nullified or at least alleviated. Seen in this light, CALL has strong capabilities to lessen fears and help students become more relaxed and self-confident (Wyatt, 1984; Higgens and Johns, 1984).

In addition to the direct correlations between certain language learning characteristics and teaching implications and the attributes of CALL, there is another area in which the computer can be very helpful: the technical aspects of teaching itself (Kenning, 1983; Wyatt, 1984; Hope et al., 1984). With the superb efficiency of the computer, teachers can make better use of their time and expertise. CALL can take the boredom out of tedious mechanical tasks such as marking and correcting exercises, allow more time for class participation and activities such as discussion, simulation, projects, and group work, allow the teacher more personal interaction with students, and allow more comprehensive record keeping--detailed information on students' strengths, weaknesses, recurring errors, and overall progress. In addition to evaluating the students' progress, the methods, materials, and techniques of the teacher can be evaluated as well. As Kenning points out, used in this way, the computer is both a tool of instruction and a tool for evaluating the practices being automated (1983). The computer, then, in addition to its capabilities in contributing to language instruction, also enhances the teacher's overall technical ability as well.

CHAPTER FOUR

REVIEW OF CURRENT HARDWARE AND SOFTWARE FOR ESL CALL

Hardware Considerations

For ESL teachers desirous of incorporating CALL into their teaching programs, the myriad of choices concerning hardware and software may seem almost self-defeating. This is particularly true in the case of computer hardware; the large number of computers available and the many diverse manufacturers plying their wares can have an overwhelming effect on those involved in the selection process. Yet for many ESL teachers the choice of hardware will have already been determined by the institution that they work for. In this case, the teacher need only determine how best to use the system or systems already in use, the issue being finding usable, applicable, and relevant software. Others, however, might have the luxury of selecting the hardware, with no existing system and funds readily available. In this case, the starting point would be finding first the appropriate software; the hardware considerations would then, in effect, take care of themselves. When one finds the desired software, one finds the computer system. Ideally, of course, the preferable route to follow in the

implementation of CALL course materials would be the one just mentioned, which is based upon the perceived needs of the language learners and the determination of what materials and tools would best help them achieve second language acquisition. However, reality is rarely ideal, and in truth, most ESL teachers make the most out of what CALL materials are available, adapting them to the needs of the students.

This "adaptation" takes place because the language field is somewhat peculiar in the needs that it has concerning the effective use of computer technology. Its needs are different from those that are most associated with the use of computer systems and, in fact, for which the computer was first developed: mathematics, physics, chemistry, economics, and the like. In effect, what has taken place can be likened to the borrowing of certain tools that were made with other jobs in mind; such is the case with ESL CALL. Consequently, what has taken place is that in the design and development of both hardware and software any corresponding benefits incurred for the language profession have been entirely coincidental.

Concerning computer hardware, there are several items that the language profession particularly needs as outlined by Fernand Marty (1982, pp. 86-87): first, computers used for language teaching need large amounts of computer memory: a twenty sentence language exercise with several levels of

feedback and with good error analysis requires a minimum of 600,000 bits of information. Ideally, the student should also have access to a complete set of grammar rules in order to perform any necessary review. This review requires about two and a half million (2.5M) bits of information.

Second, the display screen large enough to show, at the same time, the stimulus, the student answer, the cues and feedback, error analysis, tables, etc. What is required is a screen with 24 lines having 80 characters per line (1920 characters total) or, preferably, with 32 lines having 64 characters per line (2048 characters total).

Third, the computer needs to have rapid response time: the system should be able to perform a complex error analysis of the students answer in less than a second.

Fourth, the computer should have the ability to type all necessary diacritics (accents, cedilla), italics, and in the case of foreign languages all alphabets, and the ability to write from right to left, etc.

Fifth, the computer should also provide fast plotting and erasure of characters on the screen.

Sixth, computers used for language teaching should have the ability to have graphics and animation of all kinds.

Seventh, random-access audio-visual equipment connected to the terminal that allows immediate access to any part of an audio or video recording, microfiche, slide tray, etc. should also be available.

Eighth, the capability should exist for students to

communicate with the computer by touching the display screen. This can be particularly useful in exercises where the student need only indicate word order or the like.

And ninth, the computer should include an edit feature that allows students to make corrections in a sentence without having to retype it in its entirety.

Of course, this list is not exhaustive; needs such as the ones listed above don't become apparent until a system is actually put to the test, until it is actually being used in a language learning situation. However, given the very nature of language, the preceding list should be viewed as at least the minimum requirements for hardware that is to be used in a CALL situation.

To a large extent, these hardware guidelines will be more or less met by the type of computer system used. Not all computers are the same, nor will all systems perform the same functions. Naturally, the type of computer used will determine the type of programs available and what can and can't be done concerning CALL activities.

