Computers in the Language Classroom

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To Rosalind, Laurie, and Jeffrey

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PREFACE

This book is intended as a gentle introduction to the uses of computers in education, with the emphasis on language instruction. Equally important are the discussions of the limitations of instructional computing, lest we claim more than is justified and attempt to use it in areas that should be taught only by a teacher. I have chosen to deemphasize the computer equipment, as much as one can in a book of this sort, and to emphasize the human factors. Like any other technological advance, such as movable type, computers will influence the ways that teachers teach and students learn. Furthermore, computers and the data bases that they can access are changing the very concept of what knowledge is, and in a very profound way.

Teachers of subjects other than English, ESL, and foreign languages will find much that can be adapted in obvious ways to their own specialties. I have assumed that the reader has no experience with computers, so all concepts are explained accordingly.

The book has been tested in various versions in my course, Computers and Language Instruction, and I am grateful to those students who pointed out where clarity had broken down. It has been gratifying to see students, mostly in-service or prospective teachers, become comfortable users of these powerful tools. Many began the term with fear and suspicion of computers, taking the course only because they feared being left behind; they finished by programming sophisticated instructional software as their term projects, all within one semester. It is hoped that this book will help others become comfortable with instructional computing, as well as serving as a valuable resource.

I would like to express my appreciation to my editors, Lorraine Anderson, C. Stuart Brewster, Ginger Johnson, and Susan Musick, as well as the two anonymous readers whose critiques gave me valuable perspective. Tom Jacobs read the glossary, and his suggestions improved its accuracy. Special thanks go to Lester Golub, whose insightful criticism of manuscript content has resulted in a much better book. Any defects that remain are entirely my own responsibility.

There is no way that I can express my appreciation to my wife Rosalind for her patience and encouragement while the manuscript proceeded, sometimes slowly. She read much of the manuscript and pointed out those places in the text that would be unclear to someone who is not yet familiar with computers. From my children, Laurie and Jeffrey, I can only ask forgiveness for the time that otherwise would have been spent with them.

R. M. H.

Chapter 1

Chapter 2

Chapter 3

Chapter 4

Chapter 5

Chapter 6

Chapter 7

CHAPTER 1

Getting Started

1.1 What is Computer-Assisted Instruction?

The coming revolution. A revolution is taking place in our schools, fascinating some teachers with its potential and terrifying others with a future that arrived too soon. This book is addressed to both groups. The revolution that I am referring to is computer-assisted instruction (hereafter CAI). Closely associated with CAI is computer-managed instruction (hereafter CMI). The use of computers as a tool of instruction in the classroom and as a tool for managing instruction according to group and individual needs is not something from science fiction. It is here, and it is here now, made possible by the advent of microcomputers. Education stands at a crossroad, in many ways like the crossroad that confronted western Europe and America at the beginning of the Industrial Revolution. Before the Industrial Revolution, craftsmen produced manufactured goods one at a time with hand tools and with methods that today would be called labor-intensive. After the Industrial Revolution began, mechanization, and later automation, allowed a tremendous increase in efficiency.

Labor-intensive methods in education today. The methods of instruction in most schools today are labor-intensive. If you have doubts about this, consider the fact that the lion's share of a school system's budget goes for salaries. Yet, for all the money invested in our schools, from kindergarten through doctoral programs, the finished product, an educated populace, is not as finished a product as the times demand, as evidenced

by the cries of outrage and complaints from taxpayers' groups and frustrated employers. There are limits to what can be accomplished by labor-intensive methods, no matter how many people are employed at the task. We could not launch communications satellites into orbit even with a million people pulling back the slingshot.

CAI, education's Industrial Revolution. Education has arrived at the point at which its labor-intensive methods are no longer adequate to the increased demands placed upon it by an industrialized society that is so far removed from such methods that many, such as Alvin Toffler, author of *The Third Wave*, speak of it as postindustrial. Education should lead the society, not follow it. If the schools are to fulfill the goal of providing every child with at least an adequate education, then we must see a breakthrough in methodology. Computer-assisted instruction is the arrival of education's Industrial Revolution. The present era has been referred to as the Computer Age, so it of course has been inevitable that computers would play an important role in education, just as they have in virtually all other aspects of our lives. There has been no reason to imagine that the schools would somehow be exempt.

