Challenges in the 1990s for College Foreign Language Programs

Sally Sieloff Magnan
Editor

Published by
Heinle & Heinle Publishers
A Division of Wadsworth, Inc. Boston, MA 02116

Manufactured in the United States of America.

Heinle & Heinle Publishers is a division of Wadsworth, Inc.

ISBN 0-8384-2548-8

10 9 8 7 6 5 4 3 2

CALL Today: Implications for Multisectioned Language Programs

Robert Ariew
University of Arizona

In the late '60s, as a graduate student, I was doing computer-assisted literary research. At the time mainframes were the only type of computer available, minicomputers having just made their appearance and being still jealously guarded by the departments that owned them. Microcomputers were, of course, still several years away. I was entering data on a keypunch, a big, cumbersome machine whose purpose is to make appropriately spaced and sized square holes on card stock. The collection of cards (the "deck") was then to be "input" into the machine as data. A program, written in SNOBOL4, was to generate a concordance of my text. I was busy entering the data, one line at a time on the cards, being sure not to make any typographical errors. Several people came into the computer laboratory, one of whom came over and curiously asked what I was doing. I told him I was entering my text data. He immediately laughed, and, as he was rejoining his friends, told me, "Didn't anybody tell you computers are for numbers?"

Several weeks later, I was again at the keypunch in the computer laboratory, entering data. This time, a group of us humanities students had the idea to type in recipe ingredients from the most commonly available cookbooks and generate an index for them. The index would reference those recipes in the cookbooks that called for, say, potatoes. If a cook had a bunch of potatoes and wanted

> references to recipes that included potatoes, he or she would open our index and find all recipes that called for them. I was sitting at the keypunch with the *Joy of Cooking* open and was busily typing in ingredients. This time the reaction of those around me was more pronounced. Some even questioned my masculinity.

Computing has evolved in the last three decades. Computers are no longer conceived as machines for numbers. The contrary is now true. With the widespread use of word processors, computers are now used mostly for text input, including indexing. Computer assisted language learning (CALL) has also evolved, especially since the introduction of the microcomputer. Entire new subfields have emerged, including desk-top publishing, hypertext, and multimedia. Similarly, computers are used in teaching foreign languages in entirely new ways. Interactive videodiscs, digitized sound, digitized color graphics have all made their appearance and have modified our perception of computers. We now can "browse" databases with impunity. While early activities such as drill and practice have remained as useful foreign language learning activities, they are now given a more restricted role.

Just as different uses have multiplied, so have the number of people that use computers today. No longer the exclusive domain of computer scientists, engineers, and scientists, computers are now used by a wide variety of people with different goals. To the administrator, the computer is now a tool used to manage a number of courses, registrations, budgets, etc; in twenty years, it may also be part of an integrated system that matches instructors' availability with specific classes, managing enrollment predictions with available resources. To the faculty, it may be a tool for research, a means to prepare a manuscript, a means to communicate with colleagues, and a general purpose manager of information such as bibliographies; before long, we can expect it to become a multimedia manager which allows the integration of voice, video, and graphics into presentations. To directors of language courses, it may be a means to prepare common examinations and presentation materials for use in classes; within a few years, we can expect it to become a tool for small group collaboration where the members of the group work together writing, editing, and refining materials. To teaching assistants, it may be a way to store class grades, to compute means, averages, and other class statistics, and to write papers for classes; eventually they may be writing their lesson plans directly on computers and presenting multimedia materials with them. Finally, to students, it may be a way to do a wide variety of exercises and to write a paper; someday it may become their principal source of information.

This article attempts to categorize and describe the old as well as the new modalities of use. It targets novice computer users as well as more experienced ones. Before proceeding, however, a few things must be made clear. The discussion will center on types of uses (for presentations, communication, etc.), not uses in specific subject areas (such as in teaching literature, teaching grammar, etc.). For a description of recent projects in subject areas, see Smith (1989) in the bibliography. Another thing to clarify is that one must be very careful when writing lists since categories of computer use (and of users) overlap quite a bit. It can be argued that it is precisely in these overlapping areas that innovations are happening. The overlaps will be pointed out below.

Presentations

The first category of use is very broad. Presentations include all uses of the computer which prepare materials for passing information orally or in writing. This category is listed first since it is overwhelmingly the most common use of computers today. It includes document preparation through text processing, database management, and use of spreadsheets. It also includes the preparation of overhead transparencies, illustrations, and handouts for oral presentations. With the advent of graphic-based machines, presentations now routinely include graphic illustrations. Other related uses have also become possible, such as computer assisted drafting, graphic design, and the preparation of blueprints and layouts.

Document preparation is routinely done in foreign languages as well. Even nonalphabetic languages can now be entered, displayed on computer screens, and then printed on paper or sent to a correspondent through a modem. (We are already overlapping functions; see "Communications" below). More specific to CALL, special types of documents are now being prepared: exams. Using a database program to keep and manage exam questions, many language teachers and teaching assistants are using the computer for computer managed instruction (CMI). They are selecting questions and printing master copies of quizzes and examinations, often on ditto masters for duplication. Similarly, using spreadsheet-like software, language instructors are keeping track of student grades and their progress in classes and doing interim grade calculations with computers. Some exams are even designed to be administered on machines. These exams take advantage of the microcomputer's fast evaluation capability and also of the possibility of designing tests that are adaptive—computer adaptive tests (CAT) where questions that are more appropriate to the student's abilities are presented.