Computer hardware can be divided into two large categories: computers and peripherals. Computers consist of at least a central processing unit, an input device (usually some sort of keyboard), and some type of visual display (usually a cathode ray tube [CRT] or video monitor). Peripherals consist of a number of input and output devices not integral to the computer itself.

Computers can be divided into either two or three

categories, depending on the point of reference: mainframes, minicomputers, and microcomputers, or terminal and micro-based computer systems (Wyatt, 1983a). The mainframe computers are the most powerful and the most expensive and as, Kenning points out, are found mostly in institutions that can most afford them: government research establishments, large university centers, and data processing centers of large corporations. These computers are used for a host of different tasks and are extremely versatile. In conjunction with and contributing towards their expense, they require large numbers of technicians, programmers, operators, and other associated personnel in order to run at all (1983). Mainframes are also termed "terminal based systems" in that access to the central processing unit (CPU) is obtained through a terminal, composed of a keyboard and monitor screen, of which there can be hundreds. Such is the case with the PLATO system at the University of Illinios, which has two CYBER computers in tandem linked to over 600 terminals (Hart, 1981; Chapelle, 1983). Also, because of terminal access, distance does not pose much of a problem for those who want to use the system yet are miles from the University; through the use of microwaves and phone lines a terminal can be linked to a mainframe thousands of miles away. Therefore, for institutions desiring the use of PLATO's CALL materials, the purchase of a mainframe is not necessary, only the leasing and/or purchasing of the needed number of terminals.

Minicomputers are also terminal based systems, yet less powerful, less expensive, and less demanding environmentally than mainframes, needing only a staff on one or two professionals; consequently, these computers are usually found in smaller colleges and educational institutions and the data processing departments of large concerns (Kenning, 1983). Unlike mainframes, these computers are also usually purchased for work in one particular area and designed with one particular skill in mind; as a result, software applications can be limited. One example of an effective CALL program using a minicomputer is the TICCIT system which incorporates 120 terminals (Langdon, 1980).

By far the most common type of computer to date is the microcomputer and it can be found in such diverse locations as small businesses, offices, classrooms, and private homes. As far as environmental considerations are concerned, a microcomputer incurs relatively the same demands as a moderately priced stereo unit; the user is quite capable of maintaining the system alone. Microcomputers are also called "stand alone" systems because each computer is entirely independent, performing the functions of both 'terminal' and 'central' computer. Microcomputers support one user at a time, unlike the terminal systems, and include a video monitor, central processing unit (CPU), a keyboard, which can be separate or one with the CPU, and--although technically not a part of the computer itself but without

which the micro is essentially useless--an input device for loading preprogrammed materials into the computer's CPU. Microcomputers are traditionally the least expensive and the least powerful of the computers available, although, as Tenczar points out, current technology is giving the new generation memory and computing ability rivaling even that of some minicomputers (1981).

All three types of computers would be quite useless to the field of language teaching, however, if divorced from the various peripherals that can be used in conjunction with them. As mentioned earlier, peripherals consist of devices used for both inputting and outputting information, which can be in turn divided into those which are textual/visual or audio in nature. Textual inputting items consist of cassette decks, disk drives, touch-sensitive screens, light sensitive pens, graphics tablets, a device called a "mouse," and the better known joysticks and paddles of video-game fame.

Cassette tapes and disk drives, essential for a microcomputer, are used for transferring preprogrammed material into the CPU. Compared to disk drives in speed and storage space, however, cassette tapes are quite obsolete and are considered unacceptable for serious or effective CALL applications (Wyatt, 1984; Hope et al., 1984). Disk drives, on the other hand, make it possible for microcomputers to be used for CALL because of their large memory capacities.

There are two types of disk drives, distinguished by

both memory capacity and the medium used for retention: those using soft or floppy disks and those using hard disks. A standard floppy disk drive can store approximately 150,000 bytes (or units) of information on one side of a diskette, with one byte being the equivalent of one character (the letter "a," the number "7," or the space between letters, etc.). This is equal to about 50 pages of written text; there are double sided diskettes available which would then double the storage amount. Hard disks, on the other hand, can store approximately 20 million (20M) bytes of information or more, providing the storage equivalent of over 130 soft diskettes. 20M bytes is a significant amount of information, roughly 6500 pages.

Because of the massive amounts of memory available with the hard disk drive, it is possible to use one drive in conjunction with several microcomputers. This type of configuration has created a hybrid computer category that Wyatt (1984) calls a "cluster system"--an attempt to combine the best of both the terminal and microcomputer systems: the portability, feasibility and versatility of the microcomputer with the huge storage capacity of the terminal.

