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**Computer-Assisted Instruction: Enhancements for Language-Learning Applications.**

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UMI
COMPUTER-ASSISTED INSTRUCTION: ENHANCEMENTS FOR LANGUAGE-LEARNING APPLICATIONS

A Dissertation
Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
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Doctor of Philosophy

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The Department of English

by
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ABSTRACT

Presently, computer-assisted instruction is in use in many educational venues. Unfortunately, the application of computer-assisted language learning at a distance has virtually been ignored. This is an opportunity that needs to be explored. In order to do so, a number of considerations must be attended to. First, effective monitor display design is critical for the optimal presentation of distance learning material. Second, gender and equity factors that impact computer use must be understood to minimize the detrimental effects they might have on computer-assisted distance learning. Third, the needs of students involved with the particularly-demanding application of distance learning principles of foreign language learning have to be specially explored.

This dissertation presents ways to improve monitor display design that are based upon current research findings for data display. In addition, suggestions to minimize the negative impact of gender upon computer use are offered based upon contemporary research conducted in a variety of English-speaking countries. Lastly, the use of computers to study foreign languages at a distance is expounded upon, with a special emphasis on the use of computer-mediated communications (CMC) media such as the Internet.

The results of this dissertation research project are clear. First, if students are to take advantage of the distance learning opportunities that computers offer, both software and hardware designers must pay attention to how such variables as color, font choice, and format can help or hamper a student viewing the screen. The presentation of on-screen material has to be carefully considered and skillfully executed. Second, the display of material should also take gender and other equity issues into consideration. For many students using computers to learn foreign languages gender, race, and class considerations can play a significant role. Therefore, software should be designed to avoid sexist stereotypes and to promote user friendliness.
Easy-to-read monitor display screens with non-gender biased software can be extremely helpful for learning languages at a distance. But the full potential of computer-assisted language learning (CALL) is still unrealized. For example, many opportunities in CMC for language practice are not being taken either because of expense or logistic limitations.
CHAPTER 1
INTRODUCTION

Computers have been in use in K-12 schools since the early 1960s. Of course, computers were not found in all schools, but the pioneers of computer education did start their work back then (Finkel, 1991, p. 29). In 1963, computer-integrated instruction was formally initiated by Patrick Suppes at Standford University (DeVillar & Faltis, 1990). Early drill-and-practice computer programs in computer-integrated instruction represented the first efforts by educators and software designers to apply learning theory to computer-delivered instruction. Unfortunately, the behaviorist model that heavily influenced drill-and-practice software was later found to be flawed, which meant that much of the software produced was ineffective or simply boring. As the linguist Chomsky stated, “Language is not a habit structure. Ordinary linguistic behavior characteristically involves innovation, formation of new sentences, and patterns in accordance with rules of great abstractness and intricacy” (Chomsky, 1966, pp. 47-8). Subsequently, the cognitive science model replaced the behaviorist model.

The cognitive science model began to gain respectability during the 1960s. This model posits that learners learn best by actively processing information and by actively constructing their own mental models of processed information, that is, their own knowledge constructs. Computers can potentially engage learners in such highly individualized active information processing and knowledge constructing—for example, in the kind of processing required for language learning.

During the early 1960s a lot of experimentation was done with computer-based language instruction methods. Far-sighted educators of the 1960s envisioned classrooms in which computers would serve as “infinitely patient tutors, scrupulous examiners, and tireless schedulers of instruction” (Dunkel, 1987, p. 250). By the mid-1960s, however, accepted views
of language, language learning, and language teaching were beginning to change. Situational Language teaching (a development of the 1920s Oral Approach) was under fire. The principles of Situational Language teaching—oral practice, grammar, and sentence patterns—were considered outmoded (Richards & Rodgers, 1992, p. 42). A re-thinking of how languages could best be taught occurred contemporaneously with the shift from the behaviorist to the cognitive science model of general learning. Computers using revamped versions of audiolingual methods from the 1940s were initially believed to be able to efficiently teach students foreign languages. Computer-delivered programs using audiolingual techniques had some staunch supporters. They claimed the method transformed teaching from an art to a science and that the computer would help learners achieve mastery of a foreign language effectively. The method was widely adopted for teaching foreign languages in North American colleges and universities (Richards & Rodgers, 1992, pp. 47-8). Practical language-learning results again fell short of expectations, however.

Innovators continued to try to tie computers and the learning process together during the late 1960s, as witnessed by the efforts of both IBM and the Digital Equipment Corporation to enter the education market when several school districts began large computer-assisted instruction projects (Atkinson & Wilson, 1972, pp. 3-5). In fact, computer simulations for instructional purposes were beginning to be used by innovative curriculum developers, and, if one looked hard, one could find computers or computer terminals in some high school classrooms (Venezky & Osin, 1991, p. 1).

In the early 1970s computers were edging their way further into the education field due to technological advancements. That time saw the birth of the microcomputer. The thousands of individual circuit elements necessary to perform the functions of a computer were suddenly manufactured as a single chip (Brown & Mullen, 1991, p. 77). The federal government was
encouraging computer interest in schools at that time in an effort to counteract technological advancements by the Russians. The American desire to stay on an even keel with the Russians in the arms race was being mirrored in the rush to remain equal in the technologic race. Computer literacy was definitely a part of that race.

In the mid-1970s the introduction of the Altair personal computer completely changed how society perceived computers (Long & Long, 1990, p. 531). No longer was the computer only purchasable by large corporations or the military; it was a tool that could be bought and used by everyday people. In response to the newly developing personal computer market, Apple Computer was launched. By 1977 the first affordable personal computers had arrived at the marketplace, sparking an industrial interest in producing CAI (Computer-Assisted Instruction) hardware and software.

By the end of the 1970s microcomputers had hit schools like a storm. Computer prices dropped, and the number of computers in schools increased. ARPANET (Advanced Research Projects Agency), one of the first large computer networks, was developed and clearly showed the possibility of exchanging data quickly and effectively among multiple network users. However, although the advent of the personal computer in the late 1970s brought significant educational changes, personal computers still served merely as interesting curiosities for most people during the late 1970s, and the vast majority in use, even in education, were not networked (Finkel, 1991, p. 22).

The movement of microcomputers into the educational field during the 1980s was rapid. In the early 1980s microcomputers made their public appearance, and the era of the mainframe began its decline. However, it was not until the mid-1980s that there was any widespread acknowledgement that the microcomputer was a genuine learning tool that could impact every area of teaching and learning (Miller, 1988, p. 8). It became clear at the time there were not
sufficient good examples of educational software to fill the demand, and much of what did exist was not very sound pedagogically. Many software programs had been designed by computer programmers who did not have a firm grasp of either education principles or learning theory. Sound pedagogy took a back seat to the limits of programming at the time.

In the later 1980s, hypertext and multimedia provided content-oriented learning environments. Generally speaking, computers were making serious inroads in education and business. Rather than using the computer as an information delivery vehicle, generative learning systems and knowledge-construction environments were designed to form partnerships with learners/users. These environments engaged learners because their active intellectual involvement in the learning process was essential. Some saw computers in the future as functioning as intellectual toolkits for enhancing the mental and perceptual capabilities of humans (Jonassen, 1993, pp. 331-3). By 1987, the momentum toward the electronic classroom had become so swift and so powerful that many second-language educators echoed Teichert's assertion that becoming computer literate and incorporating CAI into the curriculum was a matter of professional survival (Pederson, 1987, p. 99).

Today, in 1998, serious applications of computer-assisted instruction (CAI) are in progress at most universities in the United States. Unfortunately, many students and teachers still use computers only for word processing and for playing games, but now all major journals in, for example, foreign language education devote space to issues related to hardware and software and their use in language learning (Smith, 1987, p. 2). And currently innovative software programs, CD technology, and elaborate local and global networks are providing language teachers and students with new resources to aid in distance language learning. What technologic marvels will be developed for CAI in the future remains to be seen. However, today high expectations and low expertise mark CAI language-learning applications, both in the
classroom and in distance education. The fault does not lie entirely with the technology. Part of the problem can be attributed to a continuing lack of knowledge regarding the learning process in general. Technology can assist in the learning process, but it cannot provide a total theory of learning.

There is presently no widely-accepted, all-encompassing theory of learning today, and such a theory is not likely for a long time. However, research shows that students tend to be predominantly holistic or serialist in their approach to learning. Therefore, matching a teacher's teaching style to a student's learning style can sometimes result in almost a doubling of the student's learning performance. Hence, it is extremely important to understand how students learn in order to produce quality language-learning software for when the computer acts as teacher.

Several models of learning have been proposed and have been used as the basis of CAI. The behaviorist model of learning emphasizes the learner's response to relationships between stimulus events and their associated responses, and does so at the expense of any acknowledgement of the learner's understanding or other mental states. Programmed learning with programmed texts was very much influenced by the behaviorist view of the learning process. The underlying belief of programmed learning/instruction is that a body of knowledge can be reduced to a set of very small steps and that the whole is the sum of the parts. For example, programmed learning applied to grammar study assumes that the grammar of a language can be broken down into a series of structural elements. By being repeatedly drilled on these various structural elements, the student eventually learns the grammar of the language (and, by extension, the language itself). Research on audiolingual methods has shown, however, that operating from such an assumption stems from fallacious reasoning.
In contemporary theories of learning and instruction, learners are no longer seen as persons who simply drill structures or copy knowledge presented to them. They are active agents organizing and constructing knowledge (Polson, Richardson, & Soloway, 1988, p. 110). In one theory of learning known as “constructionism,” for example, learners must relate new knowledge to existing knowledge. Moreover, learning is viewed as a socially-constructed activity. In order to progress, learners must be allowed to cooperate before they can function with total learning independence. Certainly the effects of constructionism are being felt in the field of language learning today. Students are encouraged to view language learning as a social act where meaning is freely negotiated, and communication is more than simply spouting back grammatical structures or vocabulary in parrot-like fashion. Highly interactive software could certainly encourage meaning negotiation. Moreover, computers could act as intelligent and interactive tutors. This is an important consideration, since in the future computers will most likely be the dominant delivery system in education.

Computers can flexibly interact with students either in constructionist or behaviorist fashion, depending on the software. They can also be used to stimulate social activity, either in group work around a single computer or on a computer network to encourage learners, and especially language learners, to apply what they have learned. The ability of the computer to interact quickly in an individualized manner with a user is a special boon for language teaching. Moreover, the computer can monitor a student’s language learning work and provide helpful feedback. Sadly, researchers cannot at present agree upon a single view of the learning process that can be applied wholesale to language teaching. Otherwise, a uniform and optimal material presentation strategy might be possible for application to language learning. Nonetheless, some of the most successful college-level CAI applications have been in the teaching of a foreign or
second language. Such CAI language applications are collectively known as Computer-Assisted Language Learning (CALL). CALL holds much promise for today's language learners.

**Computer-Assisted Language Learning (CALL)**

Part of the reason for the success of college-level CAI in language teaching is that CALL integration of computer-based instruction into the foreign language syllabus design can be rather easily accomplished. Subject matter from traditional classroom materials that are already in use can be incorporated as the content items for the computer-based lessons. An extra benefit is that the contents of the computerized lessons can be closely tailored to meet the particular content needs of individual classes. Thus, computers and properly-selected software can be used as an essential part of a syllabus design that includes both oral and written language experiences.

Unfortunately, neither CAI nor CALL is being fully utilized for teaching problem-solving skills and language processing. Simply having computers in school or in use in distance learning programs does not automatically improve learning. Therefore, students should be taught with computers only if such teaching provides a real advantage over conventional methods. As always, teacher and students have to work as a cooperative unit for effective learning even when computers are involved. CAI and CALL, after all, are instructional tools, not teaching methods, and computers cannot solve all learning problems for the general student or language learner. However, computers can be used as helpful adjuncts in the learning process. For instance, in CAI, computers can be used for group presentation of material, small collaborative teams at one computer, or as an individual resource. Probably the computer's greatest potential for application in language-learning situations specifically lies in its ability to provide a richly supportive interactive language learning environment in which students are helped individually to develop, expand, and refine their expressive and communicative abilities.
in a new language. The computer offers almost limitless possibilities in that regard. With properly chosen software and network connections the student has the world at his or her fingertips for language learning.

**Purpose of this Research**

CAI and CALL research need to continue in order for the process of computer-aided teaching and learning to become more refined, especially in the promising distance-learning context. This dissertation, therefore, provides information on current research that can help in that quest. First, a discussion of effective monitor display design in Chapter 2 offers practical information on how to exhibit text and graphics that might be used for language-learning applications. Second, gender and equity issues that might affect computer use are considered in Chapter 3. If computers are to be used effectively and efficiently for language learning, then sex and class barriers that impede learning by computer must be understood so their negative impact might be lessened. Third, since distance-learning of foreign languages has all but been ignored, Chapter 4 explores the nature of distance learning and offers suggestions on how language learning at a distance might be advantageously pursued using computers and computer-mediated communication.

To effectively display textual information on a computer monitor requires a combination of experience, visual awareness, and attention to the screen reader’s needs. Chapter 2, “Effective Monitor Display Design,” describes some of the factors that affect monitor display design and provides suggestions and insights on how screen displays can be designed more effectively. Research shows that such factors as color, font choice, and point size can affect how readers process textual information displayed on a computer screen (Schwier & Misanchuk, 1993, pp. 240-1, 245, 278). How much information should be displayed at a time and how it should be divided or “chunked,” can be thorny questions. Nonetheless, much is known about how to
“package” information on a display screen to make it more readable as text and hence easier to understand and to retain. Chapter 2 not only discusses the use of color and font and shows how organizational structure can be strengthened using them, but it also promotes other presentational techniques based on semantic and syntactic principles (Holmberg, 1995, pp. 97-8; Davis, 1990, p. 254). The use of generous white space is encouraged, as is the use of line justification in order to assist readers to easily process textual and graphic materials (Schwier & Misanchuk, 1993, p. 222; Favaro, 1986, p. 157). Chapter 2 also outlines general principles to achieve effective monitor displays by use of such techniques as screen harmony and consistency. The importance of giving prompt and understandable feedback on the monitor display is discussed (Nunan, 1991).