The computer itself is now being used as the medium for presenta-

tions. Since the computer display can be enlarged for group viewing by means of a liquid crystal display device (such as the Kodak DataShow), the microcomputer, especially a portable one, becomes the medium of presentation and can afford the ability of displaying graphics, making animated presentations, and even playing digitized high-quality sounds. These on-line presentations are now being made in classes, as a kind of animated, graphic blackboard with multimedia capabilities. They suggest that a set of prepared materials may be written to illustrate elements of a language class. The materials can be shared by the teaching assistants in charge of a section of the class. These same materials could also be used by adjunct faculty to extend large courses by offering them in a variety of modes (at night, short course, adult learning, intensive courses, etc.).

One of the most powerful new uses of microcomputers is desktop publishing (DTP). It represents an overlap between graphics design and word processing. A relatively inexpensive workstation which includes a high-resolution laser printer and a graphics-capable microcomputer is used to merge graphic elements, text, lines, and headlines into a publication. Many departmental publications (handouts, newsletters, alumni communications, recruiting pieces, etc.) as well as course materials (syllabi, lesson plans, handouts, etc.) may be prepared in this manner. University publishers are now making use of DTP to publish monographs. Textbook publishers have also adopted DTP for foreign language workbooks and laboratory manuals.

In the future: Presentation will include not only voice and color graphics, but also color live-action video. Appropriate scenes will be transferred to the presentation and shown on projecting devices. Most word processors will have desktop publishing capabilities and will also allow the integration of images in page layouts.

Communications

It can be argued that the microcomputer is nothing but a sophisticated communication tool and that it is best used when disseminating information among users. By merging microcomputer resources via local area networks, people are now able to work in task groups, sharing peripherals such as printers, scanners, modems, etc., and also sharing the same database, adding to it, modifying it. In CALL, local area networks make it possible to share the same software (through site licensing arrangements with the publishers). Teachers do not have to ask students to hand in separate diskettes, but can access scores and other student information stored in one common device. Laboratory directors can also update information and software in one location rather than

having to modify dozens or even hundreds of individual diskettes.

Local area networks are also making it possible to send electronic mail among the members of the network. It is possible, for instance, to establish a messaging system for teaching assistants where the director could send a message to all members or to selected ones. Teaching assistants could also send messages to each other or to the director. Messaging systems may eventually replace the countless short messages and signs that clutter departments of foreign languages. Similarly, using a modem and the telephone system, microcomputer users can access information stored on remote devices. Bulletin boards (computer-accessed private messaging systems) routinely make available software, data, graphics, etc. Large networks such as bitnet, internet, and arpanet also allow users to exchange information worldwide. It is not unusual today to make article submissions via bitnet. The article, having been written on a word processor, is then sent to the editor via a communication network. This not only saves time, since the transmission is usually made within the same day (typically within an hour), but also money, since bitnet is usually provided free as a university service.

Commercial services are also available that can give the user the ability to communicate with others, to draw from large caches of information as well as to participate in forums (conferencing). Forums are communication areas where users can ask and respond to questions, take part in ongoing debates, and exchange information. Contributors typically review software and hardware and give opinions about processes and computer services. One of these forums is of special interest to the foreign language educator since it specifically targets communication in the discipline: the foreign language educator's forum on CompuServe (a commercial bulletin board). Researchers and directors can join the interactive forums, post questions to be answered by the members of the forums, or answer questions posted by others.

In CALL, local area networks may be used as a means to improve students' foreign language skills. Forums and electronic mail messaging services can be used among students collaborating on the network. Students may communicate on-line (simultaneously write to each other and read what others are writing), leave messages, and comment on each other's work. Forums on local area networks are becoming the electronic, written analogs of small group work in foreign language classes.

In the future: Personal computers will continue to have a local storage capacity, perhaps in the order of 100 megabytes of information (100 million characters). However, they will also have access to a much larger database. Using dedicated data lines or even cellular telephone

communications, computers will have access to gigabytes (billions of bytes) or even terabytes (trillions of bytes) of information from remote databases. The user will probably not know (or care) where the information is stored, but all of it will be available, regardless of the configuration of the computer itself.

Research

Research and computers form an ambiguous pair. It is ambiguous because of the dual nature of the computer: the computer may be a tool or a vehicle for research. As a tool, the computer is a sophisticated device that can store information gathered during experiments (for instance, latency of response, time between display and response, time to read instructions, etc.). Having collected information during the experiment, the researcher then analyzes the data (normally with the same computer) and makes generalizations.

As a vehicle for research, computers are also routinely used to evaluate the effectiveness of computer assisted instruction (CAI) or CALL materials. Students may be asked to give their opinions about material they experience (affective research) or data may be gathered about how well they perform (quantitative research).

It has also been argued that computers are affecting how people perceive and acquire information. Computers allow people access to information in a different way than books: in a more random-access mode. While books are much more linear in their format (book indexes do allow for some measure of random accessibility), computers are much more flexible in allowing random access. While computers are responsible for providing a new way to look at information (in a random-access mode), they may also be able to document for us how this can benefit (or cripple) learning.

The matter of documentation is important in research. Here again the computer has been proven to be a very useful tool. Much library work—for example, searching, retrieving, cross-referencing, and collating—is done by computers nowadays. By merging the computer's communications capabilities with its strengths in search and retrieval, libraries can now offer remote services. Researchers can now request library services from their office or from home via modem.