Unlike the disk drives, the other input devices function as the means through which the user interacts directly with the computer. One is a touch sensitive screen, a screen that need only be touched to indicate the choice or command as defined by the program in use. Another

is a light sensitive pen, a wand that is attached to the computer that is used to touch or "draw" on the screen . Other input devices include a graphics tablet consisting of a flat tablet, stylus, and appropriate program: that which is drawn on the tablet is replicated on the monitor screen. In a similar vein, there is a device called a "mouse," which consists of a hand-sized box with a ball underneath and a push-button on top that can be rolled over flat surfaces. Movement of the mouse moves the cursor on the screen; the button is used to send various commands. Also included in this group are joysticks and paddles, both of which are used to move the cursor or any other object designated under their control, the joystick with its stick, the paddle with its knob. As with the mouse, both of these devices employ a push button to send commands of one form or another.

In addition to these textual input devices, there are also several that are audio in nature: cassette decks, random-access audio units, and computer controlled digitizers. Designed originally for audio replication, the cassette deck can simply be used to record students' speech prompted by the dictates of a particular computer program for later analysis by the instructor. Using a similar though more sophisticated approach, the random-access audio unit does the same thing, using in place of the cassette tape the memory space of a floppy diskette. The digitizer, on the other hand, not only records speech, but can also

analyze and manipulate it by converting "speech sounds and characteristics into a digital form similar to that in which all computer information is stored" (Wyatt, 1984, p. 30). Given the textual nature of computer technology, this area of audio input is still in its infancy and much progress needs to be made before it can be widely used in CALL (Marty, 1982; Hope et al., 1984; Wyatt, 1984; Pusack and Otto, 1984); however, technological advances are being made in this area so rapidly, that major breakthroughs in voice recognition will take place in the very near future.

The same textual and audio categories can be used for output devices, which are used to store or display information. Along with the video monitor, without which the computer would be uses unusable for educational purposes, textual output devices include cassette decks, disk drives, and printers. The video monitor or cathode ray tube (CRT) is the prime output display tool. Not all monitors are the same, however; they range from the standard black and white TV to high resolution CRT's able to create all the colors of the rainbow and everything in between. Of special concern to CALL applications, though, is the screen display capability: most microcomputer screens can only display 25 to 50 percent of a regular printed page; mainframe and minicomputers, on the other hand, can accommodate about a full page. The Apple MacIntosh microcomputer, however, with its elongated screen overcomes this problem.

Along with the needed video monitor is the necessary cassette deck or disk drive, serving the dual functions of both input and output. The cassette deck is just as inappropriate for this role as it would be for the previous one and for the same reasons: insufficient speed and storage capacity. Both soft and hard disk drives can function as primary storage areas for student records, answers, attendance, or other items.

Printers are used to produce hard copies of computer generated output, which can include the computer programs themselves, the immediate contents on the screen, or in the case of word processors, letters, compositions, and manuscripts. As is true with all peripherals, different printers have different capabilities, the major factor being the mode of character production, which determines the speed of replication and the versatility of the printer. Dot matrix printers, which produce characters by using a series of dots, are the fastest and can create graphics and near letter quality print. Daisy wheel printers, which use a printing wheel which looks like a daisy, are slower than dot matrix printers but produce letter quality print. However, with current technology the difference between the near letter quality of the dot matrix printer and the letter quality of the daisy wheel is becoming less and less distinguishable. In addition, other forms of production such as ink jet and laser printing are available. These combinations of different printers and capabilities can meet

almost any printing need.

In the area of audio output, the same devices used for input perform a dual function here also: cassette decks, random-access audio units, and computer controlled digitizers. Included here also are the sound generators integral to most microcomputers. Sound generators can produce a whole range of sounds, even a mechanized form of human speech, such as that found with some video games. Though unsuitable for speech replication, sound generators can be used to enhance software programs with their ability to create music and sound effects. Pre-recorded tapes can be used with cassette decks and played back according to the dictates of the computer program; the same can be done with random-access audio units. With digitizers, on the other hand, what is produced more closely resembles artifical speech:

> At one level, this can be achieved through the playback of previously recorded--or more accurately, digitized--speech. Digitizers are capable of producing very high quality, natural sounding speech. The type of artifical speech with the greatest potential is true speech synthesis. Through the use of a computer-controlled synthesizer, speech output can be generated from prestored phonemes and allophones, with appropriate suprasegmentals added at the word, phrase, and sentence levels (Wyatt, 1984, p. 32).

Although used in some existing projects (Van Campen et al., 1981; Schneider & Bennion, 1983), artifical speech is largely an area for future ESL CALL considerations.

However, as with the immediate potential of voice recognition breakthroughs, "future" applications of voice replication could be only months away.

There are two other output devices that do not fit neatly into the textual or audio categories, and they are the video cassette recorder (VCR) and video disk player. The one most advantageous to CALL is the video disk because of its immediate access branching ability, combined with dual independent audio tracks and its freeze-frame and slow and reverse motion capabilities.