Along with the physical display of data, another factor affecting the actual use of computers and data for language learning is the gender and/or social class of the learner. In Chapter 3, "Gender and Equity Issues Affecting Educational Computer Use," gender differences with regard to perceived self-efficacy expectations and attitudes toward computers are shown to represent a very important issue in the area of computer education. Gender issues can affect computer interest, enrollment for courses in college, choice of career, and the use of computers in future work settings.

The problems associated with gender must be addressed in the interest of equitable computer use. Unfortunately, today there is no all-embracing theory that can completely explain or predict computing differences based on gender. But much is known about the role gender can play in computer access and use. Generally speaking, more boys than girls have access to computers both in the classroom and at home, and more male than female students have access to a home computer before they enroll in college (Robertson, Calder, Fung, & O'Shea, 1995). Moreover, sex role identification and software-appeal may help explain...
measured gender differences in computer usage. For instance, boys tend to dominate after-school informal computer use, and men participate in computer-based activities far more than women (Culley, 1988). Also, men usually dominate women in everyday computer usage activities (Busch, 1995, p. 154). The male computer dominance image is typically reinforced by the media (Underwood & Underwood, 1990, p. 146). However, it is in computer-mediated communications where gender differences in computer use become patently obvious. Men dominate the Internet and on-line services. Additionally, there is resistance to women’s acting in technical computing roles or competing with men online (Tamosaitis, 1995, p. 145). This trend of resistance shows few signs of changing. Part of the inertia may be attributed to the fact that many existing computer education programs underserve females. However, through systematic planning, perpetuation of these inequalities can be lessened. Especially in language learning applications—where ideally communication should be bilateral and balanced between students—cooperative learning models must attend to and work with gender (and social class) constraints if they are to lead to successful social harmony and academic achievement for all students. When children do not work collaboratively, their general performance can decline. Girls are particularly affected in a negative way by competitive group situations (Underwood & Underwood, 1990, p. 193).

Usually it is not the nature of computer work that causes problems for girls and women. It is the social organization of that work. The subtle interaction between gender expectations and the dynamics of group work leads to conflicting conclusions on mixed-gender pair efficiency. However, one conclusion is clear: the organization of the group is critically important. Teachers who create mixed-gender groups to work on computers in general and language learning applications in particular should stress cooperation and minimize competition (Underwood & Underwood, 1990, p. ix).
CMC (computer-mediated communication) may provide a way to overcome some of the problems associated with gender and computer use. Since CMC is primarily text-only, its use can lead to a protective ignorance surrounding the user's gender and status (Collins & Berge, 1995, p. 4). Another advantage of virtual anonymity is that it offers hesitant students the opportunity to participate on a network. And participation in CMC is almost limitless in its potential to expose users to new or different cultural values and beliefs. This nearly limitless potential results because the global network is all-inclusive: Physical and geographical boundaries, gender, social class, and other extraneous obstacles to free interaction can be overcome as users work with others in the global network (Baker & Buller, 1995, p. 193).

Thus, CMC can facilitate active participation by all kinds of network users by reducing the typical barriers to communication raised by distance, gender, and social status. But easy access to computers is essential for effective CMC, and particularly where computers are to be used for frequent language learning practice at a distance. In fact, although computer applications have been frequently used in the teaching of second languages in traditional educational settings, foreign language teaching at a distance has all but ignored the potential that this medium holds. Chapter 4, "Language Learning at a Distance via Computer," considers the nature of distance education and its students, and then presents specific ways in which computers and computer-assisted language learning can help remedy some of the extremely serious difficulties faced by distance learners of a second language.

Distance education is the delivery of the educational process to learners who are not in proximity to the person or persons managing or conducting the process (Lewis, Whitaker, & Julian, 1995, p. 14). Many factors differentiate distance education from traditional classroom education or private study. One of the most positive is that distance learners can largely choose what, where, and when they want to learn. Yet, presently, only a small portion of all distance
learning students are studying by means of CMC due to expense or logistic limitations. There are about 10 million students taking degree courses at a distance in the world. At least that many, if not more, use some distance education methods for more traditional modes of study.

Distance learning holds great promise for those living in rural areas or those suffering with disabilities or who are otherwise without easy physical access to campus-based schools. Nonetheless, students may have their effective access to distance learning lessened because of economic considerations such as the costs of computers and Internet services or because of logistic and educational skills constraints. For example, there may be no local Internet service provider in the area or a student may lack computer user skills. In general, on-line teaching courses may be most adaptable to advanced-level courses where students are experienced and are more likely to come with better-developed study and computer skills (Brande, 1993, p. 14).

From an administrative angle, the rapid grading of assignments in general can raise completion rates in distance education courses and can therefore help with student retention (Cookson, 1990, p. 200). Since distance education is generally directed to the adult population and since adults normally have a high number of potential distractions from their studies, student retention is an important issue. It is important, therefore, for distance-teaching organizations to find ways to offer tutoring and counseling services (Holmberg, 1995, p. 128).

For distance learning to be successful it is also critical to provide clear deadlines for coursework to the distance learners (Eastmond & Ziegahn, 1995, p. 66). Teachers must closely monitor progress to help students working alone or in distant groups to stay on schedule. Tutors could also be helpful in that regard. Otherwise, students' problems might cause them to quit their coursework if they feel overwhelmed or if they lose interest in their studies. Since motivation is what seems, more than any other factor, to bring success in distance education, teachers and tutors should check frequently with students and provide support and
encouragement (Cookson, 1990, p. 116). Such checking may help prevent students from feeling they are isolated with their computers. Electronic messages sent by teachers and tutors to students could certainly diminish any feelings of isolation students might be experiencing.

Computers are increasingly being used for distance learning either by themselves, networked to other computers, or controlling sophisticated multimedia workstations. They are proving excellent for application in foreign-language teaching at a distance—an old idea now with a cyber twist. The first real correspondence-course institution was the Toussaint and Langenscheidt Institute, founded in Berlin in 1856 to teach languages (Brande, 1993, p. 65). Interactive text, images, animation and voice are now conveniently available thanks to computers and software. With an Internet connection, students also have access to the World Wide Web. That access opens the door to a rich array of language-learning resources, such as printed material, audio, and video. For students who would prefer organized study, on-line schools have been around for about a decade (Stucky, 1995, p. 76). Their success hinges partially on the appeal of their courses’ databases. Any database learning program must be put together carefully and thoughtfully. A reasonable, well laid-out syllabus is critical for student success (Eastmond & Ziegahn, 1995, p. 66).

Limited computer literacy or access could especially hamper the free-flowing exchange of communication that is essential for language learning at a distance (Hiltz, 1994, p. 12). On-line language practice, restricted by such constraints, would have its fluidity and effectiveness weakened significantly.

Making the language-learning situation as comfortable and familiar as possible can aid in keeping students interested in and motivated by their studies. Also, students must receive feedback and must self-monitor for personal control over the learning process (Stevens, 1995, p. 2). Since all the functions of a traditional classroom teaching situation except for the actual
physical contact may be simulated by way of computer and/or telecommunication technologies, the distance learner can most assuredly learn a language at a distance via computer (Brande, 1993, p.14). Using networked computers and the resources of the World Wide Web, language learners can have access to rich audio and visual resources. Furthermore, opportunities to practice the target language exist in the forms of e-mail and discussion groups.

References


CHAPTER 2
EFFECTIVE MONITOR DISPLAY DESIGN ¹

Introduction

Those designers who are able to express their ideas clearly and efficiently on a computer screen will be most successful at gaining an audience for their thoughts. Typically, information users will scan for visuals that communicate ideas with a minimum of time invested (Nanny, 1990, p. 88). Unfortunately, the cues for idea transfer that are typically present in interpersonal communication are not present in communication between a person and a computer. A message displayed on a computer screen simply does not contain the same information as the identical message presented in a classroom or in a face-to-face encounter (Steinberg, 1991a, p. 1). However, it is reasonable to expect that screens that are pleasant to look at may contribute in a cumulative series of small ways to the efficacy of learning and communication (Schwier & Misanchuk, 1993, p. 210). Moreover, such factors as color, font choice, organization and structure of material, and common-sense presentation principles can play a decided role in the overall effectiveness of screen design for a variety of uses and users.

Color

While color is available in printed materials, it is usually expensive to print and is normally reserved for special purposes. Color, however, is widely available for computer monitors. Although it has been shown that color improves performance under limited conditions, its full potential for monitor screen utilization has not yet been explored. But even if color does not affect performance, its presence is pleasant and may make learning more enjoyable.

Extrapolating from considerable evidence from research on print material, the use of color on screen is likely to make a difference only when its use is truly salient. It seems unlikely to

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have a powerful effect when applied solely to text (Schwier & Misanchuk, 1993, p. 243). In fact, all colors facilitate recognition equally, while both realistic and non-realistic color materials are superior to monochrome materials for cueing. However for recall tasks, realistic color is superior to both monochrome pictures and line drawings. Non-realistic color is least effective, and may inhibit encoding (Schwier & Misanchuk, 1993, p. 245).

One use of color could be to anchor a grammatical point. For example, in German there are three different genders which might be gender (color) anchored: masculine (blue), feminine (pink), and neuter (green)). This form of anchoring (working with colors) would naturally appeal to the right hemisphere of the brain (Hager, 1994, p. 12). In general, color may serve several purposes:

   To enhance the “personalities” of the different functional areas of a computer screen;

   To distinguish between different types of screen information;

   To establish a link between related pieces of information;

   To highlight important or critical messages; and

   To aid in the comprehension of complex displays (Venezky & Osin, 1991, p. 222).

For whatever color application, a norm whose validity is clear from a physical standpoint is the avoidance of the combination of red and blue. These colors are on the two extremes of the visible spectrum and require different focusing. To minimize eyestrain, do not use red-blue combinations, if possible (Venezky & Osin, 1991, p. 223).

A word of warning regarding color usage: Since cultural associations for colors may be markedly different, it is prudent to choose screen colors and designs only after doing research with that critical consideration in mind. For example, in the United States, the bride is normally dressed in white; in Spain, black is the accepted color, traditionally a color of mourning in the United States.
Font Choices

Fonts used on computer screens should routinely have lowercase letters and true descenders, as well as variable character widths (proportional spacing). Furthermore, the use of upper- and lower-case letters, rather than all upper-case letters, will promote legibility for printed text, as will using serif fonts rather than sans-serif fonts (Schwier & Misanchuk, 1993, pp. 240-241).

Although most readers are able to comprehend a wide variety of typefaces with equal ease and rapidity, they exhibit strong preferences for fonts with serifs (Schwier & Misanchuk, 1993, p. 277).

Aesthetics suggests that in most cases no more than two different fonts should appear on a single-screen display. If more distinction is required, style variations (e.g., bold, italic) may be used to easily create differentiation (Schwier & Misanchuk, 1993, p. 241).

Regarding user font choices, the Times and Helvetica fonts are generally least preferred. Courier is in the middle, while Bookman and New Century Schoolbook are most preferred. Certainly providing text that users find pleasant to look at may have a positive transfer to learning and communication. Even though the effects may be small, several such effects may cumulate (Schwier & Misanchuk, 1993, p. 277). With all the possible fonts now available, screen designers need to give serious thought to font selection. In general, readers prefer text with

- a serif,
- a heavy stroke (bordering on boldface),
- clearly distinguishing characters between letters,
- substantial width to the letters (Schwier & Misanchuk, 1993, p. 277).

In general, good writing style dictates that the use of unusual type styles (e.g., italic, bold, reverse, shadowed text, etc.) be strictly limited (Schwier & Misanchuk, 1993, p. 241). The
same approach should be applied to computer screens. For example, the use of bold type for emphasis and cueing on screen may be useful, provided that it is not used too frequently. The reason is simple. To act effectively as a cue, a stimulus must be unusual. If a stimulus is overused, it will lose effectiveness as a cue. Similarly a stimulus that is inappropriate or confusing should be avoided. For instance, underlining text, on paper, indicated to a typesetter that the text was to be set in italic. Since most computers usually provide italic fonts, and since underlining can make the following line of text difficult to read, italic or boldface should be used instead of underlining (Schwier & Misanchuk, 1993, p. 242).

Size is also an important consideration when using fonts. Typefaces larger than 12-point should be reserved for standard use as headings and titles. The most reasonable choices for body use appear to be 10- or 11-point (Schwier & Misanchuk, 1993, p. 278). One might think that large, widely spaced characters would be read more easily. Research shows the opposite. Reading smaller, more densely packed characters apparently requires less ocular (and presumably less cognitive) work. Readers expend more fixations on large characters, but they do not achieve any greater comprehension of the text in doing so. Thus, large characters require more screen space and more time to be read, but with no measurable gain in reading (Schwier & Misanchuk, 1993, p. 240). As a result, they should only be used sparingly as attention-getters. Optimal legibility is achieved with text that is 9-12 points in size (a point is equal to about 1/72 inch). However, as a consequence of the way in which type is measured, not all type of a given size is actually the same height (Schwier & Misanchuk, 1993, p. 277).

**Organizational Structure**

Effective communication through print is partially a matter of capitalizing upon readers’ expectations. One such reader expectation is that screen displays have a structure. There are many simple graphic devices that can be used to impose structure. Examples include the
indenting paragraphs or numbering them to make a screen display's structure explicit; using bullets to mark important points; and drawing attention to certain components of the screen text by using larger type, bold type or a different font; using horizontal or vertical rules and shading; and using the margin for comments or special symbols (Lockwood, 1994, p. 169).

Obviously, structural and logical divisions of the text into reasonably short paragraphs along with the generous spacing of chapters, sections, and paragraphs, can considerably help a computer-user read a monitor. Clearly, a number of headlines and sub-heads are valuable not only in facilitating legibility but also in structuring the contents, as noted above (Holmberg, 1995, pp. 97-98).

It should not be surprising to find that text which is logically organized is recalled better by students than text that is poorly organized. In general, poor reading-comprehenders organize their recall protocols in a list format—a collection of non-related descriptions about a topic—while good comprehenders organize their recall of expository text using its inherent logical relationships (Donaldson, 1990, p. 3). Thus, the extension of reading comprehension to screen use is plain. The better screen text is organized, the more likely it will be easy to read and to recall. The message is simple. Make it easy on the screen reader by providing structural help.