In the future: Researchers will have access to a kind of programming that will allow them to define a set of actions that the computer will perform at a later time (in the background, while other applications are idle). The tasks will be performed somewhat intelligently and somewhat independently. For instance, the researcher may specify that the computer search external databases for bibliographic information that meets

criteria previously set, download that information to a local storage device, rewrite it to conform to an accepted bibliographic format, and alphabetize it. The program will also be able to act as an assistant and assign levels of priority or importance to the information, identifying it as most appropriate or less appropriate.

Of course, the cursory treatment above does not do justice to the growing complexity of the computer as a research tool. One needs only look at any scholarly journal (in any field) to understand that there are indeed very few areas of research where the computer has *not* made its mark.

Instruction (CALL)

CALL undeniably has evolved and become more sophisticated in the last few years. The most telling evidence is that the original basic assumptions about CALL no longer hold true: the types of CALL activities once considered axiomatic no longer seem to be absolutes; the old definitions about what CALL is and is not simply do not serve well today. Tutorials, drill and practice, simulations, and games are no longer the only four categories of CALL activities. The clear distinctions that this taxonomy implied have become blurred; qualifications must now accompany the taxonomy. Moreover, CALL, at its most popular and implementable forms, used to rely on small, inexpensive, and readily available hardware, such as the Apple II family of machines. While the Apple II is undeniably still a vehicle for much CALL activity, the discipline is beginning to consider much more "hefty" hardware, with new and much more powerful capabilities. In short, the assumptions made previously about hardware do not seem to hold true either.

Types of CALL-based Activities

A decade ago, CALL categories were well-understood and were still very useful in shaping lesson materials. These "classic" categories are described below.

Tutorials are lesson materials that consist of explanations, principles, and definitions through which the student acquires new knowledge. Questions are presented at appropriate intervals to check on understanding of concepts. Responses are judged as either correct or wrong and appropriate branching is provided to maximize understanding and learning. Tutorials are conceived as interactive books that provide more or less information according to the student's learning as evidenced by answers to appropriate questions. Tutorials are used as an integral part of many CALL materials. For example, tutorials typically precede drill

and practice materials to ensure that students have understood the rules on which the practice is based.

Drill and practice is a distinct type of activity that stresses application of concepts and works with discrete points. Its goal is to reinforce students' knowledge and to remedy any weaknesses through error diagnosis and correction. Help sequences are made available either to refresh the student's memory or, when errors occur, to restate the rules which may have been misunderstood. Drill and practice is also characterized by repetition of the same or similar tasks. One typically finds drill and practice materials for formation of verbs and tenses, use of pronouns, etc.

Simulations present a real-world analogue to the student for the purpose of teaching the intricacies of a particular process. In this type of material, there is no predetermined algorithm to solving the problem or to understanding the process. Students are free to explore a multitude of available paths and are given a wide choice of possible actions to perform. Because of the difficulty in designing meaningful or realistic linguistic simulations, they have not been widely used in CALL, but the number of examples is growing.

Finally, CALL **games** involve solving small problems or overcoming obstacles in a competitive format. Games are typically fast-paced and involve acquiring points. Essentially drill and practice activities jazzed up (with accompanying sound and color graphics) and with a goal (scoring routines), they are used typically to check on student progress, while, at the same time, "lightening up" the didactic process.

While the more traditional uses of CALL have been superseded, as we will see below, they remain an important and well-defined area of instruction in foreign languages. Many instructors rely on computers to have students practice grammatical structures. The computer thus assumes the role of an electronic workbook, giving students the opportunity to perform "linguistic calisthenics." The time saved in grading, the effectiveness of the medium as a repetitive drill master, and the fact that the computer seems to make the activities more acceptable, all justify this type of use.

Advances in CALL have also been made in new and more creative uses of traditional software. For example, drill and practice, while still used quite extensively in foreign language study, now occupies a new niche in the learning process. Jones and Fortescue (1987), among others,

argue that the computer as drill-master still has a place in the learning environment since it can free up the instructor who can then spend more time interacting with individual students and give them more face-to-face communicative practice. The benefits of using CALL in that way are even more obvious in multisectioned language programs with teaching assistants as instructors. The teaching assistant does not have to spend time with the more routine aspects of drill and practice and can be assured that, if the students have spent some time in the computer laboratory, they will be familiar with the material. Along the same lines, Clark (1988) proposes that CALL should be seen as "a part of the total instructional system which also includes the live teacher, textbooks and other print materials, outside-of-class learning opportunities, and numerous other non-technological components" (p. 5). Similarly, students who are given free rein to explore (or "browse") databases are learning by discovery (and by doing). This kind of free-form learning is very much reminiscent to some of the more modern classroom techniques such as group learning or student-centered learning. Jaffe and Lynch (1989) propose that the computer should now be conceived as a Personal Learning Workstation (PLW), where students take more responsibility for their learning and where the computer provides as much or as little information as requested. Just as teachers' roles have evolved from leaders to facilitators of instruction, computers are now seen as facilitators of instruction. Instead of limiting the use of a computer to a one-to-one setting, teachers are also using them as information providers for small groups. Young (1988) further proposes that it is precisely in the area of learner-interaction analysis that CALL will make its greatest impact.