Encouragingly, most of the earlier stated hardware needs of the language profession can be met with the current computer technology available, specifically in the case of the more powerful mainframes and minicomputers. Because of their smaller memory abilities, microcomputers would be the ones most likely lacking in the necessary requirements; however, when linked to a hard disk drive they can perform similarly to a minicomputer, and most microcomputer screens provide the desired amount of character space (1920 to 2048 characters total) even though it is not equivalent to a full-sized page. Hardware capabilities are such that all the necessary diacritics, graphics, and animation are possible as well as fast plotting and erasure of characters. With the video disk, random-access audio-visual capabilities are possible and the touch sensitive screen can be attached to most computers, regardless of size. The quick edit feature, however, has yet to be fully realized.

Given the entirety of computer hardware available for CALL activities, the general trend is toward the use of microcomputers, because of their lower cost, portability, ease of use, and versatility when linked to various peripherals, especially hard disk drives. Current prices for a complete microcomputer system fall anywhere between $400.00 (e.g. Commodore 64, disk drive, and monitor) to $3000.00 or more (e.g. Texas Instruments' Professional Computer with two disk drives and color monitor). Minicomputers and mainframes, on the other hand, fall in the ten to hundred thousand dollar range.

Unlike minicomputers and mainframes, microcomputers are highly portable; they can even be placed on push carts and moved wherever desired, such as from classroom to classroom. Also, because of their ease of use, it takes no special training to make sure environmental conditions are just right. In addition, linked to a hard disk drive, a microcomputer has access to all the memory it needs, even though in many cases, a floppy disk drive is just as adequate and all that is really needed.

Software Considerations

Considering, then, what computer hardware is currently available and what the hardware needs are of CALL, teachers interested in ESL CALL theoretically have pretty much what they need as far as hardware is are concerned. However, the hardware of a system is only as good as the software that

can be used on it; and it is in this area that the potential capabilities of CALL and the present realities generally fail to match up. Even though CALL is compatible with contemporary language theory and pedagogy, the pivotal items are what the software programs are and how they go about testing and teaching--in other words, how they assist the language learning process.

The quality of existing ESL software is a major concern of CALL advocates and its critics, and for good reason. Courseware (i.e. software) is criticized as structure-bound and reflecting the audio-lingual approach of the 1960,s as well as trying to cover up trivial or meaningless language exercises with computer-generated enhancements (Sanders and Kenner, 1983; Loritz, 1984; Sheridan, 1983). As Baker (1984) points out, "most software is developed by good language teachers who don't know enough about programming or by programmers who don't know enough about language teaching" (p. 6). In both cases the results are far from satisfactory. Baker (1984, pp. 8-10) deliniates the following ten deficiencies in current CALL computer software.

In the first place, programs lack solid instructional design--what is to be taught and how can it best be taught; In addition, some software attempts to teach items on the computer that should not be attempted at all.

Second, techniques of discovery learning are used very little--most software attempts to teach the little details,

with little or no attempt to lead the student towards generalizing or consolidating knowledge.

Third, about 95% of available software is trivial in the extreme--almost all software consists of simple- minded flash-card systems, involving either translation drills or the simple manipulation of word forms in complete isolation from any meaningful context.

Fourth, most software is fragmented rather than integrative--there are no thematic interconnections within a particular drill or attempts to integrate items into any larger scheme.

Fifth, lesson content is often not accurate--many items display samples of language that no native speaker would ever utter (this is particularly true of foreign language courseware).

Sixth, programming is not user friendly due to poor formatting and documentation--little thought is given to screen displays, ease of program use, or clarity of instructions.

Seventh, many programs contain too much cuteness--over-use of student's name, over-praise and use of cheap rewards, and excessive use of graphics and games.

Eighth, there is no standardization for methods used by software for obtaining accents and other diacritics--most programs resort to unnatural methods such as assigning the number and punctuation keys to special accented letters.

Ninth, software is not ready and tested when

advertised--it seems as if the initial marketing announcement is also the beginning of the testing period.

And tenth, most software lacks portability--there is no incentive to adapt software for use on one computer system for use on others.

As a result of these concerns, a growing amount of literature has begun to appear outlining guidelines for choosing and evaluating CALL software in light of contemporary language learning theory and methodology (Simonsen, 1985; Chapelle & Jamiesson, 1983; Decoo, 1984; Tuttle, 1983). One representative of this concern is the CALICO Journal, which beginning in 1983 has regularly included CALL software reviews of new programs entering the market. The emerging consensus, though, goes beyond what to look for in software: those who know how to teach language should be those writing the software programs (Marty, 1982; Holmes, 1983; Tuttle, 1983; Pusack and Otto, 1983; Wyatt, 1983a; Baker, 1984). If language teachers are not involved in developing, testing, and evaluating software that is produced for ESL students, then there will be no impetus to change the current software deficiencies, and software will continue to be written by those who have no foundation or understanding of what language is and how it is learned.