Inform the reader of the organizational structure of the screen text, using devices such as headings, titles, abstracts, hierarchies, summaries, and tables of contents (Davis, 1990, p. 254). For example, headings are valuable devices for communicating the structure of the subject matter, but only for learners older than about 13 years (Schwier & Misanchuk, 1993, p. 125). As always, how to structure screen information must be based on the audience that will read the screen. Helpful guidelines for “audience appropriateness,” the extent to which the text matches
the reader's knowledge both of the content and of discourse features, are essential. Several useful guidelines are provided by the following suggestions:

1. Technical terms or other difficult vocabulary should be introduced only if learning their meaning is an intrinsic part of learning the context. When such vocabulary is required, clear definitions should be provided or should be accessible.

2. Analogies, metaphors, and other types of figurative language should be used only if their referents are well known by the reader (Davis, 1990, p. 246).

Certainly the age and experience of the audience are powerful factors in determining vocabulary and referent choices. Another factor is the amount of information to be displayed on the screen. The amount of information on a computer display screen varies, but is usually not more than 24 lines, with a range of 40 to 80 characters per line. As a comparison with screen displays, page capacity in books varies upward from about 40-54 lines with 60 to 75 characters per line (Steinberg, 1991a, p. 154). Unlike book text, computer text should be delivered onto the screen at a minimum of a paragraph at a time. Normally, screen text should not be delivered a sentence or a line at a time (Schwier & Misanchuk, 1993, p. 255).

Regarding computer screens, paging refers to presentation of text in blocks. When the reader finishes a "page"—a screen—the next page is presented. It should be possible for the reader to easily page back and forth. Intuitively, the best situation is to read long pages with many lines (as opposed to short pages with just a few lines), but the number of lines presented in a window may be reduced to four without affecting reading speed (compared with 20-line pages). With less than four lines, normally reading speed diminishes. On the opposite extreme, for some unexplained reason, students do not read the display if the entire screen is filled with text...strange, since they normally read books in which entire pages are filled with text. Students have different expectations for screen reading loads (Steinberg, 1991b, pp. 52-53).
Students may also instinctively know that reading too much material at once on a screen may cause eyestrain. They compensate by either not reading the complete screen or by only quickly scanning the screen. Such techniques minimize eyestrain.

For screen reading, readers can page or they can scroll. In scrolling, the text is presented without page boundaries. In other words, the text is organized as a long sequence of lines. In general, users prefer paging to scrolling. Another method of text presentation is Rapid Serial Visual Presentation (RSVP).

In Rapid Serial Visual Presentation text is presented a few words at a time in a fixed space, each chunk replacing its predecessor. Some reading applications may effectively use RSVP. Indeed, very unorthodox text presentation methods may succeed in specific applications, even if they go against intuition (Venezky & Osin, 1991, p. 219). For example, one need only look at web page designs to see both good and bad moving-text displays in 1960s-style Las Vegas blinking lights: flashing messages darting across the screen, spinning logos, etc.

Another way to organize and to present text is based on syntax. Syntactic structure that conveys the ideas at hand and effectively relates "new" information to prior knowledge, i.e. "old" information, is but one of several ways of utilizing syntax. In one experiment, college students who read text that used simpler syntax recalled more information, read faster and used less cognitive capacity than those who read text with more complex syntax. It is also important to note that "new" information that was placed at the end of sentences added to recall and reading speed (Davis, 1990, p. 247).

In addition to syntactic clues, semantic features can be used to structure and to organize material. In "chunking," one line is used for each "chunk," or meaningful unit of information, in designing text layout. A line length of 50-70 characters is easiest for the eye to scan (Davis, 1990, p. 250). "Segmentation"—dividing text into "meaningful components"—can also help
readers. Segmented text can result in reader response times that are 14%-18% faster than those for normally presented text. Moreover, segmentation helps poor readers’ performance, and aids low-ability learners (Schwier & Misanchuk, 1993, p. 223). Obviously, segmentation and the use of segmented text should be important concerns for educational program designers and software engineers.

No matter how material is presented—segmented, highlighted, etc.—a user should be able to easily access material at any point from a screen within an instructional unit. He or she should be able to return to the screen location desired without having to restart the entire unit of instruction. Going through display after display of instruction to where he/she finally wants to return is simply too inefficient and frustrating a way to navigate (Steinberg, 1991b, p. 118). Navigating screens should be easy and should allow users a level of individuality. For example, users should not be constrained to follow the same instructional path, plodding through screen after screen in robot-like fashion (Venezky & Osin, 1991, p. 109).

**Space Outline**

Several studies have shown that double-spaced text is either preferred to or more effective than single-spaced text for computer screen displays. Moreover, the International Reading Association has recommended that screen text be double-spaced (Schwier & Misanchuk, 1993, p. 243). Double spacing for reading ease is important. However, spacing considerations should go beyond the simple use of double spacing—for example, the use of “white space.”

“White space” refers to space (on a printed page or on a computer screen) that is not devoted to text or graphics. It should not merely be a leftover, something that remains when the text and graphics have been placed. It can and should be used as a tool for achieving certain ends. Effective use of white space can bring together or separate ideas, create a sense of lightness to the screen display by making it less overpowering and crammed with information, and illustrate
relationships through the use of space. The proper use of white space can improve readability. It can also make text more pleasant to view and easier to recall.

Blank or white space on computer screens is “free.” Unlike paper-based media, the presence of large amounts of blank space on a computer monitor does not increase printing and reproduction costs. Information that should be logically separated for practical, conceptual, or aesthetic reasons can easily be presented on two different displays. It is not more expensive to use two displays than it is to use one (Schwier & Misanchuk, 1993, p. 222).

On a display itself, there is no reason to cram in as much text as possible. Text should be easy to read and pleasant to look at. Moreover, matching the approach and the display to the material to be covered is critical. For instance, people read computer display screens more slowly than printed pages. Therefore, instruction that involves extended bodies of text is not usually appropriate for computer-presented instruction. (Steinberg, 1991b, p. 10). In general, displays jam-packed with text are to be avoided. However, display text with well-thought-out and effectively-used white space should be encouraged. Well-laid-out text with effective white space can border on being a diagram (Schwier & Misanchuk, 1993, p. 222). Text justification is yet another way to effectively and aesthetically present legible text while utilizing white space to avoid (over)crowding a screen.

Right justification means that all of the text on the screen ends at exactly the same place on the right side of the display. Right-justified text is often cleaner in appearance than non-right-justified text because all the ends of lines on the right-hand side of the page are even. Studies in readability indicate that the average reader can read right-justified text more quickly and is more likely to remember its contents (Favaro, 1986, p. 157). However, not all researchers agree on the benefits of right-justification. Some believe that right-justified text probably has a negative effect on legibility (Schwier & Misanchuk, 1993, p. 279). One way to solve the right
(or for that matter left) justification question might be to allow the screen viewer the option of selecting how the text is to be justified. In fact, the reader should be able to “adjust” screen design to his or her needs and desires in any number of ways, not only to satisfy idiosyncratic quirks, but to “correct” screen design weaknesses. For example, a screen design that may be eye-appealing on a large monitor may be ugly, cropped, or distorted on a smaller monitor screen. The monitor-user/reader should have options to adjust the screen display accordingly. Fine-tuning options aside, here are general principles to consider when designing screen displays.

General Principles

Screen design should aim for balance. Balance in screen design evokes a feeling of stability. Text and graphics will not look like they are about to slide off the screen. Moreover, the screen will not look like it is going to tip over to one side (Schwier & Misanchuk, 1993, p. 210).

Along with screen balance, screen harmony is important.

Screen harmony is achieved in large part by consistency and by repetition. Using similar text fonts, or colors, within a screen display and across successive screen displays will create a sense of harmony, and so will using a consistent graphic style (Schwier & Misanchuk, 1993, p. 210). But consistency should not lead to boredom.

Simply changing the visual stimuli can attract attention and stifle boredom, and may also result in improved learning of instructional screen material. Using various cueing techniques such as highlighting, color, underscoring, repetition, arrows, or spots on text and visuals can also direct attention (Knirk & Gustafon, 1986, p. 123). To be truly effective, cueing devices should be consistent. Another way to direct and to maintain attention is through screen unity. “Screen unity” refers to the singularity and wholeness of the on-screen display. A screen display should definitely look as though all the elements forming it belong together (Schwier &
Misanchuk, 1993, p. 221). Otherwise, the sense of screen cohesion and unity will be lost. The ease of readability will also be diminished.

Here are other ideas for improving screen presentations:

1. Keep the instruction at a language level compatible with the intended audience.
2. Avoid jargon and unnecessary scholarly language.
3. Present ideas succinctly; keep the text lean.
5. Avoid compound constructions.
6. Use "point form" (for example, bulleted lists) when possible.
7. Use the active, rather than the passive, voice.
8. Stay away from negative statements.
9. Use informal language. Write the way you would speak to a learner. Contractions and abbreviations are OK.
10. Use personal pronouns: Call yourself "I" and call the learner "you."
11. Use lots of relevant examples and examples that learners will find familiar.
12. Use inclusive (i.e., non-sexist, non-racist) language (Schwier & Misanchuk, 1993, p. 214).

Furthermore, to impose minimal memory load and to make the display reader's job easier, the screen designer needs to write plainly in displays:

1. Cut out surplus words.
2. Use short familiar words.
3. Use precise words.
4. Use strong, active verbs.
5. Write short, simple sentences (Holmberg, 1995, p. 91).
To make effective displays, add to the suggestions presented above one of the most fundamental dictates of good screen design. That dictate is consistency—consistency in:

- level of discourse and style of presentation from one screen sequence to another;
- placement of various items (e.g., orientation information, navigation devices, student input, feedback, operating instructions);
- use of color (including "grays" and white space in black-and-white presentations);
- access structure (e.g., use of headings and sub-headings);
- use of cues (font, including size and style; bolding, italics, and color);
- style of graphics;
- screen density and white space; and
- terminology (directions, prompts, menus, and help screens) (Schwier & Misanchuk, 1993, p. 213).

Along with the above suggestions, the following ground rules are also important for the preparation of interesting and effective instructional screen display presentations:

1. Avoid verbosity.
2. Elicit responses relevant and appropriate to the screen's instructional content.
3. Use a variety of responses.
4. Use constructed responses to give users practice in formulating their own answers.
5. Offer a variety of explanations.
6. Use appropriate graphics to facilitate learning as well as to add interest.
7. Utilize experiences of urban city users to create interest.
8. Require active participation of the user to demonstrate understanding of the material.
9. Provide immediate feedback reinforcement, either acceptance of the correct answer or immediate correction of a misunderstanding.

10. Incorporate a series of pretest displays to help users determine whether they are adequately prepared for instructional units. Test screen displays should be comprehensive, to test competencies thoroughly (Charp, 1972, p. 243).

When using instructional screens, learners should be weaned from prompts as their facility with new knowledge or skills increases. To further aid the learner, feedback should identify the successful and unsuccessful features of the interaction and describe why incorrect responses or omissions are insufficient. With this in mind, instructional display screens should:

- gain and maintain interest (attention);
- be directly related to the content and larger instructional content (relevance);
- provide a challenging but comfortable level of difficulty with ample instructional support (confidence);
- reward successful performance (satisfaction) (Schwier & Misanchuk, 1993, pp. 181-185).

To ensure the display material is easily conveyed, a high level of redundancy can be used. Highly redundant screens convey their meaning more successfully than those low in redundancy (Holmberg, 1995, p. 93). Of course, the redundancy level should not be so high as to bore the user. One way to avoid losing the user’s attention is to make the displays seem interpersonal and interactive.

To emulate interpersonal interaction, displays should have the following characteristics:

- immediacy of response;
- non-sequential access of information;
- adaptability;
feedback;

options;

bi-directional communications;

interruptability (Schwier & Misanchuk, 1993, pp. 175-6);

user-controlled pacing (Steinberg, 1991a, p. 154); and

cohere or organization, a climate of fairness, and the ability to motivate (Toombs, 1990, p. 381).

Like instruction, questions displayed on a monitor should be explicit, understandable, as brief as possible, and simply stated. Good questions should be stated so that they test a learner's knowledge of the subject matter, not an ability to interpret the questions. Furthermore, the vocabulary used in questions should be within the comprehension range of the intended users (Steinberg, 1991a, p. 106). Confusing the user with difficult vocabulary defeats the purpose of asking questions. The main purpose of any question should be to elicit quality feedback that can be used for remediation. Clearly, early correction of learner errors in the beginning stages of instruction is not only desirable but also absolutely crucial to attaining high levels of proficiency. Inattention to accuracy encourages and rewards communication at the expense of form and, in some instances, "fossilizes" the learner at a low level of proficiency (Curtin & Shinall, 1987, p. 261).

Designing feedback screens is a tricky business. Sometimes students purposely give wrong answers, just to see what will happen. If the feedback is particularly interesting or motivating, they continue to willingly give wrong answers. In one computer-assisted instruction program the feedback for an incorrect response was a screen display of a child with tears running down its face. This display so fascinated students that they continually entered incorrect responses to see the display (Steinberg, 1991a, p. 124). The lesson to be learned from the child-with-tears...
display about captivating feedback is simple. Straightforward messages probably form the most useful and appreciated feedback. Inappropriately visually enticing displays may draw attention away from instruction. Furthermore, displays with flowery or overly enthusiastic statements can begin to wear thin on learners after a while (Schwier & Misanchuk, 1993, p. 229).

To be effective, feedback displays should be clear, direct, and virtually instantaneous. If feedback must be delayed, that fact should be indicated to the learner (Schwier & Misanchuk, 1993, p. 230). Along with speed and directness, feedback should have an emotionally neutral tone. One excellent advantage of screen-given feedback is that the absence of a peer-group audience permits students to take risks, make mistakes, and try again to a much greater extent than they might be willing to do in ‘public’ classrooms (Wyatt, 1984, p. 16).

In order to produce appropriate screen displays for feedback and instruction, a screen designer should be consciously aware of the values and attitudes inherent in the materials (Nunan, 1991, p. 209). For example, a vast amount of computer screen material currently being produced is almost obscene in its use of violence with things being killed, destroyed, eaten, or hanged (Bork, 1985, p. 98). Such violence may be tolerantly condoned in adventure games, but its use in general or instructional displays is questionable.

Conclusion

There simply is no general theory for directing the effective use of sophisticated graphics techniques in human interfaces (Miller, 1988, p. 162). However, it is known that the readability of material is promoted by putting relatively little text and few graphics on the screen at one time, by using much blank space, by time delays before and after critical pieces of text, by arranging text in short sentences, by providing user control over how the text is presented, and in many other ways (Bork, 1985, p. 99).
A cardinal principle of good screen design is to impose a minimal memory load on the learner, especially while he or she works screens in an interactive multimedia environment. That is, while it may be reasonable to expect the learner to remember the content being learned, he or she should not have to remember very much about how to operate the system delivering the content or how to manipulate between screens (Schwier & Misanchuk, 1993, p. 225).

When designing instructional screen displays, it is important to keep in mind that the screen design should be able to do several things. The screen design should gain the reader’s attention, inform the user of the objective, present the material to be learned, then elicit performance and give feedback that will lead to an enhancement of the user’s skills (Berge & Collins, 1995, p. 7).

All things considered, to design effective displays and to promote screen readability/appeal there are two golden rules the designer should always keep in mind:

1. Maintain consistency.


References


CHAPTER 3
GENDER AND EQUITY ISSUES AFFECTING EDUCATIONAL COMPUTER USE

Much has been written about the potential of the computer to provide new environments in which children can be educated (Culley, 1993; Scrimshaw, 1993). Gender differences with regard to perceived self-efficacy expectations and general attitudes toward computers represent a very important issue in the area of computer education. Gender issues can affect computer interest, enrollment for courses in college, choice of career, and the use of computers in future work settings. Thus, enthusiasm for the use of computers in the classroom is being tempered by a growing awareness that the social and educational effects of computer technology could be potentially divisive (Olson, 1988). Educators and psychologists alike are becoming increasingly concerned that the use of computer technology in schools could serve to amplify pre-existing patterns of social inequality (Littleton, Light, Barnes, Messer, & Joiner, 1993). This chapter considers issues of equality of opportunity and access for computer users, including those of low socio-economic status and ethnic minorities. It suggests ways to promote equitable computer use.

Learning Theory

To better understand how gender and equity issues impact learning and teaching with computers, a brief look at some features of relevant learning theories will be helpful.

Traditional learning theory does not have particular assumptions about the differences between boys and girls. It ignores such differences. The “normal” pupil is considered to be a boy (Walkerdine, 1984), white, and middle-class. He is an empty vessel waiting for the teacher to pour knowledge into. This view, based on biased assumptions, changed during the 1970s and

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1980s. Under the “constructivist” label, students were seen as active constructors of their own worldview. To be useful to student learning, new information had to be linked to the knowledge structures already in long-term memory. The implication of this approach is that learning will differ across individuals. Thus a teacher should strive to understand the individual student’s ways of processing and linking information in learning situations. Such factors as gender and ethnic background have to be considered, since they may significantly affect the ways students learn. Howard Gardner, a leading expert on learning and intelligence, would agree.

Gardner argues that students possess multiple intelligences. They learn, remember and understand in different ways (Gardner, 1991). Some prefer a primarily linguistic approach. Others have a quantitative approach. Some perform best when manipulating symbols, while others function best when they perform at a practical level. Gardner maintains that these differences challenge existing educational systems. In essence it is mistaken to assume that everyone—regardless of gender, ethnic background, socio-economic class, and so on—can and should learn the same materials in exactly the same way. Therefore, such factors as childhood socialization and attitudes to computers should be considered because they affect how students learn on and with computers.

**Childhood Socialization**

Early socialization processes are central for children to learn their social and gender roles. The formation of social and gender identity leads to various emotional, cognitive and psychological differences. John Head argues in *Gender Identity and Cognitive Style* that similarities in early socialization processes occur across cultures (Head, 1996). These early socialization processes affect both pupils’ cognitive and learning styles. There are clear gender differences in a number of areas. Head’s research indicates some intriguing gender findings. His work should provide interesting insights for both educators and software designers working with gender issues.
Head’s research shows many gender differences. Some of them are the following:

1. Males tend to extract information from context. Females tend to pay attention to context in a study or problem.
2. In problem solving, males tend to take analytical rule-based approaches. Females tend to take a holistic approach and emphasize empathy.
3. Males tend to be more hasty, impulsive and willing to take risks. Females exercise more care and deliberation.
4. Males tend to attribute success to their own efforts and failure to external factors. Females show the reverse: Their perception of personal failure may inhibit subsequent performance.
5. Interactions among males are marked by competition. Females appear to prefer to work in cooperation.

Head’s research implies that boys and girls are likely to prefer different learning approaches and procedures when dealing with computers. Therefore, teachers should be flexible in their choice of teaching methods (Gipps, 1996, pp. 5-6). This flexibility should include the knowledge that the ethnic background of a student can also affect the way he or she is used to learning. Chinese students, for example, may expect the teacher to mainly lecture and not spend much time in general classroom discussion; the teacher is the giver of information. The opinions of other students are not so highly valued. A Chinese student might, therefore, have difficulty operating in a Western classroom where current theories of learning hold that the responsibility for learning rests with students and teachers. Students are expected to engage in dialogue with each other, and with teachers, and to validate their own understandings rather than merely accept transmitted views (Murphy, 1996, p. 15).
No matter which learning approaches students prefer due to learning style, taste, or ethnic background, their attitude toward learning in general and to computers in particular will affect how and what they learn. Therefore, students’ attitudes toward learning and toward computers must be understood and must be contended with in order to maximize learning.

Attitudes to Computers

Research from a variety of English-speaking countries (the United States, Great Britain, and Australia) indicates the impact of gender upon a user’s attitude towards computers. In general, male and female students differ in terms of their expressed enthusiasm for, and participation in, computer-related activities (Littleton et al., 1993). Data for the entire age range of compulsory schooling reveal that girls are often less positive about computer-use than boys (Todman & Dick, 1993). In fact, girls often report more negative feelings concerning their own personal involvement with computers than boys do (Chen, 1986). Moreover, girls’ responses to computers are more polarized than those of boys (Culley, 1993). For example, a survey of attitudes to computers conducted in Australian schools revealed many more girls than boys ardently disliked computers (Hattie & Fitzgerald, 1988). There are several reasons to explain the difference in attitudes.

Boys and girls tend to see the use of the computer as somehow more “appropriate” for boys than girls (Wilder, Mackie, & Cooper, 1985). In some schools the computer is regarded as a “machine for boys” and even where girls and boys express equally positive attitudes, both believe that boys like and use computers more than girls do (Hughes, Brackenridge, & Macleod, 1987). Another reason for higher computer preference and usage by boys rather than by girls is that computers have possibly come to stand for “a world without emotion,” an image that seems to scare off girls more than boys (Kantrowitz, 1994, p. 51). Whatever the reasons, there is some evidence to suggest that percentage-wise more boys than girls actually report
liking computers (Wilder et al., 1985). However, such gender differences in computer appreciation merely scratch the surface. There are many other gender differences involving computers that should be considered.

In most United Kingdom secondary schools fewer girls than boys participate in optional computing activities such as computer clubs, where girls are less than 10% of regular membership (Culley, 1988). Possibly, the girls could be simply being bullied out of the clubs because of boys' monopolization of the computers. In the United States, during free time after school, informal computer use is dominated by boys (Malcom, 1988, p. 220). But there are other telltale signs of the imbalance in computer interest and participation by boys and girls—for instance, the relative number of girls and boys taking public examinations in computer studies and computer science.

In the United Kingdom there is a very marked gender bias in the numbers of girls and boys being tested in these subjects (Culley, 1993), and the gap appears to be increasing. Over time the proportion of girls studying computer science has declined (Buckley & Smith, 1991), and applications by girls to study computer science at the university level dropped by 50% between 1978 and 1988, as did acceptances (Hoyles, 1988). Apparently, females—definitely unlike males—perceive computers as having a smaller part to play in their future lives and career aspirations (Culley, 1993).

The problem of low levels of female participation in computer-related activities is, therefore, not restricted to children of secondary school age. For example, Straker cites a report on computer use in the British primary curriculum that concludes "... there are increasing signs that computers are being used more by boys and male teachers than by girls and female teachers. Primary schools may need to take positive steps to ensure that both sexes have equal
opportunities…” (Straker, 1989, p. 230). Unfortunately, equal opportunity may not generate equal interest. This is a sad but true fact of life.

Boys and girls appear equally interested in computers until about the fifth grade. At that point, boys’ use rises significantly and girls’ use drops, most probably because sex-role identification kicks in (Kantrowitz, 1994, p. 51). It could also be the case that at the fifth-grade level the software available appeals more to boys than to girls. For instance, adventure games that involve lots of action, shooting, and explosions might be more interesting to boys than to girls. The nature of the software and the goals in the computer games are key influences in this gender separation. Girls are likely to see the material as typically “masculine,” even sexist, relying on activities and content that boys are more familiar with: fighting, using weapons, and so on.

The boyish enthusiasm for adventure games may account for boys having a far greater willingness to try a novel problem or a new piece of software. Teachers should be mindful of such behavior by their students to better understand and reduce possible gender-based bias in computer use. Thus, teachers have to discover ways of helping students “find, create, and negotiate their meanings” (Lerman, 1993, p. 93). This effort involves providing activities and opportunities that are meaningful from the students’ perspective and which allow them to apply and to develop their understandings in explicit relation to others. Otherwise, the increasing use of computers in schools could place girls at a serious disadvantage relative to boys (Evans & Hall, 1988), especially in mixed-group learning situations.

The Challenges of Mixed-Group Learning

Certain types of groups can promote educational progress. These are groups based upon cooperative principles in which learners become personally responsible for aiding each other’s learning. These types of cooperative groups are especially beneficial to girls, since competitive
groups tend more to inhibit their participation, their attitudes, and their education (Underwood & Geoffrey, 1990, p. 193). Clearly, educators and software designers should bear the importance of cooperative group work in mind when planning activities for students.

When children do not work collaboratively, their general performance can decline. Therefore, the organization of groups is critically important and has strong gender implications. Girls tend to become easily disillusioned when working in competitive groups, and their education suffers as a consequence (Underwood & Geoffrey, 1990, p. viii). Therefore, it is important for mixed-gender groups working on computers to stress cooperation and to minimize competition. That is easier said than done. Cooperation becomes more difficult for mixed-gender groups as children reach the upper end of primary school. About that time they become more aware of sexual differentiation and “typical” gender roles (Underwood & Geoffrey, 1990, p. 154).

Despite the stereotyped view, there are usually no significant gender differences in competence and interest in computer-based work among young children. It is not the nature of the work that usually causes problems for girls, so much as the social organization of that work. Barbieri and Light, for example, found that boys in mixed-gender pairs typically positioned themselves in such a way so as to ensure that it was they who gained immediate control of the mouse (Barbieri & Light, 1992). If children are to work in groups around the computer, the group must be organized cooperatively; otherwise, the girls’ education might be jeopardized, since boys in mixed-sex groups tend to dominate computer-based activities (Underwood & Geoffrey, 1990, p. ix).

Gender is but one of many factors in a mixed-group learning situation. There are normally constraints upon effective communication, positive interrelationships, and improved academic achievement among racially or ethnically diverse student groups within a heterogeneous
classroom setting. Such constraints include status inequities, lack of direct institutional
support, stereotypical beliefs, inter-group anxiety, and the limitations of the type of cooperative
learning model used. These constraints can override even the most well-designed cooperative-
learning endeavors and reinforce a segregated status quo within schools. Cooperative-learning
models must attend to and work with these constraints if they are to lead to successful social
harmony and academic achievement for all students (DeVillar & Faltis, 1990, p. 66).
Otherwise, learning for all students may not be maximized.

Teachers, as well as students, tend to form groups that result in matched, as opposed to
mixed, proficiency levels. They do this for any number of aptitudes. For example, Spanish-
proficient students normally are either placed or joined with other Spanish-proficient students.
Likewise, fluent English speakers are either placed or joined with other English speakers
(DeVillar & Faltis, 1990 p. 26). Teachers need to make sure that students have the opportunity
to work with fellow students whose native language, culture, and abilities may not be similar to
theirs. For some students this opportunity will not be voluntarily taken. They would rather work
alone and without a computer than to be forced to work in a group around a terminal
(Pennington & Brock, 1992, p. 80). Other students may need help to work with pupils from
different cultures, racial backgrounds, religions, etc. Such help is critical to encourage students
to work in computer groups cooperatively and equitably.

To minimize in-group tension, offering training and support to less able students is essential.
Since there is usually a common culture of computer users and nonusers in most classes, users
should be encouraged to share knowledge with nonusers (Nalley, 1995, p. 16). In this way,
more students can benefit when they do have computer access.
Gender, Equity, and Computing

Gender disparities in home computer use have long been noted. Differential access by boys and girls to home computer technology is significant (Culley, 1988). Parents more frequently buy computers for boys than for girls (Mohamedali, Messer, & Fletcher, 1987), and parents are more likely to encourage boys than girls to use computers (Hoyles, 1988). In addition, male students receive significantly more encouragement from friends than do female students (Busch, 1995, p. 154).

Boys take advantage of the computers and encouragement they get from their parents. They make more use of computers in the home than girls do (Robertson, Calder, Fung, & O'Shea, 1995). While this is primarily for games, gender differences in use are reported in all home computer activities (Martin, 1991). In cases where there are computers in the home, men and women normally have different patterns for using their computers (Busch, 1995, p. 155). For example, boys and men seem to enjoy typical computer games more than girls and women do.

For boys computer games appear to provide an initial motivation to become more acquainted with computers. As Culley notes, “Games form a key part of an important social network outside schools from which girls are excluded” (Culley, 1993, p. 151). For instance, many girls wish to avoid arcade games. The goals set in such games are apparently not personally meaningful. Killing giants, rescuing princesses, or starting an inter-galactic battle do not seem to be of great interest to the majority of girls (Underwood & Geoffrey, 1990, p. 32). Consequently, there is often a gender difference in the rate of success and in the enthusiasm for adventure games. Girls’ lack of enthusiasm for adventure games contrasts sharply with the experience of educational excitement when the computer is associated with a genuine collaborative mode of working. Under collaborative conditions, girls are typically just as enthusiastic as boys in their response to computer technology (Hoyles, Sutherland, & Healy, 43

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1991). Unfortunately, girls usually experience less satisfying encounters with computer
technology.

When girls have access to computers they are often expected by teachers to engage in more
drill-and-practice activities than male middle-class white students do (DeVillar & Faltis, 1990,
p. vii). Moreover, Culley’s detailed observations of computer classes revealed that not only do
girls tend to get less time on machines than boys, but when they do work on the computers they
get less assistance from the teachers because the boys dominate both machines and teacher
resources (Culley, 1988). Girls may be perceived, therefore, as being less interested in the
technical or recreational aspects of computers than boys. This perception is reinforced in actual
practice, since males generally have a higher degree of computer literacy than females, both in
K-12 schools and in higher education. This disparity of computer literacy is a disturbing but not
surprising fact, given that previous studies have clearly documented male dominance in most
scientific and technical fields (Besser, 1993, p. 62). Educational changes may be required to
offset imbalances caused by gender. Work is under way in that regard.

In order to improve the quality of education through computer use, sophisticated theories are
being developed and refined to model the relationship between gender and computing. For
example, one theory proposes that domination of the computing profession by men has led to a
privileging of particular styles of thinking which are often not the styles preferred by women.
Computers tend to be “conceptually assimilated into the category of science, mathematics and
technology and acquire some of the traditional qualities of differentiated interest amongst boys
and girls” (Hoyles, 1988). Another theory suggests that most women would feel more
comfortable with a relational, interactive and connected approach to objects, and men with a
more distanced stance—planning, commanding, and imposing principles on them (Jones,
Kirkup, & Kirkwood, 1993, p. 92). At this point, however, there is no all-embracing theory that
can completely explain or predict computing differences based on gender. Therefore, the nature of computer software used in classrooms needs to be carefully considered for gender bias or prejudice. There are many ways this consideration could be undertaken. Culley is particularly helpful in that regard. He offers the following recommendations (Culley, 1993, p. 157):

The software that teachers use should be carefully selected and examined for the way it constructs males and females. For example, how are males and females presented? Is the language sexually inclusive? Is the software motivating for all pupils? Do examples build equally on the experiences of girls and boys? Does the software provide the opportunities for group work and co-operative learning and is it likely to develop the confidence of pupils?

Such considerations are a good first step in consciously evaluating gender assumptions implicit in software. Likewise, software should be reviewed to see if it contains any material that might raise equity issues. For example, software containing sexist language or that perpetuates racial or religious stereotypes should be carefully screened for suitability.

Unfortunately, finding a general theory to explain or predict how such factors as wealth, social status and ethnicity will affect computing differences or software choices is still underway. But the basic evidence is in. Affluent students are usually learning to tell the computer what to do, while less affluent students are usually learning to do what the computer tells them (Watt, 1982, p. 59). Research already indicates ominous differences between working-class and middle-class schools in relation to computers and computer usage. In one research study, instructional applications of microcomputers were shown to be differentially distributed: ethnic minorities and working-class children received a different form of instruction on computers than did white and middle-class children. While white and middle-class students spent most of their time programming, working-class and ethnic minority students spent more of their time with computer-assisted instruction programs (Besser, 1993, pp. 61-2). Other research has noted that urban schools with a high proportion of poverty-level families generally have fewer classroom computers per student than either suburban or rural
schools (Besser, 1993, pp. 61-2). Such computer usage trends clearly indicate inequities in the quality and quantity of computers in education. These inequities should not occur but, of course, they do. Sometimes those who should be preventing the inequities cause or perpetuate them.

Teachers may perpetuate such computer-use inequity; they may want to work with the best students and may feel uncomfortable with weak students. Thus, they may tend to use software of an elitist kind that works well only with a few students. Gender and equity issues may be pleasantly and conveniently ignored. Naturally, they should not be. Parents, therefore, should question teachers about the equity of using low-level CAI (computer-assisted instruction) for disadvantaged and other special-needs children, while creative tool applications are employed with more able students (Mojkowski, 1990, p. 15). Ideally, computerized instruction should provide the kind of highly individualized instruction once possible only for a few members of the aristocracy to students at all levels of abilities (Suppes, 1972, p. 41). But, in practice, CAI (computer-assisted instruction) sometimes serves only to provide repetitious and boring drill-and-practice exercises. One way to deal with or to overcome such problems with CAI and with other issues associated with gender and equity may be with CMC (computer-mediated communication).

**Computer-Mediated Communication**

General educational research suggests that students can learn through active participation in tasks that closely represent their real-world situations. Computer-mediated communication (CMC)—broadly, all forms of individual or group teaching that involve computer networking—can facilitate such active participation. It can also provide students who are learning to be better writers increased opportunities for interaction with the heterogeneous audience they are likely to encounter in the real world. Thus students at all levels of abilities can benefit from CMC.
Because less-able students are often the most disenfranchised members of the classroom, a technology that allows a redistribution of teacher and classmate attention so that these less able students can become more active participants may ultimately have a profound positive impact on their learning outcomes. In general, there is more teacher-student communication at all ability levels in networked class sections throughout the semester. Teachers can provide feedback on student work and point students toward additional sources for research and study. For example, networked class sections with Internet access can explore the riches of the Internet. “Even the smallest and most isolated institutions will have the potential to access the world’s finest libraries and most noteworthy faculties” (England, 1990, p. 368). Clearly students can use CMC technology in their research and study to overcome the physical barriers of distance, time, and information accessibility. Additionally, CMC can reduce other obstacles to learning and communication.

Presently, CMC is mostly conducted in the print medium—as text on a computer monitor screen. Text-only reduction of audio, visual, and social cues can lead to a protective ignorance surrounding a person’s social roles, rank, and status (Collins & Berge, 1995, p. 4). Accents disappear; mode of dress and body language clues (which are not universal) cannot be seen. The lack of such visual and auditory information in CMC can cloak a person’s gender, class status, and ethnic background. In addition, the asynchronous nature of the CMC medium can facilitate communication for those with physical limitations or personal reticence. Thus CMC offers students of all abilities and backgrounds the possibility of more fully and equally exchanging information.

When the CMC medium is used to form an electronic classroom, theoretically any number of students can dial in and actively participate. The potential student body includes anyone with a modem and the appropriate interface equipment (Thomas, 1995, p. 170). Unfortunately,
some students prefer the social aspects of the classroom and are quite unsettled by the noticeable lack of face-to-face interaction in CMC presentations (Collins & Berge, 1995, p. 5). Nonetheless, CMC in the form of computer conferencing, computer bulletin boards, and the Internet can allow isolated or distanced students worldwide to share ideas synchronously and asynchronously with one another. The learning community need no longer be geographically confined to a classroom or campus (Moore, 1990, p. 217). As a result, more educational opportunities exist for students who have been traditionally marginalized in, or excluded from, “normal” classrooms. For example, the delivery of courses using computer-mediated communications as an interactive technology is particularly relevant to resolving many of the thorny problems of effectively reaching and educating culturally and linguistically diverse students and other nontraditional learners in post-secondary-education environments. Moreover, CMC can offer computer users opportunities to deal with equity issues in a realistic and positive fashion.

Normally, few students speak up in typical class discussion: such considerations as gender and race prevent some from participating equally or at all (Day & Batson, 1995, p. 34). CMC education provides some promising new opportunities to offset in-class participation hesitancy. For example, because of participants’ virtual anonymity, the likelihood of “speaking up” on the network is much greater than it might be in normal face-to-face communications. This phenomenon has been observed in CMC class journals and open forums. Those students, including women, racial minorities, age-group minorities, and culturally-diverse members, who traditionally remain silent and marginalized in typical classes are more expressive in computer-mediated programs (Lewis, Whitaker, & Julian, 1995, p. 25). Unlike in face-to-face discussion, in CMC everyone has equal and almost simultaneous access to the “floor.” Students can be working on comments at the same time and post them to the group almost simultaneously. No
one is left out of the discussion because he or she cannot get a word in edgewise. Shouting or bullying is not necessary. Gender, ethnic or social background, physical appearance, accents, material wealth, and other extraneous factors need not negatively impact participation. Therefore, participation can be unfettered by factors that might restrain normal classroom discussion.

But personalities can and do definitely come through. Students can begin to take on inside-of-class CMC "personae" that are in some cases subtly or vastly different from their normal in-class personae (Ellsworth, 1995, p. 35). Using such personae in role plays might let students experiment on a level playing field with gender and equity issues while promoting multicultural awareness. An excellent place for such experimentation could be provided by a bulletin board service (BBS) or Internet newsgroup.

The BBS tends to make student participation in discussions or role plays more equal because it does not usually favor those students who are quick responders or who are aggressive. Students who are shy, hesitant, or introverted can respond at their own pace (Heller & Kearsley, 1995, p. 135). On a real-time (synchronous) chat line, by contrast, a student would have to communicate quickly or he or she would not be an active part of the mainstream discussion. Typically, in such a medium, conversation tends to move rapidly, as people drop in and out of the conversation. Students who are not literate writers or who lack typing skills are definitely at a distinct disadvantage in real-time discussion forums.

Given the world of opportunities that arise using computer-mediated communications, students—regardless of literacy level or typing ability—should be encouraged to experience the on-line world. Then perhaps some of their attitudes about who can and cannot use computers might be changed, and their worldviews might be expanded. For instance, using either asynchronous or synchronous means—an electronic bulletin board, an on-line newsgroup, or
chat line—students, thousands of miles apart, could join as a team to engage in an open and honest dialogue. They could, for instance, jointly construct an unbiased model of a shared economy, culture, or ecology, and then collaboratively test the model's implications (Barron & Orwig, 1993, p. 3). Constructing and testing such a model would definitely be an interesting and helpful educational experience.

Clearly, the expanding worldwide computer and telecommunication networks will better facilitate understanding between and among students. Students will hopefully learn to respect each other as individuals, overcoming their cultural biases toward racial, ethnic, religious and political groups, in favor of a sense of belonging to a global electronic "virtual village." One of the exciting characteristics of CMC is, in fact, its virtually limitless potential for exposing users to new or different cultural values and beliefs. From an international viewpoint, this expanded means of communication through distance education applications will introduce students of all ages to cultural variances in a more direct, honest, and personal way, quite different from the simplistic or biased mass media portrayal (Lewis et al., 1995, p. 24). Therefore, students at all levels should be encouraged to join a global student community and exchange electronic mail with other students, do research, ask questions of and interview experts, take field trips, go to libraries, and even get help with homework.

The global network is all-inclusive: physical and geographical boundaries do not exist, and students—even those with various disabilities—can work equally with other students in the network (Baker & Buller, 1995, p. 193). While using the global network, students have very little recourse to such cues as body language, or to race, gender, and other hierarchy-implicating factors that might give rise to feelings of inferiority or superiority. This is especially true if participation is anonymous. But anonymity is a sharp double-edged sword. On the one hand, it may aid in the honest exchange of information on controversial topics. On
the other hand, anonymity can surely allow "flaming" (rude or abusive comments) (Day & Batson, 1995, p. 35). Certainly nothing should be said in an anonymous electronic message or communication exchange that would not be said face-to-face. Culturally insensitive and judgmental language should be consciously avoided. Furthermore, respect for confidentially should also carry over to electronic data exchanges such as e-mail (McLean, 1995, p. 42).

Such common-sense considerations as confidentiality and cultural sensitivity in computer-mediated communication seem obvious. However, with the demographic make-up of many countries changing so rapidly, it is becoming increasingly important to develop communication skills for a widely diverse cultural community and world. Because the bulk of CMC is conducted in standard English and in the written rather than in the spoken word, it may perpetuate some cultural hegemonies (Collins & Berge, 1995, p. 6). Students should understand the existence and ramifications of those hegemonies in order to deal more equitably with them. Similarly, software and hardware designers must steadfastly attempt not to reproduce or augment the problems associated with the gap between technology "haves" and "have nots" when designing CMC and computer conferencing applications and curricula. Every software, networking, or curriculum innovation reflects some unarticulated assumptions from the worldview of the culture that created it (Collins & Berge, 1995, pp. 6-7). Software and hardware designers must be sensitive to equity issues.

Unfortunately, changing designers’ and users’ perceptions on gender and equity issues will require time and effort. For example, there still is resistance to women acting in technical computing roles or competing with men on-line. A male friend who used an e-mail (electronic mail) account of a female friend and posted technical items in the technical sections discovered he was not taken seriously. He set up a male alias in order to feel like a part of the conversation.
(Tamosaitis, 1995, p. 145). Using such a technique may seem to be extreme. However, it did appear to work: another sad testimony to gender bias on the Internet.

Although many have said rather simplistically that computers are for boys, meta-analyses of the gender, attitude, and instructional-technology-competence literature reveal that although boys are likely to be more enthusiastic about computers, this gender bias disappears if girls see the relevance of computing and, in particular, if their first experience of the computer is not through tedious programming sessions (Underwood, 1988, p. 3). But children model the behavior of adults in a society divided by gender and equity issues. They see men participating in computer-based activities far more than women, and they usually see men dominating women in computer usage (Busch, 1995, p. 154). This is an image that is reinforced and supported by the media. For instance, when women are portrayed in high technology publicity material, it is often only as the lowly keyboard operator, with an authoritative business-suited man hovering around and pointing at the screen (Underwood & Geoffrey, 1990, p. 146). Such images shape the ways boys and girls view themselves, computers, and society.

**Conclusion**

Gender and class divisions in society are part of the social structure in which the educational system operates, and most additions to any curriculum or job environment tend to replicate and reinforce existing divisions. Simply providing computer classrooms and computer access, therefore, will not be the complete solution for gender and equity problems. Unfortunately, computer classrooms do not usually break down traditional barriers founded on gender and class differences, and they do not make people any more productive or generous or intelligent than they were when they walked in the door. Teaching with/on/through computers tends to generate a unique set of difficulties, both pedagogical and human, that are very often situation-specific (Peterson, 1994, p. 1). Therefore, it would be extremely naive to expect computer
education or computer use to alleviate stratification. There is, in fact, strong intuitive evidence to suggest that the addition of technology to the curriculum will often further exacerbate existing stratification. For example, in a classroom where computers are introduced, students who can go home and practice on their parents’ computers will probably learn more quickly than those students whose families who cannot afford a computer (Besser, 1993, p. 62).

Since educational decline normally goes hand in hand with national decline (Adams & Hamm, 1987, p. 103), it is imperative that all students regardless of gender, cultural or racial background be familiar with computers and how to use them. The challenges of teaching and learning in the next century will be to know how to seek and use information efficiently; how to ask relevant questions; how to find effectively the informational resources available to each user; and how to use appropriate information to express new ideas. The most disadvantaged in the 21st century will be those for whom easy access to interactive information systems is limited or totally nonexistent (Withrow, 1990, pp. 43-4).

References


Background

Although computer applications have been frequently used in the teaching of second languages in traditional educational settings, foreign language teaching at a distance has all but ignored the potential that this medium holds. This chapter considers the nature of distance education, its students and costs, and presents specific ways in which computers and computer-assisted language learning (CALL) can help remedy some of the difficulties faced by the distance learner of a language.

Distance education is the delivery of the educational process to learners who are not in proximity to the person or persons managing or conducting the process (Lewis, Whitaker, & Julian, 1995, p. 14). There are any number of things that differentiate distance education from traditional classroom education or private study. Two of the main defining and differentiating elements of distance education are:

- The possibility of occasional, as opposed to rigidly scheduled, daily or weekly meetings for both didactic and social purposes; and
- The influence of an educational organization, which distinguishes it from private study (Brande, 1993, p. 114).

Since distance education is achieved through non-contiguous communication, and is therefore a mediated instructional transaction (Saba, 1990, p. 344), instruction might involve technical media to unite teacher and learner in order to carry the course content or to allow for dialogue exchanges. The learner is certainly not wed to a traditional classroom approach to education. In distance learning, learners can choose where they want to learn (at home, at an

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in large measure they can also choose when they want to learn. In essence, they can have the best of all possible worlds to fit their situation.

Because of its flexible approach one might think that distance education would have caught on rapidly. But this is not the case. Until 1970 the realization of the concept of distance education was not totally successful. Before then, distance education was roundly criticized for the malpractice by some of its commercial practitioners. The move from private to public provision of distance learning in the last thirty years has muted some criticisms. But others have appeared: that it alienates students; that it is contrary to the Koranic teaching tradition (a weighty consideration in Muslim countries); that it cannot give a full university atmosphere; and that it is characterized by many of the evils of industrialization (Keegan, 1993, p. 2).

In spite of the late entry of the United States into the distance education arena, the idea of teaching languages at a distance is not new. The first real correspondence-course institution was the Toussaint and Langenscheidt Institute, founded in Berlin in 1856 to teach languages (Brande. 1993, p. 65). A century and a half later, teaching foreign languages at a distance is still important. During the International Council for Distance Education in May 1990, Professor Tamas Lajos suggested that distance education opportunities be linked with foreign language learning, thus helping to motivate the students for the latter (Brande, 1993, p. 222). Fortunately, with the use of personal computers, language teachers now have the facilities they need without having to have great intense technical expertise, to enrich their students’ distance learning environment with dynamic interactive text, images, animation, and voice. It is not quite the same for the students as being there with the teacher as they study, but it is a lot better than being on their own (Jennings, 1995, p. 3).
Along with the basics—a terminal or a personal computer, floppy drive and compact disks—other computer technologies are available for studying languages at a distance. For example, telecommunications can provide a way to link computers into networks. Networked computers are flexible enough to accommodate a wide range of learner abilities and levels. Even advanced language-learners can augment their studies by using networked computers to send electronic mail, participate in discussion groups, or explore web sites while using the target language.

With computer-mediated communication, a student could take a course in French literature at the Sorbonne from his or her dorm room in Philadelphia over the Internet (Farrington, 1994). But the possibilities for language learning at a distance via computer do not stop there. For instance, Language Connect may completely change the way learners approach learning a language.

Language Connect, the home of Language Connect University (LCU) is a "virtual school of language"—a World Wide Web gateway to the world of Internet language resources and materials. This home base for language learners, developed by Syracuse Language Systems, includes important links to sites providing language learning, travel connections, international business information, cultural affairs, and local news. At LCU, students can enroll in instructor-guided classes that incorporate the best aspects of multimedia, Internet, and traditional teaching methods, and open the door to a rich array of language-learning resources on the World Wide Web. Of course these educational efforts are state-of-the-art. The "bugs" are still being worked out. This is completely understandable. Although Harvard has existed for over two and one half centuries, the oldest schools on-line have only been around for about a decade. [Ten years is a very long time for anything in cyberspace (Stucky, 1995, p. 76).] Given the fact that distance learning takes place in the real world and the cyberworld without much face-to-face contact, what kinds of students are best suited for distance language learning?
Students

Today, without setting foot on a campus, a student can take college classes and can even earn a degree through his or her computer modem (Stucky, 1995, p. 73). Only a small portion of all distance learning students is studying languages by means of computer-mediated communications, due to expense limitations or technical and logistic problems. Nonetheless, distance education already reaches millions globally, and it can potentially reach even more students—for instance, those living in rural areas or those with serious disabilities who may not have easy physical access to campus-based schools. Virtually everyone, regardless of location or physical prowess, can access telephone lines with the proper hardware and software (Stucky, 1995, p. 73). However, students at all levels and abilities who study languages at a distance must be prepared for the special rigors of the task.

Students with poor reading and writing skills will have their effective access to distance language learning greatly lessened. Computer communication is currently implemented by systems based mainly on writing (typing) and reading. Even if a student is using a stand-alone computer with language-learning software, interactivity with the software will most likely require reading the screen and typing in responses. Where computer-mediated communication is the prime means of information exchange, then lack of skill using in writing and reading can severely hamper the timely exchange of communication (Hiltz, 1994, p. 12).

In language learning, as in any other distance learning endeavor, submitting class work in a timely fashion is crucial for success. The lack of computer skills should not be used as an excuse to delay or to avoid submission of class work. Adhering to deadlines for class-work submission is critically important. Students need to be forced to meet all deadlines, since getting behind schedule makes it more difficult for students to self-generate the energy to continue their coursework (Holmberg, 1995, p. 169). To control tardiness in the completion of
assignments, weekly quizzes work very well as a mechanism for motivating regular participation (Hiltz, 1994, p. 109). Students are also far less likely to procrastinate when deadlines are clear and there is a clear penalty for missing the deadline.

In language learning, unless the fundamentals are covered, understood, drilled and tested, it is unlikely that students will ever develop a thorough knowledge of the target language. This is especially true when students are geographically distanced from the teacher and their classmates and have no opportunities to practice except by means of coursework. Sticking to the timeline of the syllabus is therefore imperative.

A coherent and well thought-out course syllabus is an administrative necessity in all kinds of post-secondary teaching. To the CALL (computer-assisted language learning) and CMC (computer-mediated communication) course designer, however, the course syllabus is also a blueprint for subsequent course development and implementation. Syllabus creation forces the designer to be explicit about the scheduling of lessons, tests and coursework assignments. The syllabus may also be used to lay out in advance the times and topics of on-line sessions, conferences and other instructional activities, and to provide guidelines for student evaluation as well (Eastmond & Ziegahn, 1995, p. 66).

Given a syllabus, students must do their part by cultivating self-discipline in order to stay on schedule. The extra self-discipline required to complete distance education courses may be one reason students shy away from them. Potential students may also be reluctant to register for such courses for a variety of other reasons. Many do not understand the mechanisms by which their courses are to be delivered. Some of them have little experience with computers and lack confidence in their ability to master necessary computer skills. The relatively high tuition charged by a private college might frighten away some students whose post-secondary experience has been in community colleges. Moreover, before some students are willing to
register, it seems important for them to know that others like them have successfully completed courses (Markwood & Johnstone, 1994, p. 37). They must be assured that they will not be left to dangle, either at their study desk or in cyberspace. They must know they can receive help from tutors or from on-line sources. Curiously, when tutors are available, one of the most common statements from learners regarding their hesitancy in talking to tutors is that the student's problem was not worthy of their tutor's attention, and that he or she was unwilling to take up the tutor's time (Holmberg, 1995, p. 112). Students should be convinced that tutors are there to assist them no matter how insignificant or trivial the problem may be. The key to bridging the distance to the individual learner is to personalize and to individualize the tutor-student and advisor-student interactions (Cookson, 1990b, p. 116). Students must be carefully nurtured in a distance-learning environment. Otherwise, their problems will cause them to quit their efforts at language education at a distance.

Considering the typical students of distance-teaching organizations (adults with families, jobs, and numerous commitments) it is not surprising to find that the reasons given for discontinuation are, in the majority of cases, the pressure of other duties, work commitments, travel, illness, lack of time, and similar circumstances (Holmberg, 1995, p. 199). Tutors should monitor the students' progress and check for signs that a student is having trouble—late assignments, poor-quality or rushed or sloppy work, etc. It should be remembered that distance students are usually on their own in their studies. With the anxiety and problems that distance learning students encounter, it is important for distance-teaching organizations to find ways to offer tutoring and counseling services (Holmberg, 1995, p. 128).

However, in the final analysis, neither age nor distance nor domestic environment nor any other quantifiable term stands out as salient prerequisite to language-learning goal attainment. It is motivation above everything else that, despite physical and general social and
environmental problems, brings success in distance education (Holmberg, 1995, p. 199). In other words, the key to success in a distance education program may depend mostly upon the determination of the students. Those who are determined to reach their educational goals persist and complete courses; those who are least determined or who are easily sidetracked receive incomplete grades or fail (Atman, 1990, p. 141).

To avoid receiving incomplete or failing grades, students studying languages at a distance using CALL may need help while achieving functional mastery of the tools that could assist their learning. Students should not have to frustratingly fumble with their course material or their computers. Hence, it is imperative that course material be designed for easy student access and that the student have support to cultivate basic computer skills in order to fully utilize the language learning course material.

Computers
In general, the opportunity to learn via computer has the potential to become a radical force in the building and upgrading of skills, knowledge, and ability levels for those motivated to study languages. When students use a combination of computer technology, networks, and telephone transmission for study and practice, barriers of time and place fall away. Now students have access to coursework based on their own schedules (McInerney, 1995, p. 149). For the first time in the history of language-learning and language-teaching, educators are able to combine and integrate what up to now have largely been incompatible: self-access learning and tutoring, and second-language learning and practice (Kohn, 1995, p. 2). Computers are, therefore, increasingly being used for distance language learning—either by themselves, networked to other computers, or controlling sophisticated multimedia workstations.

Computer-based training or computer-assisted learning is often available to learners on stand-alone personal computers. They are also available on terminals linked to a mainframe
computer, or by geographically remote access servers connected by telephone lines to personal computers. Computer networks (local or wide area) can give language-learners access to remote databases and enable them to communicate with other students and teachers in the target language by means of e-mail or by computer conferencing. Additionally, vast amounts of information in the form of words, sounds, pictures and animation are now available to individual learners by means of a CD-ROM drive. Interactive video is also potentially very attractive in language teaching and training, bringing together the interactive potential of computer-assisted learning and the benefits of full-motion video sequences through the medium of the laservision video disc (Kirkwood, 1994, pp. 65-66). Naturally not every home will have interactive video, but, as more and more computers appear in homes, the home will increasingly become a major potential site for education. Some or all of what currently happens educationally in schools during language-learning classes may soon be possible in the home environment. This development may be one of the most recent dramatic consequences of the use of computers in education (Bork, 1985, p. 170).

Computers and computer-assisted learning are definitely having positive effects in distance education. For example, increased completion rates and enrollments at the Center for Independent Study of the University of Missouri can be attributed to successful implementation of off-line and on-line systems (Andrews & Strain, 1985). In the on-line computer-mediated communications environment distance education students have the logistical benefits of not having to expand their storage and study areas to accommodate distance education material. They also do not have to hunt for paper, envelopes, or stamps, or make visits to the post office to contact fellow students or faculty (Lewis et al., 1995, p. 18).

Computers can provide individual dispatch of study material and perfect record-keeping for several different purposes simultaneously, at very high speed, and at very low cost (Holmberg,
1995, p. 141). They are especially well-suited for foreign language teaching at a distance. Computers can allow students to use language-learning software for drill and practice at the times best suited to the individual. They can allow students with Internet connections to surf the Web, to find information in and on the target language, or to participate in chat room discussions in or about the language they are studying.

In general, however, computer-assisted instruction, when used as the sole or primary mode of instruction for distance learning, appears to be effective only if there is also significant communication between teacher and student (Hiltz, 1994, p. 21). Language learning is one such area.

It is widely recognized that learning to speak a foreign language in free-flowing fashion requires active practice, preferably in a natural setting with intense interaction and feedback in a conversational way. Generally, this situation is only achieved by going to a country where the language is spoken, or through small-to-medium practice groups under the direct guidance of an experienced teacher or native speaker. Where neither of these opportunities is available advanced communication technologies—notably networked or satellite approaches—offer alternative solutions (Brande, 1993, p. 11). These alternatives should be of special interest to language teachers and learners.

Costs

Whether distance language learning takes place in cyberspace or at a stand-alone computer, cost factors play a very important role for students, teachers and distance learning program administrators. Considering that time is money, there are many advantages to computer-assisted language learning. For non-resident students, the time spent commuting to and from campus (and finding a parking space) can instead be devoted to courseware. Even for resident students, “wasted” time moving among classrooms can be reduced or eliminated (Hiltz, 1994, p. 11).
Furthermore, employers are more likely to spend company funds to purchase a language module for employees to study at home than they are to spend them on paid educational leave (Jarvis, 1993, p. 172). Typically the single largest component of training costs is working time lost by trainees. Since lost working time accounts for as much as 85% of the total training cost, depending on the type of training and personnel involved, companies generally prefer providing home study materials for their employees. For employers using computer-based training during working hours, money is saved in users’ travel costs and salaries for the instructors (Brande, 1993, p. 112).

In her article *Materials Production in Open and Distance Learning*, Jane Henry provides a way to calculate the cost per person for conventional distance learning courses (Henry, 1994, pp. 7-17). Listed in the article are some of the expenses that might be included in cost calculations. Those expenses can be adapted for cybercourses. For example, at the Open University in England the computer-marking system marks an assignment at a cost of about a tenth of the price of a tutor-marked assignment (Henry, 1994, p. 15). The reduction of cost realized by a computer-marking system could be included in cost calculations when administrators are planning a cybercourse.