Microprocessors and microcomputers. Microprocessors, also popularly called chips, were first developed in 1969. Technically speaking, the terms *microprocessor* and *chip* are not entirely interchangeable. A microprocessor is a type of chip, one that consists of miniaturized computer circuits. But there are other types of chips that are not microprocessors; for example, a chip may contain the circuits for an audio amplifier and have nothing at all to do with computers. The advent of microprocessors led to the development of the microcomputer in 1975. These small and relatively inexpensive desk-top units, also popularly known as home computers or personal computers, provide the technology for doing a lot of tasks for which it had not been economically feasible to use a computer before. One of these tasks is assisting teachers. Many saw microcomputers as a solution in search of a problem, not realizing that education today is confronted by more than its share of problems, some of which can be partially resolved by the appropriate use of this new technology.

Teachers' fears of CAI and computers. Teachers and administrators terrified by the seemingly sudden arrival of CAI could easily become the Luddites of the present CAI revolution, embittered by a change that they feel threatens traditional education as they know it, although traditional modes of instruction are not adequate to the demands of the present society and many of them would be among the first to admit it. Their fears often result from a complete lack of understanding of the CAI revolution, what it is, and what it can and cannot do. It is hoped that this book will help many in this group to resolve their fears of and

hostility toward CAI by giving them at least an introductory knowledge of computers and of the applications of CAI and CMI. This book also deals in considerable detail with the limitations of CAI, in order to help prevent abuse of this new medium. CAI is not a panacea for all of the problems of education. Like any other innovation, it has its areas in which it can be used as a powerful instructional tool. Like any other tool, its misuse or overuse can yield results that provide arguments for those who seek to criticize CAI in its totality. As we shall see, CAI has the potential of taking over the drill-and-practice work that now occupies too much of class time, thereby freeing the teacher to present creative material. At present, CAI cannot teach open-ended or creative material but as we shall see later, there are many ways that we and the student can use the computer to do creative work.

Teachers' acceptance of CAI and computers. The other people this book addresses do not need to be convinced that CAI will become an important part of teaching in the immediate present or near future. They are concerned with acquiring the skills and background to work effectively with CAI. I normally begin my class on computer-assisted language instruction by asking the students why they are taking the course which is not a required course. A common response that I get is that they see CAI as the wave of the future and want to get in on the ground floor. They fear being left behind. Some in-service teachers state that their schools are getting microcomputers and that the principal knows very little about what to do with them or how to use them, so they feel that if they have a background in educational computers, the principal just might ask them to take over direction of the CAI lab and take the problem off his or her hands.

The scope of this book. This book is devoted to an applied approach to establishing computer-assisted language instruction in a school, from determining which educational activities are suitable for CAI (Chapter 2) and locating suitable computer programs for those applications (Chapter 3) to selecting equipment (Chapters 4, 5 and 6). The emphasis on computer programs in terms of their applications (Chapter 2) and their form (Chapter 7) is crucial to implementing CAI effectively. Computer-assisted classroom management (Chapter 8) allows the teacher to computerize many of those record-keeping chores that seem to take so much time. But CMI is much more than merely automating the present record-keeping. It can become a force in its own right that allows the teacher to individualize instruction in a way and to a degree that would not be feasible without the help of the computer, thereby changing the nature of the teaching and learning experience. Chapter 9 takes a look at the future of instructional computing and the impact that computers may have on curriculum, as well as some of the broader implications of computer use in society.

Hardware, software, and courseware. Computers cannot teach, or do anything for that matter, without programs, the sets of instructions that tell them exactly how to do their work. Computer programs are called **software** in order to contrast the program with the **hardware,** which is the machine itself. Additionally, computer software used for instructional purposes is often called **courseware.** Thus, a program that keeps attendance records for the school is software but not courseware, while a program that instructs a student in English or any other subject is not only software but also courseware. At the time that this is written, there is a shortage of software throughout the computer industry, with developments in hardware technology far outrunning software. The shortage of quality software is well known to those who have bought computers for their schools and then have discovered that the specific courseware that they need is simply not available. A large part of Chapter 3 is devoted to sources and techniques for locating courseware.

The four levels of computer literacy for teachers. Learning to use computers as an instructional tool is far easier than most teachers anticipate because there is actually a progression through four levels of educational computing literacy. This does not mean that one must necessarily go through all four levels sequentially, just that the option of doing so is available. The four levels will be treated in considerable detail in Chapter 7, Section 7.3. But for the time being, the four levels can be outlined as follows:

Level 1: The computer-using teacher. A person at this level knows how to locate, evaluate, and use ready-made courseware to supplement his or her classroom teaching.