New Categories

More recently another category of CALL activity has been introduced: **tools**. This category describes the use of the computer as a resource, as, for example, when students use the microcomputer to solve a broad problem. In this case, the machine itself does not hold the solution to the problem, but is a means to solve it. The clearest and most often cited example is using the microcomputer as a tool for writing. Typically, pre-writing software (tutorial software) helps the student define a topic, while word processing software (tool software) makes the editing and re-editing cycle much easier. In addition, the computer can help the student check certain aspects of grammar, spelling (many word processors now include spelling checkers in several languages), and vocabulary (thesauruses are now also available in word processors), as well as with conjugation and grammatical rules (databases with grammatical

rules are now becoming available; see for instance *Système-D*, software for writing French).

Even with the introduction of this new category of CALL activities, there seems to be an uncertainty about the adequacy of the taxonomy of CALL activities. In 1984 Hope writes:

> In foreign language CAI, this typology quickly breaks down. Good tutorials involve extensive practice and "simulate" the classroom. Drill is often dismissed as mechanical or "Skinnerian," largely because weak programs offer the student little help in reaching a correct answer. Advanced types of structural practice probably should be classified as problem solving. Simulations may be little different from drill if they can handle only a small number of precise foreign language responses to a given situation; if they use multiple-choice questions, they may be better classified as reading exercises. While we use the traditional classification scheme, we recommend that it be viewed skeptically, especially when these terms are invoked in a judgmental fashion, in order to heap scorn upon drill, or to extol the glories of simulation. Good CAI materials in foreign languages seldom meet the challenges of the field in predictable ways (p. 18).

In 1987, again being very cautious about the adequacy of the traditional taxonomy of types of activities, and aware of recent pedagogical changes in foreign language teaching, Ariew and Frommer write: "Although these classifications may have sufficed when computers were first used in language learning, they no longer cover the wider range of formats made possible by improved technology and increased experience" (p. 179). In that same article, another new category is proposed: **contextualized activities.**

Contextualized activities are especially important in foreign language learning because they emphasize the language content along with structure.

> Contextualized activities require greater involvement by students than occurs in drill and practice exercises. Consisting of units of text longer than word or sentence items, these programs stress understanding and creative use of the language, rather than merely eliciting correct and automatic responses. Activities of this type are cloze passages, in which every n th word is missing and must be replaced; paragraphs in which sentences must be reordered (thus requiring understanding of the complete text); or stories containing erroneous or misplaced words that must be

> identified and changed. Students must not only understand the material but often, by completing it, actually contribute to its meaning (p. 180).

In that same article the authors state a final caveat, again underlining the inadequacy of even the newly proposed categorization: "In fact, the more elaborate CALL packages usually involve elements of more than one type of CALL activity. For example, there are software packages that begin with a tutorial, a short grammatical presentation interspersing questions to ensure comprehension. The presentation can include simulation if it shows graphically how the language works. A drill and practice exercise then allows the student to practice the grammatical concept with many examples. Finally the last part of the package is a contextualized activity or game that rewards quick recall" (pp. 181-82).

Computers are also used in several new ways, many of which are not traditional or adequately described by existing categories. For instance, computers are used to help students with writing skills; some software helps students organize thoughts (outline processors) and formulate and write down ideas ("idea processors"). A new rubric might describe this type of software more adequately: **skill-development software.**

Another major category of innovative software is the video-driven materials which simulate interactions with people, albeit people on film. This type of software may be classified as "simulation," but goes much beyond what "simulation" used to mean. One might term this type of materials **live action simulations.**

Hypertext, a concept that was elaborated in the '60s, is also making a significant impact on CALL-based activities. Much new software is being written that incorporates its characteristics. "The delivery of information in forms that go beyond traditional list and database report form..., [hypertext] links facts across conventional subject boundaries. For example, when studying chemistry, you may wish to study the life of a chemical compound's creator...[or else] you might connect the chemical compound to a listing of grocery store products that incorporate the compound, or to long-term health studies on the compound" (Goodman, 1987, p. xvii). Hypertext allows the user to access these parameters at will.

Although there presently exist few hypertext applications for CALL, one can foresee useful materials. For instance, a foreign language reading text presented on a computer might have links to information about the author, to a dictionary, or to comments about the cultural context (politics, life-styles, etc.), or even to comments about the meaning of the

text, to the gist of paragraphs, etc. If the hypertext concept is taken to the next logical step and incorporates other media stored on the computer, there could be links to a recording of the text, to graphics giving information about locales, conditions, etc., and even links to a video recording, showing the specific locale or even actors playing the roles described in the text. This extension of the hypertext concept, called **hypermedia**, is an important conceptual leap and is beginning to make an impact on the design of CALL software.

Attributes and Limitations

While it is easy to fall into a trap and to think of the computer as a wondrous machine embodying the solution to all problems, both real and imagined, computers do have their limitations, especially in their ability to teach foreign languages. For instance, they are incapable at this time of interacting with the user in a conversational oral way. Unless giant leaps are made in the field of voice recognition and output (and similar leaps in linguistics, including semantics and parsing), the computer will not be able to converse with the user in a free-form oral interchange in the near future. In line with current thought in L2 acquisition, free-form oral interchange between two people is a major goal of foreign language learning. It can be argued therefore, just as it has been argued that the book is an ineffective medium of instruction for foreign languages (see Schulz, this volume), that computers are ineffective as well. They do not address at all one of the major goals of foreign language learning: speaking.

Of the four skills (listening, speaking, reading, and writing), which one(s) can the computer address? In what areas does it have attributes that would make it valuable in foreign language learning, particularly for multisectioned programs? In a recent article (1987) I discuss the relative capabilities of video, CALL, and text. I develop the chart below, modified here to take into account the latest advances in computer technology.

	Textbook	CALL	Video
Listening	-	+?	+
Speaking	-	-	-
Reading	+	+	+?
Writing	+?	+	-

Several things emerge from a scrutiny of this table. None of the three media addresses speaking specifically. However, it can be argued that a textbook does address speaking skills indirectly by providing activities and materials that will spark discussion. But texts do not directly

affect speaking skills. Neither does video or CALL. The only resource that can directly affect the teaching of speaking skills at the present time is interaction with a teacher (teacher-student interaction) or with other students (student-student interaction).

The **textbook** is primarily a medium for addressing written skills. It shines as a medium of presentation for reading materials. It is also used as a means to elicit written responses and to participate in written activities. The evaluation of the writing, however, is left up to a teacher or another evaluator. Hence the textbook is a good medium for presenting writing activities, but does not evaluate written production. (This is the reason a question mark follows the plus sign next to "Writing.")

CALL is a good medium for reading skills instruction as well. It should be pointed out, however, that recent research shows that people still prefer to read from a book rather than to read from a screen. Only very short messages (one or two screens long) are acceptable on a computer monitor.

With recent advances in digitizing speech on a computer, CALL adds an ability to present listening materials (an ability that the book does not possess). The technology, however, is still in its infancy; there are still some problems to solve, including a needed increase in storage capacity to make listening materials routinely available on computers. CALL can address writing as well. Many programs exist to help develop ideas, organize the essay, check spelling, check grammar, etc. Unfortunately, CALL cannot evaluate extended writing as would an instructor. However, the holistic suggestions that software can provide may be valuable.

Video has altogether different attributes. Like CALL, it can facilitate listening skills. It is especially suited for that skill since it can present not only audio material, but visual material as well, thus increasing motivation, adding realism, immediacy, and important nonverbal information to the communication. While video can also address reading skills, resolution of video images is still very poor and only a few characters may be displayed on a video screen. (A computer display, on the other hand, has more resolution.) One loses legibility very quickly with large numbers of characters. In any case, reading text from a video screen is tiring and not altogether practical.

It is plain to see that CALL, even though it does not address speaking skills, is still the most potentially useful medium for foreign language study of the three. It can address the most skills and, according to research, has other attributes as well.

Effectiveness

What evidence is there that CALL is an effective and efficient vehicle for language learning? Complete answers to those questions are not available. There are tantalizing bits of evidence from various sources that point to CALL (and to CAI, the more general form of CALL) as an effective and efficient medium of instruction, but longitudinal or long-term studies have not yet been done. Intermediate results are not conclusive.

What information we do have is interesting. For instance, in an extensive study of effectiveness of CAI (which includes all kinds of instruction such as mathematics, social science, etc.), Kulick, Kulick, and Cohen (1980) have shown that a certain measure of effectiveness comes from the use of computers in learning.

Kulick et al. began with a DIALOG (a bibliographic search and retrieval system) search of the literature available in 1980 about the results of studies that used computers to teach a wide variety of subjects. It should be noted that the studies dealt broadly with the use of computers in learning (CAI) and not specifically with CALL. Furthermore, since they were conducted in the 1970s (during the prehistory of CAI), they overwhelmingly concerned mainframe-based materials; none of the studies used microcomputers (which were made available in the late '70s). Although over 500 studies were identified, only 59 studies were retained because the others failed in some way to satisfy the researchers' criteria. Those retained reported on actual college-level classroom studies, used outcomes which were measured quantitatively, had control groups, did not include anecdotal evidence, and did not have apparent methodological flaws.

Kulick et al. went about analyzing the effectiveness of CAI from the evidence presented in the studies retained. The researchers were interested in the impact of CAI in several different categories. They examined student achievement, or how well students performed with CAI vs. with regular classes. They were also interested in aptitude vs. achievement. They looked at the rate of course completion in CAI vs. in a regular class. They further assessed student attitude toward the subject matter. Finally, they measured total instructional time in both the CAI class and in the normal class.

It should be noted that the researchers undertook a "meta-analysis" of findings; that is, they merely reported the results obtained in other research experiments. Kulick et al. do not report on the specific methods used in each study, but on an analysis of the results, collectively. They refer the reader to the individual study for specifics. I shall do the same.

The results nevertheless were surprising:

Student Achievement: CAI has a small positive effect. The average examination score for students in classes using CAI for a part of the instruction was 60.6%, while students in a conventional class achieved on the average 57.6% on their examinations. The effect of CAI in a typical class was to raise student achievement by about one-quarter of a standard deviation unit.

Aptitude vs. Achievement: CAI has a small positive effect on the correlation between aptitude and achievement in college courses.

Course Completion: No effect. Students in normal classes were as likely to complete the course as students in CAI classes. Average CAI class withdrawal was 26.9%, while in conventional classes it was 27.6%.

Student Attitude: CAI has a small positive effect on students' overall attitude toward instruction in CAI and conventional classes. Four studies showed a statistically reliable difference in favor of CAI, while one study favored conventional teaching. Furthermore, CAI has a small positive effect on the students' attitude toward the subject matter being studied. In five studies CAI classes had more favorable attitudes toward the subject, while in two studies students in conventional classes expressed a more favorable attitude.

Instructional Time: There was a significant time savings in the CAI class vs. the regular class. What took on the average 3.5 hours in a regular class took 2.25 hours in a CAI class. "There appears to be little doubt that students can be taught with computers in less time than with conventional methods of college teaching" (p. 537).

While not overwhelmingly positive, the results shown by Kulick et al. are encouraging and do point to CAI as a viable medium of instruction. However, the results are not entirely applicable to CALL since they were based on data for general classes, and not language classes. Questions still remain about the efficacity of CALL. Also still debatable is the importance of CALL in the context of large numbers of classes with multisectioned courses and diverse staff (teaching assistants, adjuncts, and faculty). Can CALL make a difference?

Unfortunately, there are few objective or longitudinal studies on the effectiveness of CALL. We do have some tantalizing bits, however. For instance, Robinson (1989) reports that on the whole, CALL classes show

a marked improvement in achievement when compared with regular classes. She thus replicates Kulick's results on achievement. Robinson's study further suggests that an integrated approach to materials may be the most effective way to present CALL or, for that matter, any material.

> In organizing material for CALL (or textbook) lesson presentation, language learning materials may be more effective, over time, when presented and practiced within an *integrated context* in which students' attention is focused on the *meaning* of the material and language is used to *draw inferences* as in *solving a problem*. Material may be more meaningful when students *relate personally* to it, either because the materials contain *reference to themselves* or to *people they know*, because it is amusing or otherwise *emotionally appealing*, and because they *select it (from a menu)* out of *personal interest*. While these features did not appear to have any *immediate* effect on second-language learning in this study, their *cumulative* effect is noteworthy and merits further investigation (p. 131).

Robinson addresses an area which was completely ignored by Kulick et al., namely, the factor of quality. Nowhere in the criteria for selection of studies in the Kulick et al. metastudy did a criterion for quality appear. In other words, whatever gains were demonstrated about the effectiveness of computer materials, they referred to the medium and not to the quality of the materials. This effectively makes the gains for the CAI classes more impressive: if learning improvements can be shown with CAI materials whose quality has not been measured, more impressive results could probably be shown with well-designed CAI or CALL materials.

Similarly, Rivers (1989) suggests that "the most pedagogically sophisticated courseware producers have turned their attention to creative and exploratory interaction with the computer which seizes students' attention and involves them with reception and production of language because of the intrinsic interest of the evolving situation." In other words, while CALL may be an interesting medium through which to present language materials, one ought to pay particular attention to the content and design strategy of the materials, for they too can play a crucial role in the students' motivation and learning.

What about the impact on multisection courses? While no studies specifically deal with CALL in multisection courses, there are a few things that can be inferred from what we already know. Multisection courses are typically taught by diverse staff (teaching assistants, adjuncts, and faculty). Staff diversity is both a blessing (it provides students with a variety of teaching styles and emphases) and a problem (it is hard to

keep all sections roughly on the same track). CALL's attributes seem exactly suited for the multisection course since the medium provides a standard, stable set of core materials to be used by all students in the class. (Note that there are no reports of completely computerized modern language courses, nor should there be.) The staff would be assured that all students have access to the same set of materials and could take advantage of time savings afforded by CALL. The supervisor would also be assured that some measure of standardization is occurring across the sections both in materials covered and, to some extent, in the quality of coverage.

Of course, another important factor in teaching multisection courses is time. Much of the planning work that goes into supervising a multisection course is devoted to matters of saving time or of making efficient use of the time. The instructional staff, the teaching assistants, must devote much or most of their time to their graduate studies; their teaching duties must therefore be carried out efficiently. Once again, CALL can make a real impact since, according to the results of the meta–analysis of Kulick et al, computers can save instructional time. What takes on the average 3.5 hours in a regular class takes 2.25 hours in a class that uses computers for some of the instruction. CALL can both save instructional time for students and afford flexibility in the use of time for instructors.

Finally, we should ask what role the new hardware will play in shaping further the type of CALL interactions in the next few years. What trends can be detected in the hardware?

What's Coming?

New features are appearing on computers almost daily. The industry is willing and able to provide more of everything, for a price, of course. Speed and capacity of microcomputers are doubling every few years. We are now able to purchase displays with extremely high resolutions and with several million shades of color. We have computing speeds 33 times faster than the original Apple II, storage devices with about 5000 times larger capacities than single-sided floppies, sound-digitizing capabilities that are as good as audio compact discs, and very sophisticated programs to do everything from teaching Russian to doing taxes. And yet, our appetite for more of everything goes unsated.

One of the most interesting developments that has come out of the laboratories of the hardware gurus is the CD-ROM. (For a thorough description of the hardware and software implications, see Lambert and Ropiequet, 1986. For a CALL perspective, see Woodbury, 1988.) It is a device which can store an incredible amount of information, and, by

itself, may be very significant indeed. But it is the type of information that can be stored on CD-ROM that makes it very exciting for CALL. It appears that the CD-ROM is a kind of universal storage device for all manner of information, including graphics of all kinds (in color), programming information, digitized sound (of very high fidelity), and eventually even color video. One such disc holds enough information to be practical for distribution of very sophisticated courseware. It is possible to consider that in one of the discs a whole semester's worth of multimedia instruction could be stored. And, in quantities, that disc would cost only a dollar or two to produce (for the disc itself, and not for the software it contains). The impact the CD-ROM will have on all of the audiovisual devices found in schools (language laboratory carrels, slide projectors, video players, overhead projectors, etc.) will be significant since the CD-ROM has the potential to replace all of them.

Where to Begin?

Not having a firm idea of what to do or where to start, the reader is probably deep into a state of confusion. There are just too many options, too many things to think about, and too few support dollars. It is painfully clear that introducing computers in academe is expensive. It is also clear that, since computers have been getting cheaper every year, one can wait just another year and purchase them for several hundreds of dollars less. Therefore it is understandable that one of the most popular reactions is to do nothing. One merely waits until computers get more powerful and cheaper. Unfortunately, that solution is probably the costliest of all. Computers do help; they do save time; they are efficient. And waiting will simply postpone becoming efficient.

What to do? I would like to propose a plan of action, a series of plausible steps to take. The first thing to do is to get ONE computer (and printer) for exclusive use by the staff. (Note that computers available at a learning center are no substitute. Exclusive use is essential.) This, in itself, will not solve many problems but it will do two things: 1) It will get the staff of the multisection courses on a learning curve. They will shed their apprehension about computers, about how "difficult" they are to use; and 2) It will get them started thinking about using computers in support of teaching. They will probably start small by putting exams and quizzes on the machine (see the section entitled "Support Materials" for sources of software). The process will be laborious at first, but then there will be a great benefit when the tests are printed virtually error-free. Then there will be another great benefit when similar exams must be given the succeeding semester and the ones on diskette become the basis for new exams. Then the staff will probably want to use the

machines for other management tasks such as grade keeping. They may then use the machines for preparing handouts, notes, review materials, and announcements. Experimentation with educational software comes next. Some of the software will probably come from the public domain, some from academic sources, and then some will eventually be designed by the staff using authoring systems. By this time, there will probably be a need for a second machine, as the original one is becoming heavily used, not only by the staff, but also by students using software experimentally. Eventually, other machines may need to be added, this time in support of students' learning.

The process will take some time, but is predictable. As the benefits of the computer are felt on the curriculum, more will be needed. However, the journey starts with a single step: the acquisition of the first machine exclusively devoted to curricular development.

In some departments computers are available and are routinely used for word processing for faculty. Generally though, no systematic curricular use is made of those machines. To improve the situation, one computer ought to be devoted to curricular use and made available exclusively for it. Teaching assistants, adjunct faculty, and other support staff ought to think of that machine as their very own. Furthermore, "expert" users ought to be encouraged to tell how they are using their machines and to demonstrate their applications. Training facilities should be identified on campus and people should take advantage of them. Often people are reticent to use computers, not so much because it is a "difficult" thing to do, but because of their innate fear of the unfamiliar and new. Demystifying computers by making them a common and accessible commodity will go a long way in dispelling people's emotional reaction to them.

Works Cited

Ariew, Robert. "Integrating Video and CALL in the Curriculum." *Modern Media in Foreign Language Education: Theory and Implementation*. Ed. W. Flint Smith. Lincolnwood, IL: National Textbook Company, 1987: 41-66.

——— & Judith Frommer. "Interaction in the Computer Age." *Interactive Language Teaching*. Ed. Wilga M. Rivers. New York: Cambridge University Press, 1987: 177-93.

Clark, John L. D. "Toward a Research and Development Strategy for Computer Assisted Language Learning." *CALICO Journal* 5, iii (1988): 5-23.

Goodman, Danny. *The Complete Hypercard Handbook*. New York: Bantam Books, 1987.

Hope, Geoffrey, Heimy Taylor & James. Pusak. *Using Computers in Teaching Foreign Languages*. New York: Harcourt, Brace, Jovanovich, 1984.

Jaffe, Conrade C. & Patrick J. Lynch. "Hypermedia for Education in the Life Sciences." *Academic Computing* 4, i (1989): 10-13; 52-57.

Jones, Christopher & Sue Fortescue. *Using Computers in the Language Classroom.* London: Longmans, 1987.

Kulick, James A., Chen-Lin C. Kulick & Peter A. Cohen. "Effectiveness of Computer-based College Teaching: A Meta-analysis of Findings." *Review of Educational Research* 50 (1980): 525-44.

Lambert, Steve & Suzanne Ropiequet. *CD ROM: The New Papyrus.* Redmond, WA: Microsoft Press, 1986.

Rivers, Wilga. "Interaction and Communication in the Language Class in an Age of Technology." *Language Teaching, Testing, and Technology: Lessons from the Past with a View Toward the Future.* Georgetown University Round Table on Language and Linguistics. Ed. James E. Alatis. Washington, DC: Georgetown University Press, 1989: 186-97.

Robinson, Gail. "The CLCCS CALL Study: Methods, Error Feedback, Attitudes and Achievement." *Modern Technology in Foreign Language Education: Application and Projects.* Ed. W. Flint Smith. Lincolnwood, IL: National Textbook Company, 1989: 119-34.

Smith, W. Flint. *Modern Technology in Foreign Language Education: Applications and Projects.* Lincolnwood, IL: National Textbook Company, 1989.

Woodbury, Verl. "CD-ROM: Potential and Practicalities." *CALICO Journal* 6, i (1988): 25-35.

Young, Richard. "Computer-Assisted Language Learning Conversations: Negotiating an Outcome. *CALICO Journal* 5, iii (1988): 65-83.

Support Materials

Selected Publications

Academic Computing, news and projects in higher education, Academic Computing, PO Box 804, McKinney, TX 75069.

ALLC Bulletin, a journal of the Association for Literary and Linguistic Computing, J. L. Dawson, Literary and Linguistic Computing Centre, Sidgwick Site, Cambridge, CB3 9DA, United Kingdom.

CALICO Journal, journal of the Computer Assisted Language Learning and Instruction Consortium, specializing in foreign language learning with computers, CALICO, 3078 JKHB, Brigham Young University, Provo, UT 84602.