In general, whether coursework is computer-assisted on-line or not, where the number of students is expected to be small, it can be more cost-effective for course organizers and students to negotiate the curriculum directly and base part of it around activities which give students a chance to study areas of particular interest to them. That approach may be preferable to taking the time to write substantial course material that few people will ever need (Henry, 1994, p. 9). After all, it is the student, the student’s attitude, and what the student needs that should determine the organization, content, learning dynamics, and delivery medium of distance learning.
Designing Curricula for CALL Distance Learners

In general, any distance learning program must be put together carefully and thoughtfully. An effective CALL program, in particular, must be well-structured.

Organization

Some students just muddle through distance learning, never quite organizing a regular study pattern (Jones, Kirkup, & Kirkwood, 1993, p. 60). They need a well-constructed syllabus. Students need to check in regularly to show they are meeting time and course objectives that are shown on the syllabus. Mary Thorpe provides a helpful list of requirements for effective course management in her article *Planning for Learner Support and the Facilitator Role*. Facilitators can use her article as a checklist of requirements they should fulfill as a starting point (Thorpe, 1994, p. 152). Along with a well-designed syllabus, a proper study guide is a necessity. For information on what a study guide might contain, see Derek Rowntree’s article *Existing material: how to find it, evaluate it and customize it* (Rowntree, 1994, pp. 79-88).

Materials

Self-instructional materials are often based upon confirmatory feedback intended to mechanically guide the student towards a prescribed learning goal. Higher-level cognitive goals, however, demand non-lock-step opportunities to negotiate learning objectives, to construct meaning, and then to validate knowledge through discourse and action (Garrison, 1993, p. 12). This is especially true in a language-learning situation. Students should be given opportunities to practice new vocabulary and grammatical structures in drill-and-practice exercises. For more advanced students, computer-mediated communications should be available to permit e-mail, and preferably voice, exchanges in the language being taught.

No matter what the language learning level of the student—novice or expert—self-instructional materials from a whole range of subject areas and types of instruction possess one
common characteristic: they all contain activities. They all pose questions in the text, inviting the learner to respond in some way (Lockwood, 1994, p. 89). The student must interact with the material, and, to be effective, the interaction must be appropriate to the learner’s skill level.

What usually determines the pacing of learners’ studies are the assignments and their due dates. Where a course or a package does not include assessment material, learners will most likely need assistance to organize and to pace their studies (Lawless, 1994, p. 59). This is certainly true when students are dealing with learning a new language.

Studying at a distance can be difficult under the best of circumstances. For those not working in their first language, it is particularly demanding. Institutions are aware of the problem and usually provide assistance. They do not want under-prepared students to falter and to fail. For this reason institutions may recommend additional facilitative work in other areas besides the language being taught, for example time management and goal setting.

Facilitation is most effective where learners are proactive and make demands, rather than simply wait to be helped. Materials producers can promote this orientation in a number of ways. They can suggest that activities in the materials be discussed either with the facilitator or in a group session (Thorpe, 1994, p. 150).

Testing

The following testing approaches have proven effective in distance learning:

Multiple-choice tests in which the student marks which of several suggested answers is/are the correct one(s).

Re-arrangement tests in which the student numbers the various items of a series of events, a process of work, etc., to demonstrate the right order.

Completion tests in which the student fills in gaps in sentences between the items figures, terms, or other indications of fact (Holmberg, 1995, p. 107).
All of the above testing types can be adapted easily to the CALL environment. For instance, gaps in a sentence in a foreign language could be filled in, or missing words, phrases or endings could be supplied, by the student.

On-line

As technology costs come down it is possible to foresee the time when distance learning students, perhaps at satellite-receiver sites, regularly will sit at keyboards sending questions and comments to presenters, with the student material being fed back to the origination site via a data channel on the satellite or by other electronic means (Oberle, 1990, p. 93). However, whether a student is learning at a terminal linked by satellite, or at a networked computer linked by satellite or landline, all external resources required should be available to him or her on-line (Venezky & Osin, 1991, p. 253). In general, the student should not be forced to seek help from any other sources (dictionaries, manuals, atlases, etc.) than the computer, whether the computer is networked or not.

Historically, on-line courses emphasize those very skills in which many students may be most lacking: reading and writing. Furthermore, on-line courses may eliminate the very means by which many students actually do the most learning, namely through the spoken word. For this reason, some believe that on-line courses are most adaptable to advanced course levels, where students are experienced and more likely to come with better-developed study and reading and writing skills (Brande, 1993, p. 14). For students who are weak in the course’s subject matter—whether elementary or advanced—collaboration may ease the difficulty of self-study.

It is a common practice for two or three students in an on-line course conducted at a learning site to develop a “buddy system.” Such students sit next to each other and collaborate discussing things that come across the screen and helping one another with the contents of the
material or the mechanics of using the system. Although this is supposedly not allowed during quizzes, it undoubtedly occurs then, too (Hiltz, 1994, p. 171). The pressure to get a good grade can most assuredly undermine honesty.

**Appropriate Timing**

To cut down on collaboration during tests, students can be monitored or given tests that cover the same material, but in a different order. In other words, two or more versions of the same test can be produced. Such preparations could greatly diminish inappropriate collaboration.

In a regular class a quiz can be given simultaneously to all students and can be immediately reviewed with the correct answers and, if necessary, with explanations. With the on-line class this valuable teaching practice may be impossible. Students can normally take a quiz at different times. Some may not meet the deadline or, if they do, they may do so only at the last minute. Consequently, it usually takes some time to collect all the submitted quizzes and grade them. A week can pass between the time that the first students take a quiz and the time that all their grades are posted. Feedback is thus delayed and its teaching effectiveness greatly weakened (Hiltz, 1994, p. 340).

At the NKJ School in Norway, when the turn-around time—the time elapsed from when the student submitted an assignment until it was returned by the tutor—was reduced from 8.3 to 5.6 days, completion rates in courses soared from 69 to 91 percent (Cookson, 1990a, p. 200). To keep completion rates high, then, the amount of time spent on-line correcting and mailing grades to students should be drastically reduced. Such reduction can be accomplished by programs that grade quizzes and automatically send the scores to the students (Hiltz, 1994, p. 333).
Attitude

In courses conducted on the Internet, complaints about the periodic slowness of connections can sometimes be handled by software and/or hardware solutions. Negative psycho-social comments from students relating to the missing of face-to-face social contact, or having to motivate themselves to do course work in spite of other demands on their time due to family or work are perhaps more difficult to fix. In such cases, empathy remains a very desirable distance-educator quality (Holmberg, 1995, p. 127). Students need to know that their problems are important and that the instructor and distance learning institution are willing to help resolve logistic or motivational log jams.

Even technological determinists cannot totally neglect the psychological adjustment necessary to undertake working at home. Some who have tried working at home have felt lonely and isolated, missing the social contacts provided at school or at the workplace and some have found that they did not possess the self-management skills necessary to organize their lives efficiently—e.g. skills in self-motivation, discipline, effective time management, and coping with stress. In addition, some distance learners have had problems in separating “work” from “home” life, experiencing tensions in relations with their families or spouses, and even with friends and neighbors (Jones et al., 1993, p. 67). These problems must be addressed if the student is to be successful at distance language learning.

Learning Dynamics

Distance educators are now beginning to consider important learning dynamics: (a) there are different learning styles; (b) students create their own meaning when learning new things; and (c) what makes a difference in content retention and transfer is not so much what is done by teachers, but what students as learners can do by themselves (Berge & Collins, 1995, p. 4). These dynamics must be considered whether the student is pursuing CALL from a stand-alone...
computer or from a networked computer. It is very important that the student not feel isolated while immersed in a learning environment. Otherwise, optimal learning might be compromised.

Distance learning can be a very lonely business. Distance language-learning can be even more so. Context and spontaneous communication can be substantially diminished, or completely lost, in the distance learner's world. For the distance language learner this can mean an impoverished learning environment in which the learner will often founder or fail. However, human communication and interactivity, which are so fundamental to living language, can again be introduced into distance language courses through the application of advanced communication tools (Jennings, 1995, p. 3). For example, using the Internet, students can access real-time chat rooms or discussion groups via computer and modem, and engage in real-time "conversations" where topics are free flowing and meaning is negotiable in an unrestricted learning environment."

If the computer-assisted language learning environment is to be a true "virtual classroom," a computer system must support all or most of the types of communication and learning activities available in the "traditional" physical classroom and campus. There should be a classroom-like interaction space, where the "teacher" or others may "lecture" and where group discussions may take place. There should be a communication structure like "office hours," where student and teacher may communicate privately. There must be the ability for teachers, proctors, or tutors to administer, collect, and grade tests or assignments in a timely fashion. There has to be the ability to divide a larger class into smaller working or peer groups for collaborative assignments. There needs to be the equivalent of a "blackboard," where diagrams or sentences may be posted for discussion or note taking, and where class participants may add to or erase parts of the evolving diagram (Hiltz, 1994, p. 6). Such thoughtful organizational considerations are crucial to help ensure student success.
A set of functions can be extracted from what goes on in those various venues that are common to all learning situations. Those are: lecture; question-answering; exercises; explanations; corrections; discussions in classroom or in groups with or without guidance from the teacher; getting help; submitting assignments and examinations and receiving feedback; and, finally, being credited. For these functions it is possible to establish generic infrastructures and services which will allow for teaching foreign languages at a distance. These generic infrastructures and services may need to be supplemented by dedicated tools to allow distance teaching of specific content areas or courses (for example, language teaching may require support tools such as vocabulary drills) (Brande, 1993, p. 14). Such infrastructures and services can be extremely helpful in the case of home learning.

Home learning essentially takes place in isolation and with very limited support. Therefore, it is absolutely essential that configurations and materials be very user-friendly and offer a wide range of support mechanisms, either through (intelligent) help or by on-line support (Brande, 1993, p. 5). Also, learners must receive feedback and must self-monitor for personal control over the learning process (Stevens, 1995, p. 2).

All of this thought that should go into producing an effective on-line foreign language learning environment is not simply a tedious part of some hollow academic exercise. By the year 2010 in many of the newly emerging economic “dragons” of Southeast Asia, telecommunications-based technologies will have probably become the primary means of delivery of distance teaching (Bates, 1993, p. 213). Since the learning of foreign languages for business remains a high priority, CALL will probably be an integral component of distance learning coursework in the Far East and worldwide. To illustrate the fact that language learning at a distance via computer is a viable option, a Yahoo search with “distance language learning” recently produced 21 web sites. Some of the sites advertise software and virtual schools for the
learning of many common and exotic languages. There is obviously a current demand for language learning at a distance via computer, and that demand will most likely grow. The financial imperatives of the new global economy will spur the necessity for communicating in any number of languages. Learning foreign languages at a distance via computer can be one helpful option in the quest for achieving functional fluency in a flexible and convenient study setting.

Conclusion

Distance learning apparently is here to stay, and CALL (Computer-Assisted Language Learning) is surely going to be a developing part of distance learning. With carefully-designed CALL software, all the functions possible in a traditional classroom teaching situation, except for physical contact, may be simulated by way of telecommunication technologies, creating a virtual classroom electronically. Any number of potential students could join in from widely dispersed geographical areas.

Distance teaching of language exposes its own particular issues, which must be addressed. Those issues of providing useful and interactive experience in the language are extremely challenging. Given the notoriously high dropout rates from language learning even in face-to-face classes, questions regarding the motivation of learners and their retention in the system may be of even greater concern. The key to success must lie in the quality of the support offered to the learner—through the materials first and foremost. Of course, students must assume personal responsibility for learning when the distance learning institution provides the materials and support necessary for language learning. The discipline and motivation required to excel in distance learning should not be underestimated. Working alone with only occasional feedback may not be a comfortable academic setting for all students. However, if dedicated students are willing to make the necessary sacrifices to ensure their distance learning success,
language learning at a distance via computer will be a viable option for language study. Stand-alone computers, networked computers, and telecommunications technology can allow students the flexibility to study a variety of languages at a number of skill levels. The resources are definitely available for language learning at a distance. Students should make best use of those resources by utilizing them fully.

End Notes

1 Language Connect University can be reached via Syracuse Language Systems at 800-209-3122.
2 For computer applications which are particular to second language teaching at a distance see the Journal of Distance Education Vol. 4, No. 1, Spring 1989, pp. 20-35.
3 For a discussion on the use of computer-assisted instruction in distance education specifically focused on computer-assisted language learning (CALL) see “Computer-Assisted Language Learning and Distance Education” in the Journal of Distance Education, Vol. 4, No. 1, Spring 1989.
4 For articles written on the Internet and Second Language Instruction see ERIC Minibib mb97-05 (May 1997) compiled by Jeanne Rennie and available from the Center for Applied Linguistics 1118 22nd Street NW Washington, DC 20037.
5 For a list of electronic sources for information and discussion on distance education, check the web site www.iat.unc.edu/guides.html for information resource guide series #IRG-06.
6 For the results of an international survey of distance education institutions that was conducted to assess the use of computer-assisted language learning for the teaching of second languages in distance education settings at the tertiary level, see “Computer-Assisted Language Learning at a Distance: An International Survey” in the American Journal of Distance Education, Vol. 5, No. 1, pp. 3-14, 1991.

References


CHAPTER 5
SUMMARY AND CONCLUSIONS

A Synthesis

Today, serious applications of computer-assisted instruction (CAI) are underway, including computer-assisted language learning (CALL). Powerful language-learning activities have been developed around computer applications such as word processors, desktop publishing packages, database management systems, view-data simulations, and electronic conferencing programs (Bright, 1992, p. 293). In addition, global computer networks are providing teachers and general users with new resources for language learning. The application of CAI, CALL, and networked services to language learning can be highly effective due to the beneficial results of computer interactivity with students. But for computers to provide optimum benefits, many factors have to be considered. This dissertation has focused upon several ways in which CALL can be improved.

Chapter 2, “Effective Monitor Display Design,” showed that to effectively display textual information on a computer monitor requires a combination of experience, visual awareness, and detailed attention to the screen reader’s needs. Displaying information on a computer screen goes far beyond possible font choices. Nonetheless, much can be said about font choice and its impact upon the reader in processing information (Schwier & Misanchuk, 1993, pp. 241, 277-78). In fact, given today’s font creation software and the existence of fonts for standard and exotic languages, virtually any written language could conceivably be represented and studied using computer technology.