Surprisingly, in light of the serious and valid questions regarding current ESL CALL software, its availability is very limited; there just isn't much of it around. Compared to other computer-assisted learning areas,

materials available for ESL CALL are somewhat limited with much of the existing potential relatively untapped. Yet, software programs do exist, and with the rapid growth in the use and availability of microcomputers, more programs are on the way. The software that is available can be classified a number of different ways, depending on the particular point of reference, the most common being the subject matter or discrete language skill on which the program seems to focus. However, as with any classification, dividing lines can become fuzzy, with certain items overlapping two or more categories. Still, under this classification, language skills currently receiving attention from ESL CALL software are the following: grammar, vocabulary, writing, and reading.

Naturally, given the nature of the computer's capabilities and the systematic nature of grammar, computer courseware with a grammatical emphasis is the type most widely available at the moment and the type most susceptible to a structuralist approach (Smith, 1983; Hope et al., 1984; Pusack and Otto, 1984; Wyatt, 1984). Programs of this nature generally follow a drill and practice format, similar to exercises in a textbook but enhanced by the electronic flair of the computer (not always to their benefit). Another similar grammar format is the tutorial, which makes the most use out of the computer's capability to individualize instruction.

The same pedagogical problems exist with much of the

software for teaching and testing vocabulary; though highly efficient, most vocabulary programs are essentially electronic flashcards that give no thought to contextual considerations whatsoever. One example is the program FLASH by Robert Roseberry (1984). For students wanting to review their memory, however, this type of program could be just what they need. In effect, old vocabulary teaching methods have been transferred to the computer, which handles them with much greater efficiency.

Such is not the case with writing skills, however; programs exist that have been developed specifically for the ESL learner or applications are being found for word processors in helping language learners write. Word processors hold special potential with their editing features and text manipulation abilities. One such word processing program designed for classroom students is Word Runner by N-Systems for use with the Commodore 64 microcomputer (CALICO, March 1985). A budget priced program ($44.59), it is designed to be easy to use and easy to learn, with no complicated commands for the student to memorize. Yet the program has sophisticated editing and text manipulation for the experienced user.

Currently, software also exists that focuses on reading skills. CARI (Computer Assisted Reading Instruction), a computer-assisted reading instruction program developed by two English teachers, is a program that provides supplementary and relevant material for ESL students in

three subskill areas: skimming, scanning, and guessing (Simpson and Simpson, 1984). Another program that focuses on speed reading is Comprehension Power by Instructional/Communications Technology, which employs interesting stories with drill and practice exercises (CALICO, September 1984). Produced by the same developers, Cloze-Plus: A Context Analysis Program is another reading program incorporating drill and practice routines (CALICO, June 1984). The target audience is children and adults with reading levels of 3-8. Synonym Search by Fredrick Burggraf, on the other hand, employs a game format to teach reading skills (CALICO, June 1984). The stated purpose of this software is to expose students to a large number of synonyms, have students recognize and match synonym pairs, and in the process expand their vocabulary and ability to analyze words to determine their meanings.

Other classification categories can be used in addition to the particular language skills mentioned above. When viewed from a pedagogical perspective, ESL software falls into roughly five categories: drill and practice, tutorials, simulations, games, and those that employ problem solving (Harrison, 1982; Hope et al., 1984; Roberts, 1984). Tutorial programs present new information to the student through explanations, rules, principles, charts, tables, definitions, exercises, and appropriate branching. Drill and practice routines assume that the new information has already been introduced to the student and focuses on the

application of the rules, examples, etc. Games "involve the mobilization of knowledge to overcome obstacles and reach goals" (Hope et al., 1984, p. 18), where the obstacle can be the student's grasp of the subject and the goal his understanding of it. Those that are problem solving in nature involve large tasks that, in order to be resolved, are broken into smaller sequential units. The computer is the tool or resource used in finding the solution. Under this classification scheme, most ESL software available is either drill and practice, tutorial, or game in format.

When software is classified according to the role that it can play with student or teacher, as opposed to content or format, three categories emerge: instructor, collaborator, and facilitator (Wyatt, 1984).

The instructor-role--the role in which CALL has historically been identified--includes two types of programs: drill-and-practice exercises and tutorial programs. Included in both these types of programs are "associated management systems that can provide extensive score and progress reports to students and their teachers" (Wyatt, 1984, p. 7). These programs are also planned on the assumptions that only one student will be working on them at a time.

In the instruction role, the computer presents the student with information in ways similar to those used in the traditional classroom:

> In the instructional role, the computer program presents material and conducts practice activities as an authority figure. It teaches students in a highly preplanned fashion, and they have only to follow directions and work at producing the anticipated language forms and responses. Students are actively involved in the learning process, but their role is that of responder rather than initiator. This closely mirrors some of the activities that are found in our workbooks, textbooks, and classrooms (Wyatt, 1984, p. 7).