Level 2: The nonprogramming author of courseware content. A person at this level knows how to write courseware content and knows not only what can and cannot be done in creating courseware but also what should and should not be done. He or she does not do the actual programming of the content as courseware.

Level 3: The user of authoring systems. A person at this level knows not only how to write the courseware content but also how to use special software, called authoring systems, to create his or her own courseware.

Level 4: The teacher-programmer. A person at this level is competent in a suitable programming language, such as BASIC, Pascal, or PILOT, and can design and program his or her own courseware.

The students in my Computers and Language Instruction course are usually teachers of English, English as a Second Language (ESL), or foreign languages, or they are undergraduates preparing to teach in

these subject areas. By the end of this one-semester course, they have reached the fourth level of educational computer literacy and have prepared two courseware lessons as their term projects. The course assumes no background at all in computers or programming, and they learn the BASIC programming language as part of the course. In short, reaching the fourth level of literacy looks much more difficult than it actually is.

A typical language CAI lab. Let's look at a CAI lab in operation. As we enter the lab, we find a group of children sitting at what appear at first glance to be small television sets, but closer inspection shows that attached to the front of each of the units is a keyboard like that of an electric typewriter. These are microcomputers. I shall have a lot to say about these machines in Chapters 4, 5 and 6. Since there is only one child at each computer, we may wonder if the school is being wasteful of the taxpayers' money, but there is a reason. Each child is being tutored individually on a one-to-one basis, and each is being taught a different lesson according to his or her needs. The flexibility of the computer is impressed upon us as we notice a student who is wearing headphones. She has limited English proficiency and does not read her native language although she speaks it at home. Her computer is using an electronically synthesized voice or is operating a tape recorder to speak to her in her native language and instruct her in ESL. The other students, able to read English or their native language, are instructed by text that appears on the television-type screens. A short lesson appears on the screen and remains there until the student pushes a button; it is immediately replaced by the first of the questions. When the student enters a wrong answer, the computer, addressing him by first name, informs him of the fact. Different text appears on the screen, remedial material that explains to him exactly where he went wrong in answering that question, but the remediation is no ready-made response. It refers specifically to the relevant words and affixes of the sentence that the student has just missed so that the abstract principle is explained in terms of the elements of the concrete example. We watch as the student moves through the questions, getting few right. He obviously needs review of the lesson, which he requests by pushing a single button. The lesson appears again on the screen, but this time it uses different example sentences than in the first presentation. He reads it, pushes a button, and is returned to the testing session. Finally, he manages to get the eight in a row right needed to end the lesson and advance to the next lesson. It is unlikely that he would be able to get eight in a row right if he had not mastered the lesson, and teaching for mastery is part of the philosophy of this school. A single printer shared by all the computers begins chattering away, printing out for the student his score and all of the questions that he missed in the session. This is his own individualized homework. The aide running the CAI lab hands him the paper

with his score and homework, and the student returns to his classroom for conventional instruction. Another student takes his place at the computer.

Four types of courseware. We may recognize four types of courseware:

1. Tutorials: courseware that presents a lesson to the student, either initially or as a supplement to regular classroom instruction.
2. Drill-and-practice: courseware that tests the student on the material learned from a tutorial or in regular classroom instruction.
3. Simulations: courseware that allows the student to experience a situation and influence that situation by his or her responses.
4. Games: courseware that incorporates a learning activity into a format that entertains while it teaches.

These four types of courseware will be explained more fully, as follows.

Tutorials and drill-and-practice. The **tutorial** is the type of courseware whose operation was outlined in the description of a visit to a typical CAI lab, and the remainder of this book will concentrate on this type of courseware, as well as on the use of computer-managed instruction. As its name implies, tutorial courseware instructs a student on a one-to-one basis like a tutor, interacting with him or her by presenting facts, skills, or concepts, and then testing the student's grasp of the material. Like a human tutor, such courseware relies heavily on remedial presentations until the student masters the material. Some people distinguish between tutorials and **drill-and-practice** courseware. To them, a tutorial is the courseware that teaches the material initially, while drill-and-practice courseware, as its name implies, gives the student a chance to reinforce material that he or she has learned either in a tutorial or in a conventional classroom presentation. In one sense, drill-and-practice courseware is not all that different from courseware used for **computer-assisted testing.** The main difference is that courseware for computer-assisted testing has provisions for keeping track of the student's score and may or may not have remedial capabilities, while drill-and-practice courseware has functions more like those conventionally handled by a workbook.