Just as font choice can heavily influence how material displayed on a screen will look and how readily it can be processed, some simple graphic devices can be used to structure screen material for better legibility. These include indenting paragraphs, using bullets, and shading.
text (Lockwood, 1994, p. 169). Those techniques work well for native speakers of the language as well as for students who are studying the target language. Furthermore, using semantic and syntactic principles, overall screen organization structure can be strengthened, thus promoting screen harmony and consistency (Davis, 1990, p. 247; Schwier & Misanchuk, 1993, p. 223.) Both native and non-native readers of a language can benefit from strengthened organizational structure. Moreover, screen harmony and consistency—partially achievable by the use of structural elements—can aid in the overall readability and retention of material.

The relationship between screens is another important consideration. Should a reader need to review previous screens to aid in his or her recall of material, he or she should be able to easily page between them (Steinberg, 1991, p. 118). With such flexibility, minimal memory load can be placed on the learner and he or she can focus on the task at hand. To aid the learner with that task, color can be used to highlight important information or to aid in the comprehension of complex displays (Venezky & Osin, 1991, p. 222). For example, in a list of conjugated verb forms, verb endings could be marked in consistent colors to emphasize conjugation patterns. New vocabulary items could also be indicated by color options to indicate whether they were to be a part of active or passive vocabulary recall.

Along with making monitor displays more readable to aid computer learners, other factors that might improve computer use should be carefully considered. For example, the role gender plays in computer use can be substantial. As discussed in Chapter 3, “Gender and Equity Issues Affecting Educational Computer Use,” gender seems definitely to impact computer usage (Kantrowitz, 1994, p. 51). For example, low levels of female participation in computer-related activities are not restricted to children of secondary school age. Over time the proportion of women studying computer science at the university level has declined, and female students are spending much more time with CAI—doing drill-and-practice exercises—than they are with...
programming (De Villar & Faltis, 1990, p. vii). Furthermore, the differential access of boys and
girls to computer technology in the home is significant (Roberts, Calder, Fung & O'Shea.
1995).

If girls and women are to make best use of computers and software for language learning,
gender issues that might impede their progress have to be understood and dealt with. Basically,
equal access to hardware and software is a good start. However, encouragement and support in
the form of female-friendly software and gender-sensitive computer training are needed. The
anonymous nature of CMC could also provide an extra incentive for girls and women—who
might otherwise be too shy or intimidated—to participate in classroom settings where normally
their active involvement with computers and general classroom discussion might make them
feel uncomfortable.

Simply providing computer classrooms, computer access, and CMC will not be the complete
solution for gender and equity problems, although such provisions are definitely a step in the
right direction, especially for students who wish to learn languages at a distance via computer.
As discussed in Chapter 4, “Language Learning at a Distance via Computer,” although
computers, CAI, CALL, and networked communication have had positive effects in distance
dermatly, it is motivation alone above everything else—despite physical, social, and
environmental problems—that brings success in distance education (Holmberg, 1995, p. 199). In
spite of technologic prostheses, distance learners cannot learn unless they have or can develop
the self-discipline to keep themselves on schedule. Moreover, the use of computer-assisted
instruction as the primary mode of instruction for distance learning appears to be effective only
if there is also a significant component of communication between student and teacher (Hiltz,
1994, p. 21). Obviously, computers and software cannot ensure complete success in distance
language learning. Students must be dedicated and they must receive encouragement from their teachers. The same is, of course, true in standard classroom settings.

The computer can be a valuable part of daily language learning. Innovative software, authoring capabilities, compact disk technology, and elaborate local and global computer networks are providing teachers with new methods teaching grammar and vocabulary, and of incorporating culture, and, most importantly, language practice in the classroom, both real and virtual. Students can gain access to audio, visual, and textual information about the language they are studying and the culture of its speakers (Higgins. 1993). In language learning at a distance via computer, especially, the key to success lies in the quality of the support offered to the learner through the materials. Each student must assume personal responsibility for learning from those materials.

Language learning at a distance via computer is a complex affair. For educational software designers such factors as screen display design, gender bias, and particular pedagogical approaches for the target language must be carefully considered and evaluated. For the language learner, selecting a distance learning option for language learning represents a significant investment of resources—time, money, and effort. However, distance language learning via computer is definitely a viable study option.

What is New in this Dissertation

What is new in this dissertation is the attitude toward language learning at a distance via computer. Language learning can definitely be pursued in that fashion. What is needed is more learner control over the monitor-displayed material and over the organization and suitability of the language-learning material. Users should be able to trim out or to add graphics, to get help, or to select a learning style preference with a simple mouse-click or two. Users should also be able to optimize their learning by giving the computer information on themselves and on their
language-learning goals—for example, desired skill or fluency level. Unfortunately, foreign language teaching at a distance has all but ignored the potential of the computer.

Today, both teachers and students can benefit from this technology without needing great technical expertise. Language-learning CDs, networked or stand-alone computers, and Internet resources can provide flexible study and practice options to accommodate a wide range of learner abilities and levels. For example, networked computers can supply access to discussion groups in the chosen language, or the opportunity to explore appropriate Web sites about the culture that gave rise to it. Web sites about language learning also can be found. Thus, students can have access to second-language learning, tutoring, and practice. Unfortunately, before students and teachers can fully utilize many computer applications for language learning at a distance, several important factors must be considered—together and singly—as this dissertation emphasizes.

How material is displayed on a computer screen can critically affect the reader. Since readers do show definite preferences regarding font choice and size, they should be allowed to choose a font and a font size that best suits their taste. Providing a user more control over screen presentation elements would be a desirable change from the typical inflexible screen display option offered by many software companies. Users should also be given a help box where they can ask for and be given information on how to adjust screen brightness, contrast, etc. Having access to such information would give the screen reader control of monitor adjustments that greatly affect readability.

Further, along with providing the screen reader organizational help by means of such accepted techniques as bulleted information, sectional headings, and shading, software designers could place “hot-spots” on appropriate screens that users could mouse-click on. The screen would then show what is essential material and what is ancillary material. Further
resources about the essential material could then be provided by hypertext links or by help notes that could give definitions or more background information on points of interest to the user. Such features would be a boon to learning.

Since learners appreciate structure, language-learning software should have an outline function so users can see the overall organization of the material. Seeing how the presentation of the material is structured would aid the learner with assimilation and recall by helping him or her create an internal "map" of the material. Also, as a memory aid, the user should have the ability to make notes while in the language-learning program. He or she should then be able to print the notes as well as other helpful information directly from the program. This ability would be an especially useful aid for the "active" learner, who learns by restating key information for himself or herself in his or her own words. Finally, when the reader has to exit the program, a bookmark function should be available so that he or she can easily return to the desired point in the program.

While providing the program user such flexibility, software designers should also be acutely aware of how gender and class differences affect computer use. It is certainly invalid to assume that gender does not impact computer use. Clear differences have been found in the way men and women treat context, approach problem solving, handle risk, attribute success, and usually interact—competitively or cooperatively. Software designers of language-learning materials must be highly attuned to such differences if they are to produce software that can be effective for persons of different classes, races, and gender. Assuming everyone will learn equally from the same piece of software is misguided.

One way of targeting the appropriate software-user audience would be to allow the user to type in information about his or her age, gender, and skill level. That way the software could provide animations, sound bytes, hypertext links, and other valuable information that would be
suitable for the individual user. In addition, the user could be given the option of having simple or detailed program prompts, and also the ability to increase or decrease the level of difficulty of the language-learning material and exercises. Perhaps exercises could also be selected to have either a competitive or a cooperative approach: student versus computer or student and computer working together as a team. The cooperative approach might be more appealing to female students. Males might be more inclined to a competitive approach.

What is needed, in short, is more learner control over the monitor displayed material and the organization and suitability of the language-learning material. Users should be able to trim out or to add graphics, to get help, or to select a learning style preference with a simple mouse-click or two. Users should be encouraged to optimize their learning by giving the computer information on themselves—gender, language-skill level, age, and race or class background. Then, the computer and software could provide the kind of richly supportive interactive language-learning environment in which students would be helped individually to develop, to expand, and to refine their expressive and communicative abilities in a new language.

Above all, the great potential that computer-mediated communication has for distance language learning should not be forgotten. Organizations that offer such courses should experiment with the creation of Internet chat rooms, newsgroups, and mailing lists especially for the use of their students—at least one of each kind of communication opportunity for every language that the institution offers. Such facilities would provide an essential element of the language-learning experience, the opportunity to practice speaking and writing in the new tongue, for students who could otherwise not interact because of their geographical separation. The "emotional distancing" effect of CMC which was previously discussed, moreover, has the potential to make this kind of language practice actually more effective than traditional face-to-face practice for some students. Those, including many female and minority students, who tend
to become quiet or nonassertive in traditional classroom settings would here have the opportunity to practice communicating in the new tongue with greatly reduced exposure to personal embarrassment. Add the factor of anonymity, which might be an option made available to registered users of the on-line facility, and one might see a true flowering of risk-taking— with the use of new vocabulary, idioms and the like— by some distance language learners.

Future Action and Research

There are many topics in monitor display design, in the impact of gender on computer use, and in language learning at a distance that call for future action and research. Regarding monitor display design, three questions form the basis for on-going research:

1. Where do the reader's eyes preferentially focus on the screen?
2. What visual features draw and hold the reader's attention?
3. How do most readers tend to read computer displays?

These are questions that could be researched by monitoring the reader's micro- and macro-eye-movements in timed studies. Such factors as font choice, color, and amount of material on the screen could be isolated to determine their impact on the reader's ability to process information. By determining which factors most improve readability, the optimal readability settings could be chosen as default options for font, characters displayed per line, amount of text per screen, and so on. The reader, however, should always have the ability to exercise ultimate control over how text and graphics are presented. For example, readers who "surf" to Web sites should have an easy option to delete graphics and choose "text-only" in order to increase the speed at which the display shows information. The presence of graphics can greatly increase downloading time and can bog down a screen reader who is interested in viewing text and not graphics. The "text-only" option could reduce the frustration of such users
who have no desire to view graphics and who do not want to waste time while graphics
download. Making screen reading easier, quicker and more enjoyable for the reader are
important considerations for anyone involved in displaying material on a computer monitor.

Regarding gender issues, several questions come to the foreground:

1. Why are more men than women studying computer science?
2. Why are there generally fewer women than men in computer-related fields?
3. What computer-related fields are women entering?

These are important questions that need to be researched to determine which factors may be
preventing women from being more fully involved in computer-related activities. Those
computer-related activities in which women are currently involved should be studied to
determine why and how women became involved in them. For instance, women do not appear
to use the Internet as much as men do, based on Internet-provider demographic material. The
following questions then arise on Internet-use topics that require more research:

1. Will the low usage of the Internet by women change?
2. What factors could boost the number of women on the Web?
3. Would providing Web sites that are more female-friendly—stressing cooperation
   (among users or between the site maintainer and users), providing rich context, or not
   involving risk—bolster female participation?

A review of Web sites that are popular with women might provide interesting insights into how
to design female-friendly Web sites—and software, for that matter. In addition, visitors to such
sites could be directed to other female-friendly sites to get information on other Web sites of
interest, as well as software companies that cater to their needs.

For language learners who want to learn languages at a distance, several important questions
that demand research arise. Some of the most basic are the following:
1. How can learners determine that a virtual school is using pedagogically-sound materials?

2. Are the language-learning materials designed by teachers or built by software engineers?

3. Are the language-learning materials simply drill-and-practice exercises placed on the Web or shipped on a disk, or do they incorporate the latest thinking on language teaching?

Certainly the buyer must beware. Of course, not everyone learns the same way, but it might be helpful to know what kinds of success the software or virtual school has had. For instance, what are the completion rates of students using the software, or the fluency level improvements of students in the virtual school? Such tests of success would have to be objectively quantified.

With e-mail and Internet connections, international possibilities exist for the development of communication skills for a diverse cultural community. Care will have to be taken to screen out—quite literally—divisive material such as sexist language and negative stereotypical attitudes. For language students studying other cultures, some cultural differences may seem difficult to understand—for example, the role of women in Islamic fundamentalist countries. Such differences may need to be explored and to be explained. How to offer such explanations provides an interesting research topic in itself.

As language students use the Web to find information or to have chat-room discussions, they will find that they have to develop critical research and evaluation skills. What is "real" information on the Web? What is biased, misleading, or false information? As smart virtual information-seeking agents search the Internet for students' requested information, how sure can the students be that the sources the agents visited for the information were credible? Most assuredly, as the price of Internet access declines and cheaper "Web TV"-like appliances
become available, students will stray into Web sites and chat rooms that may cause them to re-think how they view the world. How students react to information (both true and false) on the World Wide Web that conflicts with their worldview might provide fascinating topics for research and discussion. Surely, language learning and exposure to other cultural attitudes and beliefs can be a gateway for further student worldview enlargement. Then again, exposure to new cultures might strengthen a student's desire to shun them.

There are some indications today that computers and CMC—for example, the Internet—may amplify pre-existing patterns of social inequality. Therefore, such questions as these will need to be researched further:

1. Will providing equal access to computers and CMC generate equal interest in computers and technology?
2. Are certain socio-economic and racial groups more predisposed to make use of computers and technologic resources?
3. Would providing alternative choices for computer study and use based on ethnic background, gender, or religious preference be a viable option?
4. Is the technology gap between “haves” and “have-nots” in school increasing?

To answer the questions above will take long-term, objective study. Some of the solutions to improve monitor display design may be fairly straightforward and mostly mechanical. But many of the solutions to remedy inequities of gender and cultural bias may involve a fundamental re-thinking of how students learn and how cultures formulate their beliefs about the benefits of technology in general and computers in particular. Nonetheless, language learning at a distance via computer remains an interesting but vastly underrated option at this time for students who chose it. In the future, learning languages at a distance via computer should become an increasingly popular study option.
References


APPENDIX

LETTERS OF PERMISSION

September 15, 1998

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Yours sincerely,

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William L. Harrell, Jr. is a retired corporate manager and a long-time student. His academic accomplishments include undergraduate and graduate degrees in mathematics, and a graduate degree in Arts and Humanities. Completing the degree of Doctor of Philosophy represents a lifetime dream for him. His plans for the future include more academic publishing and sharpening his foreign language skills in German, Spanish, and Chinese.
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