Separate from the instructional role is CALL's collaborative role, the distinguishing characteristic being that the "initiative is turned over to the student or group of students" (Wyatt, 1894, p. 7). In essence, these programs are problem solving and/or simulation in nature. Wyatt (1984) gives two examples of this approach. In one, the students try to discover some information that the computer alone possesses. Consequently, "the only way for students to obtain information is by questioning the computer, which acts as a interlocutor, yielding information only when the appropriate questions are addressed to it" (Wyatt, 1894, p. 7). In the other, students are led through a simulation of a trip through the Old West, the emphasis being that the students themselves are "responsible for initiating and directing the activities that occur in the learning environment" (Wyatt, 1984, p. 8).

In the facilitative role, the computer simply serves as a tool (Coburn et al., 1982). In this capacity, the computer by itself is "essentially empty of instructional content" (Wyatt, 1984, p. 8), the prime example being the use of word

processors in a writing class. Also included in this class are such programs as electronic dictionaries, as described by Jamesion and Chapelle (1982), which may technically be excluded from the CALL category, yet "their potential contribution to ESL courses and their relative neglect in the past argues for their admission into the ranks of CALL" (Wyatt, 1984, p. 8).

In addition to these three categories which are oriented toward specific CALL activities, the computer can also play the role of a "teacher's and researcher's aid" (Wyatt, 1984, p. 9). Activities under this heading include record keeping, materials development, grading, and other such things which aid in the teaching process. Programs of this nature already exist, and though not designed specifically for ESL CALL, can readily be adapted for effective use.

Another classification scheme is the point of origin of the software: that which is purchased from a company and ready for use or that which is developed, designed, and tested by the language teacher for specific needs in the classroom. Under this type of division, teachers wishing to write their own programs have three options available: using a general purpose programming language, an educational programming language, or something relatively new on the market, an authoring system (Wyatt, 1983c; Hope et al., 1984).

General purpose languages include those such as BASIC,

FORTRAN, and PASCAL. The most common of these in use with ESL CALL programming is BASIC, with over 80% of existing software written in that language. With these languages, programmers have more direct contact with the computer's microprocessor and memory than the other two approaches. They also give more control and flexibility, being more able to manipulate data. BASIC is particularly practical since microcomputers come equipped with their own BASIC version. However, truly efficient use of these languages requires hours of learning; and because that which gives these programs their power is their minute attention to detail, programs with these languages are necessarily long, taking hours to prepare, even for the professional programmer. Also, as Pusack points out, languages of this type, being general purpose languages, were developed without the needs of educators in mind (1983).

Educational programming languages, on the other hand, have been developed specifically for the educator; they combine a range of convenient commands providing trivial and powerful educational capabilities (Wyatt, 1983b). Two examples are PILOT (Burke, 1983) and EnBASIC (Tenczar et al., 1983) which try to anticipate the commands and capabilities educators will need. Because of their particular educational emphasis, these languages can save a teacher some time in learning programming skills; however, true mastery takes time similar to that required for learning the general purpose languages.

Unlike the previous two programming approaches, authoring systems are developed for those who have no programming background at all. They are an attempt to place within the hands of experienced language teachers the rudimentary tools they need to create their own software programs without their first having to spend hours and hours in front of a keyboard (Hope et al., 1984; Wyatt, 1984). CAI TOOLKIT (Lines & Martin, 1983), PROMPT (Myklarski and Paramskas, 1984), and DASHER (Pusack, 1982) are such authoring systems. However, because authoring systems have a built-in educational methodology and program logic, they are strongly instructional in nature. As a consequence, it would be difficult, if not impossible, to use them to create more open-ended or communicative activities. In most cases authoring systems are only "suitable for the creation of drill-and-practice exercises and quizzes" (Wyatt, 1983c, p. 38).

In spite of their various shortcomings, these three programming approaches have the potential for eradicating much of what plagues current ESL CALL software; with these tools at their disposal, language teachers themselves can begin to write programs that reflect their own understanding of language and language learning.

In summary, CALL ESL software is in short supply, with much that is available focusing on grammatical skills. At the same time, most available software, suffering from what many consider severe pedagogical shortcomings, makes use of,

at most, the simplest and most rudimentary abilities of the computer, leaving the greater potential untouched and untried. To date, the field of ESL CALL is still in its infancy because the software does not make good use of the hardware, which thus has an unrealised potential for effective and reliable applications to language instruction and learning. It is in the area of software where the effective use of CALL ESL must be realized, if it is to be effective at all.

CHAPTER FIVE

ESL CALL AND FUTURE PROSPECTS

When trying to visualize the future, one steps into a realm of numerous possibilities, all of which are more or less plausible, depending, of course, on whether or not certain prerequisites are met. The "plausibility" of the event is, in turn, determined by how many "what if's" are required for it to come about. In computer technology and language teaching, specifically ESL, the major "what if's" that will determine the type, role, effectiveness, and applications of CALL in the very near future revolve around the types of involvement language professionals choose to have in the software development process. If involvement is slight or non-existent, then the future of CALL in ESL could be extremely dark, for "computers are incredibly powerful devices, capable ... of destroying both literacy and teachers if not used intelligently" (Smith, 1983, p. 1). Yet if involvement is significant, then the future for ESL CALL could be very bright, "raising both language and education to levels beyond our current capacity to understand" (p. 1).