The tutoring, drilling, and testing functions are concepts carried into CAI from the conventional teaching situation. But CAI is a new medium and allows new possibilities and combinations that were not previously feasible. For example, as is shown in Section 1.4 in the excerpts from my ESL courseware, the tutoring, drilling, and testing are integrated in one lesson. While courseware for computer-assisted testing may remain a separate category, it is quite likely that the tutorial may include both the initial teaching and the drill-and-practice functions. Tutorials, and drill-and-practice courseware, if one insists on maintain-

ing that distinction, are among the types of courseware that lend themselves well to language-teaching applications.

Simulations. Another type of courseware, the **simulation,** allows a student to learn by doing. Learning in a real-life situation may not be practical or possible because of cost, danger, or the fact that the results of a certain course of action may not be felt for years. The student can gain experience instead through a simulation that eliminates these undesirable factors. Most significantly, simulations telescope time so that the student can "play through" an entire scenario and see the results of certain decisions or actions within one session at the computer. Simulations, widely used in business and the military to forecast the results of making certain choices, can be similarly used in a school situation to teach the process of decision making.

In a simulation, a situation is described to the student, he is assigned a role, and then he is presented with a decision that he would have to make in that role. Once he makes his choice, he is told the results of his decision and given the next choice that he faces. The factors that lead to good or bad results may be explained at each step of the way so that the student can see whether his decisions yielded desirable consequences or not, and why. Simulations allow the student to understand, for example, the factors that make history happen, and in a way and to a degree that would be hard for him to attain by reading history books about what in fact did happen. Because simulations allow him to understand the historical causality behind the chronology that he reads about in conventional history books, simulations lend themselves particularly well to the study of history and social studies. If the results of the simulation session indicate that the student's decisions led to disaster in the role that he assumed, he may, of course, think about his decisions and, in another session, play that role again, making wiser decisions that will hopefully lead to better results.

Because simulations are now used rarely, if at all, in language instruction, the discussion in the preceding paragraph focuses on their application to teaching history and social studies, even though those subject areas fall outside of the scope of this book. Simulations can also be very effective in science teaching. However, this does not imply that the situation must remain unchanged as the art of writing courseware advances. For example, there is the notional-functional approach to teaching ESL. Since this approach is very much concerned with teaching the ESL student how to make appropriate responses to certain questions in particular social and linguistic situations, it seems that simulations could be used to present him with model situations for which he must create or select an appropriate response. Obviously, simulations could be similarly used in foreign language instruction to teach appropriate response in the foreign language for model social and linguistic situations.

Games. The **game** is another type of courseware that may be quite valuable for stimulating students, but games must be selected with great care since they are the most seductive of the four types of courseware that are being considered here. While the objective of game courseware is to make the learning experience enjoyable, it is too easy to lose sight of the educational objectives. A well-thought-out educational game is designed around the course content that is to be taught, and the game aspect, which may be one of the themes popular in arcade games such as Dungeons and Dragons or Space Invaders, is then added. Unfortunately, too often the game theme seems to take primacy.

Word-processing courseware. A very recent application is the use of word-processing software as an aid in teaching composition. Compositions entered into a word processor can be revised with ease, thus overcoming one of the main obstacles that composition teachers face when they try to get their students to revise their compositions. Because word-processing software allows the student to change a word or phrase, or to move an entire sentence or paragraph, all without the necessity of recopying or retyping the entire paper, revision is much less painful for the student. While some schools have had interesting results with regular word-processing software, there are now several word-processing software packages available that were specifically designed for student use in terms of ease of learning the system and ease of using it. The uses of this type of software will be considered much more completely in Chapter 2, Section 2.3.