Collegiate Microcomputer, specializes in uses of computers in higher education with an emphasis on uses in writing and composition, Rose-Hulman Institute of Technology, Terre Haute, IN 47803.

Computers and Education, an international journal focusing on education, Pergamon Press, Maxwell House, Fairview Park, Elmsford, NY 10523.

Computers and the Humanities, a generalist journal with some emphasis on literary studies, Kluwer Academic Publishers Group, PO Box 358, Accord Station, Hingham, MA 02018.

Educational Computer Magazine, deals principally with secondary education, Educational Computer, PO Box 535, Cupertino, CA 95015.

edu Magazine, college-level news and projects using Digital Equipment Corporation equipment, Digital Equipment Corporation, Three Results Way, MR03-2/E7, Marlboro, MA 01752.

Journal of Computer-Based Instruction, Journal of the Association for the Development of Computer-Based Instructional Systems, educational research orientation, ADCIS International Headquarters, Miller Hall 409, Western Washington University, Bellingham, WA 98225.

System, an international journal of educational technology and applied linguistics, Pergamon Journals, Maxwell House, Fairview Park, Elmsford, NY 10523.

Wheels for the Mind, an Apple University publication prepared at Boston College, news and projects using Apple equipment, Apple Computer, PO Box 1834, Escondido, CA 92025.

Authoring Systems

MS DOS Systems (IBM and "clones")

McGraw-Hill Authoring System, a complete interactive authoring system. Includes ability to present text and graphics in color. Will generate multiple choice, fill-in-the-blanks, and matching screens. Also includes simulation capabilities. McGraw-Hill Co., 1221 Avenue of the Americas, New York, NY 10020.

MicroTICCIT, authoring system for generating computer assisted instruction materials. Includes the ability to present text and full-color graphics as well as video/computer-generated graphics on the same

screen, automatic recording of student data. Also includes a comprehensive, easy-to-learn computer language. Hazeltine Corporation, 7680 Old Springhouse Road, McLean, VA 22102.

Quest, free-form authoring medium for generating computer-assisted instruction materials. Includes the ability to present text as well as color graphics, video. Student answers may be true/false, multiple choice, fill-in-the-blanks format, free-form question/answer capability. Includes branching capability as well as student record keeping. Allen Communication, 140 Lakeside Plaza II, 52235 Wiley Post Way, Salt Lake City, UT 84116.

TenCORE, a flexible authoring system which includes the ability to display text and graphics in several resolutions. Includes the ability to display video, mouse, light pen, touch panel input, audio. The system includes its own programming language which provides complete recordkeeping, test generation, and prescription facilities. Computer Teaching Corporation, 1713 S. Neil Street, Champaign, IL 61820.

Macintosh Systems

Authorware Academic, an object-oriented development system, includes ability to use graphics, mouse, text in multiple sizes and styles, animation, pulldown menus, can also export software to the MS DOS environment, Authorware Inc., 8500 Normandale Lake Boulevard, Ninth Floor, Minneapolis, MN 55437.

Course Builder, an object-oriented development system, includes ability to use graphics, mouse, text in multiple sizes and styles, animation, pulldown menus, digitized and synthesized voice, video. TeleRobotics International Inc., 8410 Oak Ridge Highway, Knoxville, TN 37931.

Guide, a hypertext authoring tool, includes ability to use mouse, pulldown menus, graphics, branching, videodisc and CD-ROM. Owl International, 14218 Northeast 21st Street, Bellevue, WA 98007.

Hypercard, a general purpose hypertext authoring system, includes ability to use mouse, pulldown menus, graphics, digitized sounds, video, branching, searching and programming capabilities. Included with every Apple Macintosh.

SuperCard, a general purpose hypertext authoring system, includes ability to use mouse, pulldown menus, color graphics, digitized sounds,

video, branching, resizable windows, full-screen support, searching and programming capabilities using built-in programming language. Silicon Beach Software, 9770 Carroll Center Road, Suite J, San Diego, CA 92126.

VideoWorks Interactive, a graphics and animation package for designing simulations. Also allows the use of video, digitized and synthesized sound. Includes a programming language similar to BASIC. MacroMind Inc., 1028 West Wolfram, Chicago, IL 60657.

Selected Software Distributors

Bureau of Electronic Publishing, PO Box 779, Upper Montclair, NJ 07043. Software and data available on CD-ROM. For MS DOS and Macintosh computers.

Chariot Software Group, 3659 India Street, Suite 100c, San Diego, CA 92103. Macintosh software.

Conduit Catalog of Educational Software, Oakdale Campus, University of Iowa, Iowa City, IA 52242. Secondary- and college-level software.

Gessler Educational Software, 900 Broadway, New York, NY 10003. Apple II and secondary-level software for foreign languages.

Kinko's Academic Courseware Exchange, 4141 State Street, Santa Barbara, CA 93110. Macintosh and Apple II software, written by academics.

National Collegiate Software Clearing House, Duke University Press, 6697 College Station, Durham, NC 27708. Software for the humanities and social sciences.

Tools for Learning, Courseware Catalog, IBM Academic Information Systems, 472 Wheelers Farms Road, Milford, CT 06460. College-level software for the IBM PC and compatible computers. Materials available for all disciplines, written by academics.

Wisc-Ware, Academic Computing Center, University of Wisconsin-Madison, 1210 West Dayton Street, Madison, WI 53706. Research and instructional software for MS DOS computers. Software written by academics.