In the negative scenario, if language oriented software continues to be developed by those who don't understand the

complexity and the integrative nature of language, and if their products are supported by those who feel that someone outside the classroom can best decide what a teacher should teach and when, then there is a strong chance that computers could have a very negative impact on both teachers and literacy (Smith, 1983; Marty, 1981 and 1982; Davies, 1982). Surprisingly, in spite of the contemporary views concerning language learning as outlined by Dulay, Burt, and Krashen (1982), Taylor (1983) and others, this negative scenario is a possibility given the current focus of programmed learning in many educational systems, which attempts to break down a subject--in this case language--into decontextualized and separate parts to be learned entirely on their own. As defined by Smith (1983), programs are created by those other than the teacher who determine what is to be taught next and under what schedule. Such programs can be identified by the following characteristics:

> They include basal readers and other sets of instructional materials, activity kits, worksheets, most tasks with questions at the end, anything in which specified individual items of learning are expected to be monitored and graded ... and can be identified by their systematic format, continuous progress, goal orientation, right and wrong "answers," tests and scores, all designed to ensure that predetermined elements of learning are continually made manifest (Smith, 1983, p. 11).

Programs of this nature also necessitate learning activity that runs contrary to the natural characteristics that promote learning; learning is meaningful, unconscious,

effortless, incidental, vicarious, collaborative, and free from risk (Smith, 1983). With programmed learning,

> There is no evident meaning or extrinsic purpose, the learning must be conscious and deliberate, it is rarely effortless, cannot be incidental or vicarious, collaboration is frowned upon if not prohibited, and risk is always present" (Smith, 1983, p. 11).

It is this systematic nature of programs to which the computer is most adaptable. In fact, that is specifically what the computer was created to do--handle information in a systematic pattern, piece by piece, item by item. This ability is not negative in itself, but if, because of the ease of materials development, organization, registering of student progress, etc., language teaching takes on a programmed learning approach, then the computer is the most efficient tool to implement this type of teaching. And if this approach becomes the foundation or center of language instruction, then language and language teaching will be tailored to what the computer does best and what takes the least programming effort to accomplish. In effect, language teaching will be conformed to the capabilities of the computer instead of vice versa. As Smith points out, computers can teach "programs" (systematic, linear, structural exercises) much faster than any teacher, and never get bored, tired, or exasperated. Computers are also more efficient at teaching "programs" than a teacher--there is no preparation time, no time wasted, no sick leaves. In

addition, computers are less expensive than teachers--one teacher's salary could be enough to equip three classrooms with computers for five years (1983). Consequently, since computers are going to be a mainstay of many language departments, if language professionals remain aloof from involvement in CALL, the resulting situation may not be too pleasent--for both teachers and language learners.

On the other hand, if language teachers and other language professionals become more heavily involved in the CALL development process, then the future looks much more positive. In fact, according to Pusack and Otto, given the current capabilities of existing hardware, and given wholehearted cooperation between all parties involved in the development process--federal and private agencies, administrators, teachers, hardware manufacturers, and software publishing companies--a number of applications are theoretically possible in the language areas of grammar, vocabulary, pronunciation, conversation, listening, reading, and writing (1984).

Using the existing capabilities of the computer and associated peripherals, grammar oriented programs could handle entire sentences in a way consistent with ESL pedagogy, and could include lively tutorials incorporating comprehensive checking and individualized remediation. In addition, as Pusack and Otto point out, by analyzing individual errors and recognizing patterns, programs could have the ability to point students to areas of future

concentration and begin to deal with the problems of over-generalization and native language transfer (1984). Throughout this whole process, because of the abilities of video hook-ups and audio tapes, the potential learning context can include not only written grammar but spoken language as well.

In the realm of vocabulary, words no longer need to be learned out of context. The graphics and animation capabilities of the computer can provide visual referents, as can video presentations. At the same time, there would be no need for translation. By using the visual systems available with the computer, students can in fact learn what words mean in the target language, instead of depending on their native language for meaning and support.

Surprisingly, the potential currently exists for CALL applications in teaching pronunciation as well. For a number of years, Pusack and Otto point out, computers have been producing and analyzing speech effectively in research and clinical situations, yet expense and availability have made these types of applications unfeasible for second language learning (1984). However, these devices could be used to analyze and compare utterances and to give graphic feedback to language learners just as they are used for the speech impaired and the deaf (DuBrueq, 1984). In addition to these high-tech acoustic devices, the computer can be used alone to assist in learning pronunciation. The graphics abilities can "illustrate in animation the position

and movements of lips, teeth, tongue, and throat in the articulation of sounds" (Pusack and Otto, 1984, p. 199). In ESL CALL this type of program could be of great benefit given the number of English sounds for which there are no native equivalents.

Although extremely limited, CALL has the potential for conversation applications also--as a stimulus. For use in this role, the computer has a number of tools it can employ: video presentations, films, taped recordings, textual and graphic displays, and even computer produced music. Textual adventure games also have possible applications here, specifically because a group of students can work together to solve them. Under this category the only thing limiting the computer's use as a conversation stimulus is the teacher's imagination.

With the link-up of video and computer technology, the computer can have significant impact on the teaching of listening:

> In addition to allowing the student to play and replay segments of language down to the individual sentence and word, the computer stands available as a complete listener's resource. Not only [can] it provide lexical aids and transcriptions; it also highlights cultural features, structures the development of specific listening skills, and provides comprehension checking as desired by either the student or the instructor. Videodisc-based simulations of real-life events [can] lead students through myriad alternate paths, along which they hone their listening skills and interpret cultural cues by making decisions about the course of events. By adding the dimensions of control, context, and comprehensibility to aural work, computer-

> controlled audio and video [can] guarantee students a listening skill that cannot fail them when they ultimately do immerse themselves in the foreign culture (Pusack and Otto, 1984, p. 200).

Reading is also a skill that has greater potential teaching applications on the computer, in all three areas: beginning, intermediate, and advanced. At the beginning level, Pusack and Otto state, the computer can be used as a storehouse for reading material that reflects the various interests of the students. And with video output, translation can be discouraged while at the same time creating an environment where accurate guessing for meaning can take place (1984).

At the intermediate level, texts can take on more of a problem-solving approach in which students solve the text by reading it--using deduction, calculations, educated guesses, and requests for more information (Pusack and Otto, 1984). In this context, reading can be both an individual and group activity.

At the advanced level the computer can be used to move reading from an object of study to that which is an actual means of learning. In this situation, programs can be incorporated that are relevant to students' particular course of study or degree and that could contribute vocabulary to specialized topics. For example, engineering students could view a mechanical drawing of a 357 Ford engine broken into all of its labeled parts, or electrical engineers could view a schematic display of the very

computer that they are working on. Therefore, CALL does have further potential regarding reading skills.

Word processing programs are already being used in some language learning environments, yet much more can be accomplished using the existing capabilities of the computer. CALL can be used in all areas of the writing process: pre-writing, writing, and editing. Currently, programs exist that help native speakers in the invention/ pre-writing stage by assisting them in choosing topics, ideas, supporting elements, structure and organization, point of view, and the appropriate audience--they help define the writer's stance (Arms, 1983; Burns, 1982; Burns and Culp, 1980). These same abilities can be tailored to the unique language needs of the second language learner. In addition, style can be analyzed to some extent by using programs that check for passive voice constructions, excessive preposition use, words per sentence, and misspellings.

In the actual writing of a composition, word processors can be employed giving students powerful editing options at the touch of a key (Bean, 1983; Collier, 1983). First drafts can be saved for later comparison; entire portions of text can be moved with ease; different formats can be experimented with and, if disliked, easily changed; the whole process of writing--thinking, creating, putting it down, changing it around, trying it one way and then trying it another way--can be enhanced by the contributions of

existing computer technology.

To sum up, the future of ESL CALL can be very bright indeed, with potential applications in several areas of language teaching if language professionals use their talents to exploit current technology in the interests of the profession. The abilities of the computer can be compatible with contemporary language learning theory and methodology and can be used effectively to aid in the learning and acquisition of another language. However, it seems quite clear that the primary agent for language learning instruction will continue to be, and should be, the language teacher. In the classroom, The language teacher is the overseer, the initiator, the impetus, that insures students are exposed to natural communication. Even though the focus of this paper has been on CALL, the role of the teacher in implementing computer assisted learning lessons cannot be under emphasized. Without the language teacher, and his or her interaction, stimulus, example, support, and encouragement, even the best CALL programs would be of no avail. Learning a language takes place in a language learning environment; it necessitates human interaction and input.

Consequently, the goals of CALL applications today and in the future should not include trying to replace the language teacher, but to assist the teacher in the language teaching process. As has been shown, there are some aspects of language instruction that the computer is very suitable

such as grammar drills and instruction; there are other aspects in which the computer is quite handicapped such as conversation practice. It seems the logical course to follow would be to use the computer in those areas in which it is most applicable. Therefore, used in this way, the computer takes on the brunt of activities that the teacher would rather not spend time on but knows are necessary: language drills and exercises.

However, ESL software for these and other activities is in short supply with much of it suffering from what many consider severe pedagogical shortcomings. At the same time, the full potential of existing CALL capabilities is not close to being fully realized. Current ESL applications mostly make use of the more rudimentary abilities of the computer leaving the rest untried and untapped. In this light, the future of ESL CALL depends heavily on whether or not and to what extent language professionals become involved in the development process. If the results are positive, then ESL CALL truly does have the potential to assist in the language learning process.

The following bibliography is intended to assist those ESL language teachers and other professionals interested in becoming involved in the CALL development process.

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