Software aids for the teacher. There are educational software packages that are designed as aids to the teacher rather than as teaching tools. Hence, they must be considered educational software but not courseware. Among them is **record-keeping** software that acts as an electronic grade book that can average students' grades automatically, as well as maintain updated profiles on each student. Other software does *computer-assisted analysis of texts* in terms of readability formulas such as those of Fry, Bormuth, Sprache, and Dale-Chall. A disk available from the Minnesota Educational Computing Corporation (MECC—see Appendix 1) allows the user to choose among these formulas or to see the scores of all of them for any text. This flexibility is valuable because the utility of some readability formulas depends on the level of the material. Another type of software system—typified by the SOCRATES system, which will be discussed in Chapter 8, Section 8.3—allows the teacher to *store and retrieve exam questions*, thereby creating a bank of questions from previous years that he or she can draw on to assemble new exams. Finally, there is **data-base** software that acts as an electronic filing and retrieval system. One interesting use of the data base as a teaching tool is discussed in Section 8.2. In this application, the students create their own data base consisting of a record of books read by each student. This

creates an annotated bibliography that students can access to locate books that they would like to read.

1.2 Approaching Computers without Fear

Two common fears of computers. There are two common fears that people have when computers are first introduced into their work. The first is that they are about to be computerized out of a job. A person may overcome his shock enough to decide that this is the way things are going to be and that he had better train in computers to prevent himself from becoming technologically obsolete. All well and good, but that raises the second fear: math. Let's consider here the matter of math and its relationship to computer programming, deferring until Chapter 1, Section 1.5, discussion of the unlikelihood of computers ousting teachers from their jobs. After seeing a sample session of a courseware-based language lesson (Section 1.4) and after surveying the applications and limitations of CAI (Chapter 2, Section 2.1), you will better understand the scope of CAI, what it can and cannot do, and you will realize that while complete automation of teaching is highly unlikely, partial automation is inevitable.

Computer users don't need math. It is necessary to distinguish sharply between a computer user and a computer programmer. A user is someone who has attained the first level of educational computer literacy, as outlined earlier. A teacher in this category is familiar with what courseware can do and how to integrate it into his or her teaching, but using something does not require one to understand how it works. A user has only to load the software into the computer and does not have to understand how the software does what it does. For our purposes, teachers at the first three levels of educational computer literacy may be considered users rather than programmers. Even teachers who are using authoring systems (Level 3) are still users rather than programmers because the actual programming is done by the authoring system, of which the teacher is a user, not by the teacher herself.

Courseware programmers need only arithmetic. Those who aspire to the fourth level, that of the courseware programmer, will find that they need only the four basic functions of arithmetic—addition, subtraction, multiplication, and division. The popular belief that one must be a mathematical genius to work with computers arose because mathematical applications were the first uses of computers, but while they were the first, they are today far from the only use. Although the listing of a computer program looks like math to the uninitiated, it isn't math at all. Math is one thing, programming is another; so it is incorrect to equate math ability and programming skills.

You must know a subject to program for it. There is really no such person as the all-purpose programmer. There are people who specialize in programming for accounting, for certain scientific applications, for statistics, or for computer-aided design and computer-aided manufacturing (CAD/CAM). Suddenly transferred to programming for another subject area, our allegedly all-purpose programmer would first have to take time to bone up on the subject before he could even begin to think about how he was going to tackle the task. If you were going to produce CAI software for mathematical applications, you would have to know the math that you wanted your courseware to teach, and how you wanted it taught. But we are considering language courseware, so we assume only a background in language and language instruction, none in math.

Relative difficulty of language and math CAI programming. To a large extent, however, we are jumping into the deep end of the pool by considering language-teaching applications. Math teaching is the shallow end of the CAI pool since mathematical capabilities are built right into the circuits of a computer, but language-teaching capabilities, on the other hand, are not. If you look up the **library functions** in virtually any text on BASIC, you will find that these functions are ready-made procedures for dealing with squares of numbers, cosines, arctangents, and so on. There are no similar ready-made functions for language applications. Thus, in most cases, programming for math CAI is easier than for language courseware. Programming for math CAI is a bit like getting a dog to walk on four legs, which is no trick at all, while programming for language CAI is more like training him to walk on his hind legs. However, since teachers at the first three levels of educational computer literacy are users and not programmers, the relative difficulty of programming is of absolutely no concern to them.

1.3 Computers as Tutors

How CAI differs from other instructional media. Consider a situation in which a teacher trained in educational programming suggests to his principal that the school install a CAI lab. It is easy to imagine a response to the effect that the school already has more than an adequate supply of audiovisual equipment, so why add more? What can CAI do that movies, instructional television, slide projectors, and cassette players cannot? Movies and instructional television are essentially the same type of teaching tool. The same is true of the relationship between cassette recorders and record players. CAI, however, teaches in a qualitatively different manner than any other of the instructional media, and it does so in essentially four different ways. We may outline these four differences as follows: