CHAPTER 3

THE USE OF TECHNOLOGY FOR STUDENTS WITH
LIMITED ENGLISH PROFICIENCY

CHAPTER 3

THE USE OF TECHNOLOGY FOR STUDENTS WITH

LIMITED ENGLISH PROFICIENCY

INTRODUCTION: STATUS OF LIMITED ENGLISH PROFICIENT STUDENTS

The fastest growing segment of school-age population in the United States today is the group composed of students with limited English proficiency (LEP).* During the period 1978 to 1982, while the overall population of students ages 5-14 declined by 6.2 percent, the limited English proficient population grew by 10.3 percent.[1] current estimates of the total number of LEP students range from 1.2 million to 6.6 million.[2] Whatever count one uses, this group of students is making a major impact on the educational system.

---

* The Bilingual Education Act defines "limited English proficiency" and 'limited English proficient" as:

(A) individuals who were not born in the United States or whose native language is a language other than English;

(B) individuals who come from environments where a language other than English is dominant, as further defined by the Secretary by regulation; and

(C) individuals who are American Indian and Alaskan Natives and who come from environments where a language other than English has had a significant impact on their level of English language proficiency, subject to such regulations as the Secretary determines to be necessary; and who, by reason thereof, have sufficient difficulty speaking, reading, writing, or understanding the English language to deny such individuals an opportunity to learn successfully in classrooms where the language of instruction is English or to participate fully in our society.

1. Carol Pendas Whitten, Director, Office of Bilingual Education and Minority Languages Affairs, U.S. Department of Education, testimony before the U.S. Congress, House Committee on Appropriations, Subcommittee on the Departments of Labor, Health and Human Services, Education, and Related Agencies, Apr. 9, 1986.

2. The U.S. Department of Education uses a figure of 1.2-1.7 million school-aged limited English proficient children in 'The Condition of Bilingual Education in the Nation, 1986" based on an analysis of the number of children scoring below the 20th percentile (of their native-English age peers) on a test of Engish proficiency – the Language Measurement and Assessment Inventory (LM & AI), taken in the fall of 1982. This data was then factored to reflect growth from 1982 to 1986). U.S. Department of Education, "The Condition of Bilingual Education in the Nation" unpublished typescript, 1986.

The majority of these LEP students were born in the mainland United States, but growing numbers are immigrants or refugees. Up to a million persons, including undocumented entrants and refugees, are entering the country each year, predominantly from Asia, Mexico, and Central and South America.[3] Although LEP students can be found in every State in the Nation, they are most heavily concentrated (particularly Hispanics) in the border States and those States that are traditional areas of entry to the United States. California, Texas, Florida, New Jersey, New York, and Illinois have particularly large LEP student populations. Spanish is the predominant home language of LEP students in the United States, followed by the various Southeast Asian languages, but there are dozens of other languages which smaller numbers of LEP students speak when they first enter our schools.[4]

The immigrant children found on the doorstep of America's schools today present a special challenge to the educational system. Many have the multiple handicaps of poverty, the inability to speak English, and little or interrupted schooling, due to civil strife, famine, or poor economic conditions in their homelands. Many are illiterate in their native language. Educationally deprived, they are found to be retained in grade more often, drop out at higher rates, and achieve at lower levels than other students. Overall, students from homes in which a language other than English was predominate scored at least twenty points lower in reading than their classmates on the 1983-84 National Assessment of Educational Progress; Hispanics scored thirty-three points below their English speaking peers on the assessment.[5]

3.   Business Council for Effective Literacy Newsletter, "Literacy in a New Language," vol. 1, No. 10, January 1987.
4.   Bilingual Education Grant applications for FY86 included projects serving students speaking over 100 different languages. Ronald Saunders, National Clearinghouse for Bilingual Education, Wheaton, MD, personal communication, Feb. 9, 1987.
5.   Phi Delta Kappan, "Newsnotes" vol. 67, No. 7, March 1986, pp. 543-545.

One of the most serious consequences of the LEP students' difficulties with education is reflected in their high dropout rates. While national figures reveal that three out of four American students graduate from high school, for some minority groups which include large numbers of LEP students the percentage of students dropping out before graduation is much higher. Native Americans have the highest dropout rate of any racial/ethnic group: 48 percent, with Hispanic students following close behind at 45 percent. These figures are even higher in urban areas, with some studies conducted in urban high schools showing dropout rates as high as 85 percent for Native Americans and between 70 and 80 percent for Puerto Ricans.[6]

What is the price society bears when a student drops out of school? According to research conducted by Henry Levin at Stanford University, the cost of high school dropouts, ages 25-34, conservatively, amounts to $77 billion every year: $71 billion in lost tax revenues; and $3 billion for welfare and unemployment; $3 billion for crime prevention.[7]

In order to address these serious educational problems, States, localities, and the Federal Government have all made substantial investments in helping LEP students attain the English language skills which are prerequisites to their being able to succeed in school and in society. The size of this effort varies considerably from State to State and from locality to locality, depending upon the numbers of LEP students identified in each.[8]

---

6. A study recently conducted by the Hispanic Policy Development Project has documented that in New York City the dropout rate for Hispanics is about 80 percent. Chicago and Los Angeles, respectively, have 70 and 50 percent Hispanic dropout rates. Institute for Educational Leadership, Inc., School Dropouts: Everybody's Problem (Washington, DC: Institute for Educational Leadership, 1986).p.8.
7. Ibid., p.2.
8. Due to different methods of defining the limited English proficient population, and State differences in funding local school districts, there are no overall figures showing State by State spending to serve these students. Some States, like California, which has

In 1985, the Federal Government provided approximately $685 million to serve the needs of limited English proficient students, but this figure includes all funding sources which impact this group, including Chapter 1, adult education, refugee education programs of HHS, and Bureau of Indian Affairs activities. Funding for the Bilingual Education Act itself totaled $139 million.[9] (See Table 1)

The Bilingual Education Act, Title VII of the amended Elementary and Secondary Education Act of 1965, is conceived as a capacity building program, one which provides seed money to local districts in the form of grants. (This is in contrast to the formula funding programs based on student count found in Chapter 1 and Chapter 2 of the Act.) The two largest Bilingual Education Act programs are the Basic Projects and Demonstration Projects — both of which award grants to eligible applicants to support the development and implementation of bilingual education projects at preschool and K-12 levels. The Department of Education estimates that three States — California, Texas, and New York — received approximately 50 percent of these grants in the 1985-86 academic year.[10] Instructional program grants make up the largest piece of the Bilingual Education Act, with FY85 awards totaling $94.7 million and serving 205,494 students.[11] In 1982, the most recent year for which data are available, the Education

---

identified 567,000 LEP students, have categorical funding to serve this group. This year the State of California will spend approximately $110 million for specialized services to LEP students. Norm Gold, Director of Bilingual Education, State of California, personal communication, Feb. 8, 1987. In other States, due to the nature of their localized school financing patterns, this information is not assembled in such a way as to break out spending figures for LEP students. Ron Saunders, National Clearinghouse for Bilingual Education, Wheaton, MD, personal communication, Feb. 8, 1987.

9. Carol Pendas Whitten, op.cit.
10. Irwin, et al., "Impact of Legislative Changes on Major Programs Administered by the Department of Education, Fiscal Years, 1980-1987," CRS 86-990 EPW (Washington, DC: Congressional Research Service, Nov.20, 1986).
11. Other programs supported under the Bilingual Education Act are those providing training to education personnel working with LEP students (Part C: $23,566,000) and support services for LEP activities (Multifunctional Resource Centers: $10,000,000 Evaluation Assistance Centers $500,000, Instructional Materials: $250,000, State Educational Agency grants for data collection: $5,0000,000, National Clearinghouse for Bilingual Education: $1,200,000, Research Program: $3,600,000). "Condition of Bilingual Education," op. cit.

TABLE1

Federal Funding for Limited English Proficient Students, Fiscal Year 1985

Department of Education:	Millions of Dollars
Bilingual Education Act	139
Chapter 1 - Grants to LEAs	384
Chapter 1 - Migrant Education	68
Adult Education	27
Bilingual Vocational Training	4
Title IV, Civil Rights Act	7
Immigrant Education	30
Subtotal, Department of Education:	659
Department of Interior: Bureau of Indian Affairs	4
Department of Health and Human Services:	
Refugee Education~	17
Entrant program*	5
Subtotal, Health and Human Services	22
Total	685

SOURCE: Carol Pendas Whitten, Director, Office of Bilingual and Minority Language Affairs, U.S. Department of Education, testimony before the U.S. Congress, Subcommittee on the Departments of Labor Health and Human Services, Education and Related Agencies, of the House Committee on Appropriations, Apr. 9, 1986

* Note: These programs have since been transferred to the Department of Education.

Commission of the States estimated that Title VII funds accounted for about 60 percent of combined Federal-State expenditures for educating LEP students.[12]

Despite the increase in numbers of LEP students nationwide, Title VII local instructional programs served 27,380 fewer students in the 1985/1986 academic year than were served in 1980/1981, a decrease of almost 12 percent. Fellowships for graduate study in bilingual education teacher training decreased from 560 to 514 over the same time period, and the number of students in degree-oriented programs (including preservice, inservice teacher and administrator training) decreased from 11,000 to 5,590 over the same period. With funding for the Bilingual Education Act decreased by 14.3 percent from 1980 to 1987 (a decrease of 44.7 percent when adjusted for inflation), States and localities have had to bear a higher proportionate funding share in order to serve their increasing numbers of LEP students. The U.S. Supreme Court decision in Lau v. Nichols requires that all limited English proficient students receive instruction designed to meet their special needs. Unfortunately, in many cases local demand for instructional programs serving LEP students is negatively correlated with income, wealth, or other measures of taxing and spending capabilities; often those pockets with the highest concentrations of students in need of programs are least able to afford them. The percent of eligible students served by the Federal Title VII program varies according to the way the LEP population is defined. If one uses the low end of the U.S. Department of Education's count, 1.2 million LEP students, then Federal programs reach approximately 20 percent of the eligible students; if one takes the figure of 3.6 million students, the high end of the Department's estimate, only 8 percent are served;[13] and if one uses the 6 million LEP student count found in other studies, then fewer than 4 percent of the target population is

---

12.   Irwin, et al., op. cit., p. 25.
13.   Irwin, et al., op. cit., pp. 23-27.

served by the Federal bilingual program.

TECHNOLOGY AND THE LIMITED ENGLISH PROFICIENT STUDENT

Is technology being used as a resource for meeting the instructional needs of LEP students and, if so, where and why? Do limited English proficient students have as much access to classroom microcomputers as do their English speaking peers? What kinds of technologies are being used in teaching LEP students, and what are the implications of technological breakthroughs for future activities? What are the roadblocks to greater implementation of innovative technologies? The following sections deal with these questions.

Access

The question of access to technology for the student with limited English proficiency is a multifaceted one. Researchers note the "double barrier" faced by these students: [14]

> Language minority students who are limited in English proficiency have fewer opportunities to use and interact with computers than do the general population of students. They often experience a double barrier, the first resulting from their being in low SES, primarily minority schools, and the second resulting from their lack of English proficiency. In addition, the opportunities that they do have to interact with and use computers are often qualitatively inferior to those of the other students.

This lower rate of access to computers is confirmed by data from the 1986 National Survey of ECIA Chapter 1 schools. [15] This study was designed to obtain information regarding teaching practices of approximately 3,500 teachers from 1,200 schools nationwide who had at least one student in their class who received Chapter 1 or some

---

14.   Donna M. Johnson, "Using Computers to Promote the Development of English as a Second Language," A Report for the Carnegie Corporation, unpublished typescript, November, 1985.
15.   1986 data from the National Survey of ECIA Chapter 1 Schools, conducted by Westat Corporation for the U.S. Department of Education.

other special service such as State Compensatory Education. The teachers were asked, among other questions, what subjects they teach and whether they use a computer to help teach the students in their classes. The results (Figure 1) show that the percentage of teachers who use computers in instructing their LEP students is consistently less than one-half the percentage of teachers who use computers in teaching other students. This holds true for both Chapter 1 teachers and regular classroom teachers. As one educator noted, where computers exist in a school, the line to use them is still along one, and the LEP student is put at the back of the line. His teachers see that the materials are almost always written in English, and assume that the non-English speaking student will not be able to profit from them. [16]

If one avenue of access to computer instruction is through Chapter 1 services, it could be assumed that the limited English proficient student who is in the elementary school is more likely to have access to computers than is his junior high or high school counterpart, approximately three quarters of all students receiving Chapter 1 services attend elementary schools.

Another possible barrier to computer access in the upper grades are the course-entry requirements. A 1985 survey of 20 high schools in California with high levels of Hispanic enrollment documents barriers to computer use by the Hispanic students. In these schools, like many others nationwide, the high school computers generally fall under the control of the mathematics and science teachers, and often there is a requirement that algebra be taken prior to entry to a computer course. The Hispanic students, who were less likely to participate in these courses, were consequently found to be less likely to enroll in the computer courses. [17]

_____

16.   Esteban Diaz, Center for the Studyof Human Cognition, University of California at San Diego, videotaped interview, February 1987.
17.   Arias, Beatrice 'Computer Access for Hispanic Secondary Students: Barriers to Equity," paper presented to American Educational Research Association annual meeting, Chicago, IL, April 1986. Another study (Microcomputer and VCR Usage in Schools, 1985-1986, Quality Education Data, Denver, CO, 1986, p. 33), comparing Hispanic enrollment and microcomputer density in schools, showed no clear pattern of available computers

FIGURE 3-1

Teacjers* USING COMPUTERS IN INSTRUCTION
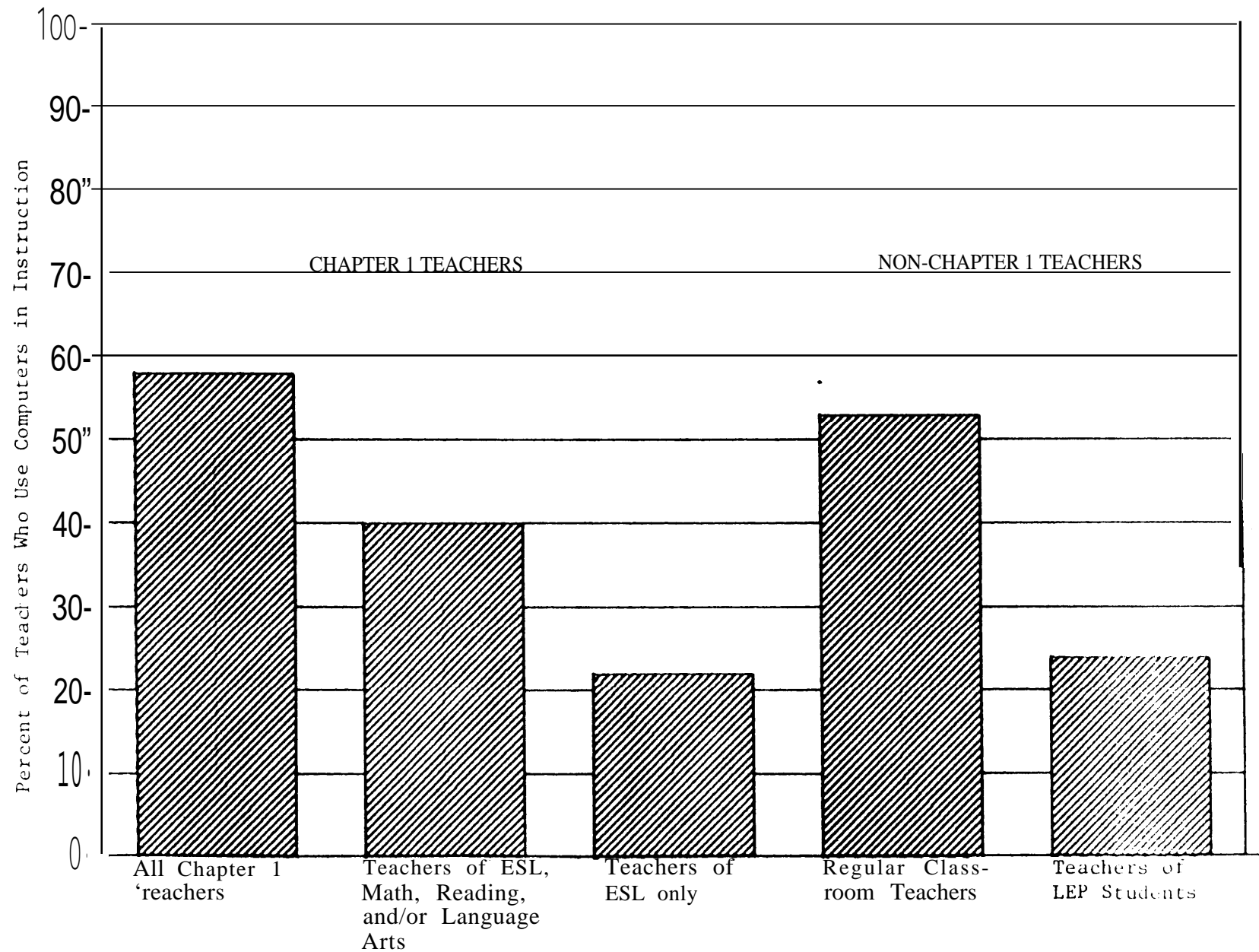
*In schools receiving Chapter 1, State, o r other compensatory education, or special education **scrvices** .

SOURCE: Wes tat Corp. , National Survey o f ECIA chapter 1 Schools , 1986

Another factor found in Arias' survey, and also noted in analyses of Chapter 1 schools, is the limited access which poor students, including LEP students, have to computers outside of class time. This works in two ways, both to the detriment of these students. Their families cannot afford a home computer, and at school they often face the "locked lab" syndrome. In these poorer neighborhoods, school concerns about the physical security of the computers may result in policies limiting the access both students and teachers have to the machines. Computer rooms are likely to be available only during class as there are fewer staff available to monitor before or after-school computer activities. Schools in poor neighborhoods are not as likely to allow students to check a computer out for the weekend to "hack around on,"[18] and as a result, the student or classroom teacher in this setting typically does not have these opportunities to feel comfortable with a computer that use at home or outside the domain of the class period allows.

The other side of the question of equal access is the qualitative one: is there a difference in the kind of computer activities" in which the limited English proficient student is involved? Survey data[19] about computer use in low Socioeconomic status, predominantly minority, schools point to using the computer in a compensatory manner to raise achievement levels through drill and practice for low achievers. Data on Chapter 1 computer use also point in this direction, and both these uses correspond to what seems to be the predominant practice with LEP students. Some educators fear that computer-assisted instruction (CAI) used for remedial instruction alone may diminish a student% self-image; these educators emphasize that the low achieving student should

---

per student in schools with high percentages of Hispanic students.

18.   Educator Sherry Turkle talks about the importance of 'making the computer your own", which comes from having the chance to play around on it, to try things on it in the less demanding atmosphere of nonclass time or in one's own home. Sherry Turkle, The Second Self: Computers and the Human Spirit (New York: Simon and Shuster, 1984).

19.   This data shows that poor schools are gaining in their computer acquisition rate, but the numbers of computers per student is still lower than in wealthier schools. Henry Becker, Center for Social Organization of Schools, The Johns Hopkins University, "1985 National Survey of Instructional Uses of School Computers," 1986.

BOX A

TERMS: Bilingual Instruction Alternative Approaches

Bilingual education — a program in which students receive a substantial part of their initial instruction, including reading, in their native language. At the same time, they start studying English, usually during daily periods of intensive instruction in English as a second language (ESL). When the curriculum also includes the study of the history and culture associated with the home language, these programs ma-y also be referred to as bicultural or bilingual maintenance programs.

Transitional bilingual education — similar to bilingual education program with emphasis on phasing out of home language usage in all subjects as English instruction is gradually phased in.

English as a second language — a variety of approaches to teaching English to students who speak another language. (The term ESOL refers to "English for speakers of other languages") ESL commonly involves intensive instruction in English, often through the use of audio-visual materials, with emphasis on communication skills.

Immersion — a program in which teachers speak only English to their limited English proficient students. If the teacher in an immersion program understands the language of the students, cues them in their home language for clarification, and allows the students to respond when necessary in the home language, this is referred to as structured immersion.

Sheltered English or Sheltered Content — a technique for teaching academically demanding courses such as science and social studies in English to students not fluent in English. Typically teachers make subject matter more comprehensible by slowing down their speech, repeating key vocabulary words, and using visual aids, "hands-on" approaches, and similar nonverbal activities.

In practice, there is generally a good deal of overlap between these instructional approaches, blurring their distinctions.

---

1. Rick Holland, U.S. Congressional Research Service, "Bilingual Education: Recent Evaluations of Local School District Programs and Related Research on Second-Language Learning," Mar. 18, 1986, pp. 7-9; and 'Teaching Immigrant Children: Terms and Issues" Los Angeles Times, Jan. 13, 1987, p 29.

have the opportunity to learn more advanced computing applications such as word processing, database management, and programming, like his higher-achieving classmates. [20] Nevertheless, the achievement gains in basic skills which CAI has shown to provide have convinced many educators that remedial instruction is inappropriate use of the technology.

Why is Technology used in Bilingual/ESL Instruction

Schools are using technology to meet the needs of their students with limited English proficiency for two basic reasons —because it works, and because it provides a means to provide instruction where other resources are not available.

The burden for the limited English proficient student is not just learning the English language — he or she is also struggling to master mathematics, science, social studies, and other subject matter content, as well as learning study habits and the social skills needed to interact comfortably with his English speaking peers in the school setting. Whether the school uses a bilingual, transitional bilingual, English as a second language, immersion, or a mixed instructional approach, (see Box A) computer assisted instruction has been seen as one tool to boost the limited English proficient student in his climb over what may seem overwhelming academic and social hurdles.

Researchers have looked at studies of computer-assisted instruction and computer-assisted language learning (CALL) and found reasons supporting the use of the technology to enhance the limited English proficient student% opportunities for academic success. The following findings on the general effectiveness of CAI suggest implications for the LEP student in particular: [21]

20. "The New Information Technology and the Education of Hispanics: The Promise and the Dilemma,[N] Policy Pamphlet Series 1, The Tomas Rivera Center, Claremont Graduate School, Claremont, CA, 1986.
21. Much of this summary comes from a paper by Patricia Dunkel, Pennsylvania State University, "The Effectiveness Literature on CAI/CALL & Computing: Implications of the Research for Limited English Proficient Learners" (soon to be delivered at TESOL Conference, Miami, FL, April 1987).

First, CAI has been shown, in many settings, to improve academic achievement. A number of studies have documented this, including a 1986 meta-analysis of 28 studies which compared final examination scores in classes using CAI with those using conventional instruction and found higher scores among the CAI students.[22] In applying this analysis to uses of CAI with limited English proficient students, a significant factor is the finding that improvement is greatest with the lowest-achieving student groups.[23] Since LEP students typically demonstrate low achievement rates, the targeting of computer resources to this group would appear to be a logical use of resources.

Secondly, according to other studies, certain types of learning takes place at a faster pace when computers are used.[24] Since LEP students have more to learn, the use of CAI as a tool to speed up their rate of learning seems justified.

Thirdly, and perhaps most importantly, student motivation for learning improves with computer-assisted instruction. While perhaps harder to measure, student motivation is easier to detect in classrooms and is frequently mentioned by computer-using teachers in bilingual or ESL programs. Several reasons for this improved motivation are generally cited:

- The computer is infinitely patient. * A student who has had difficulty mastering a concept, whether it be subject-verb agreement in English grammar, or long division rules in basic mathematics, can go over and over the problem area for as long as necessary for the concept to

22.   J.A. Kulik, et al., "Effectiveness of Computer-based Education in Elementary Schools," Computers in Human Behavior, vol. 71, N-o. 1, 1985, pp. 59-74.
23.   G. Fisher, "Where CAI is Effective: A Summary of the Research," Electronic Learning, vol. 3, No. 3, November-December 1983, pp. 82-84.
24.   J. Orlansky, "Effectiveness of CAI: A Different Finding," Electronic Learning, vol. 3, No. 1, 1983, pp. 58-60.
*   The discussion below assumes software which provides, as a minimum, a variety of problems presented, some positive feedback for correct responses (whether it be the simple expression "Good work!" or more elaborate graphics, bells, and whistles employed in some software), and progression to new skills once previous material is mastered.

become clear.   If the principle is then understood, the student can continue to practice at his own pace without pressure until the learning truly takes hold. This is drill and practice in its postpositive application —giving the student more time on task, or "seatwork" with the instructional materials.

- Reinforcements positive, nonnegative, and comes immediately on the heels of the response, (not a week later when the graded test or worksheet is handed back). Again, for the LEP student with so much to learn, this immediacy of feedbacks particularly important.

- The computer allows the student to fail privately without shame. Learning only takes place by making mistakes, yet for the LEP student, who is often older than his or her English speaking peers in grade, it can be particularly humiliating to give an incorrect answer orally, in front of the entire class. Since the computer never laughs at anyone, the student can develop the nerve to try and fail in a nonthreatening environment until success finally is achieved.

- The interactive nature of working on a computer gives the student a sense of control and skill. By the very act of booting up the program and entering data on the screen,[25] the student has some Control Of the learning process.   The individualized pacing of materials reinforces

25.   Conversations with teachers of LEP students indicate that these students have no more difficulty learning how to operate a computer than any other students. Even those who come from environments where they have never before seen a computer adapt quickly to the physical tasks; they are no more computerphobic than other youngsters. Jim Bellino, ESOL teacher, Montgomery County Public Schools, MD, personal communication, Jan. 20, 1987; Nga Duong, Seattle Public Schools, Seattle, WA, personal communication, Jan. 12, 1987, among others.

this sense of being in charge of one's own learning. The feeling of teaching oneself is a heady experience for any learner. For those stigmatized by the lower status accorded to non-English speakers in our society, the improvements in self-esteem which can follow from being able to take charge can be a first step towards improved academic motivation.

Some of the most promising avenues of computer use for ESL students are in the area of language development through writing. Here, too, general evaluations of computer effectiveness translate to successful applications with the LEP student. For example, IBM's Writing to Read Project focuses on writing as a means to develop literacy skills with prereaders, English-dominant children at the kindergarten and first grade level. The program has been put into place in schools in over 40 some large school districts across the Nation, about one-third of which use the system in Chapter 1 projects. Some teachers who work with LEP children in the Writing to Read Program are particularly impressed by these children's English language skills development through this writing process.[26]

Computers have been hailed as an effective tool for teaching writing to students in the upper elementary and secondary schools as well. In an attempt **to see** if the improvements in writing skills often found in computer writing projects translate to similar effects when used with Limited English proficient students, the NETWORK, Inc. of And over, Massachusetts, received a Title VII grant for serving gifted and talented elementary students with limited English proficiency through a computer-based writing program. Results from the 1985/1986 school year indicate that the students made

---

26. At the Franklin Year Round School in Oakland, CA, where 95 percent of the kindergarten students are non-English speakers, the Writing to Read program has helped these youngsters develop word and sound recognition in English. By the midpoint in the school year, almost all the kindergarten children tested at the 1.0 grade level on the California Test of Basic Skills. Dr. Jay Cleckner, Principal, Franklin Year Round School, Oakland, CA, personal communication, December 1986.
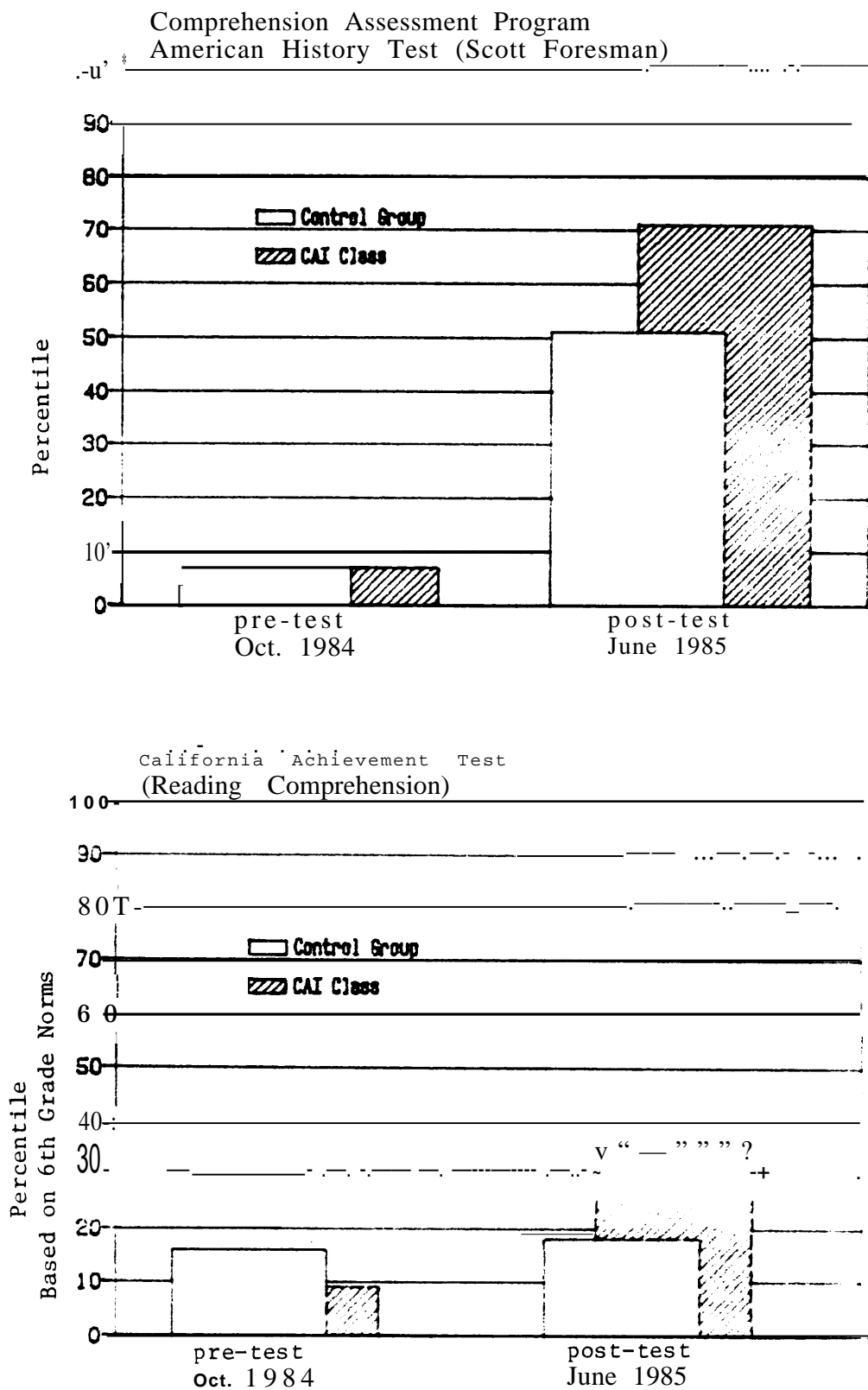
In 1983, District 1 of the Seattle Public Schools was awarded a 3-year Title VII grant from the Department of Education to use computer-assisted instruction (CAI) to increase the achievement of limited English proficient students in U.S. history. The CAI materials were developed locally to coordinate with the district curriculum, but adapted to the lower reading skills of their target ESL groups: Vietnamese, Cambodian, and Laotian high school students. The software itself is bilingual, with text and instructions generally in English, and vocabulary in English and the native language. Native language instruction is utilized to explain the operation of the hardware and software; to clarify difficulties with vocabulary, concepts, and factual data; and to link newly-learned concepts with the students' conceptual framework of native language, culture, and history.

Results of the first 2 years of the program (see figure 2) indicated that the experimental group of students at the project school had higher achievement rates in U.S. history and reading comprehension than did those in the comparison group, which was composed of language-matched LEP students who received the traditional U.S. history course without the CAI materials. Although the third year test results are not as dramatic, (the project director attributes this to student variables), the district has demonstrated its satisfaction with the project by funding it out of its own budget at the conclusion of the Title VII grant. Plans are now underway to distribute the project to other schools with similar ESL needs within the District.[1]

---

1. Nga Duong, Project Director, "Bilingual Computer-Assisted Instruction: Bridge to Academic Excellence," Seattle Public Schools, District No. 1, final report to the U.S. Department of Education, 1986.

FIGURE 2.--Seattle Public Schools, ESEA Title VII Academic Excellence
Program Student Achievement Results: Computer Assisted
Instruction Class v. Control Group for U.S. History Test
and Test of Reading Comprehension

Comprehension Assessment Program
American History Test (Scott Foresman)

California Achievement Test
(Reading Comprehension)

SOURCE: OTA

progress in their writing skills in terms of objective measures such as longer essays, longer and more complex sentences, substitution of punctuation for connective, better choice of words, better subject/verb agreements, and more sophisticated use of verb tenses; as well as demonstrating improved overall control over the writing process in terms of having clearer beginnings and endings, better handling of content, and more fully-developed ideas.[27]

Yet another example of how writing can become a means to break through communication barriers is found in the computer language long distance networks being developed by ESL teachers in several sites across the Nation. The philosophy behind this approach is that, by using the mother tongue in academic settings to accomplish communication tasks valued by the students, writing improves, first in the native language and then in English. In some cases standard writing software is used such as "Applewrite[N] or "Bank Street Writer." As an aide to writing in Spanish, however, a low-cost "bilingual" chip has recently been developed which can replace the character generating chip in the Apple II computer. When this is used with a Spanish language writing software package, students can then write in Spanish with the appropriate accents. A Spanish version of "Fredwriter," the popular public domain writing package, is currently being marketed with this character chip, for under $40.[28]

"De Orilla a Orilla" (From Shore to Shore) is a project linking Latino students in bilingual classes in the United States with sister classes in Puerto Rico. In New Haven Connecticut, a class of 40 fourth graders, predominantly children of Puerto Rican parents, is paired with a similar fourth grade class in Rio Piedras, Puerto Rico. The students communicate exclusively by word processing as they plan, compose, revise, and edit 'texts and messages to their counterparts in the 'sister school." They have jointly

---

27. John Kaiser, Project Director, 'Special Populations: Serving Limited English Proficient Students With Special Needs Through Writing," performance report to the U.S. Department of Education, January 1987.
28. Al Rogers, Technology Center, San Diego County Public Schools, San Diego, CA, personal communication, Feb. 19, 1987.

BOX C

Another kind of writing program for limited English proficient students, in this case Navajo children in a Chapter 1 program, is being used at Arizonans Kayenta Intermediate School. Kayenta's Chapter 1 teacher, Tess Ritchhart, has developed a program for her students, all of whom speak English as a second language, called the "Language Experience Program." The children, third, fourth, and fifth graders who test at below the 35th percentile on the Iowa Test of Basic Skills Reading and Language scores, come to her Language Experience Classroom for 30 minutes, 5 days a week, where, as she tells them, her job is to make them "as smart in English as you are in Navajo." The children tell the stories they have in their heads, creative tales of subjects that are important to them, writing thereon the classroom microcomputers, then printing and illustrating these 'books/' and sharing them with one another as well as with students outside the Chapter 1 class. They also tape one another on videocassette as they read their books and present plays they have written. Standardized test results show the childrens' academic gains; perhaps more exciting are the classroom teachers' assessments of their Language Experience students' improvements in self esteem. The teachers report that the youngsters come into the program feeling at a loss in the foreign world of the English-speaking school, but, through the successes they experience in the Language Experience program, come away with a measure of control over this world, confident in their ability to contribute to it. Once they see themselves as special people (bigshots!) in the school, they exhibit improved attitudes toward reading and school in general.

---

1. Tess Ritchhart, 'Teaching English Using Shakespeare, VCR, Computers, Children's Drama and Student Authoring," materials supplied by Donald R. Kearns, Director, Chapter 1, Arizona Department of Education, 1986.

produced a student newspaper and articles on research topics of interest, such as an investigation of Spanish proverbs, in which they draw upon the cultural resources of their parents and relatives. The goal is the same for the students at both sites: to promote Spanish language literacy through the motivating context of their writing.[29]

Deaf students exhibit many of the same difficulties as do non-English speaking students when learning to communicate in written English, and researchers are studying the effects of using computer writing across local area networks (within a classroom) as a means for this group to break through their barriers of silence.[30] At Gallaudet University in Washington, D.C., a local area network (called ENFI for English Natural Form Instruction) has been developed to teach deaf students to "talk" to one another through instantaneous written communication. Young deaf children from Kendall Elementary Demonstration School use the network once a week to develop and practice their communication skills in writing — the appropriate forms of introducing a topic, maintaining it, 'listening" to what the other person has to say (via reading), responding appropriately, and communicating clearly so they can be understood. In addition to further developing basic skills of communicating (which they are also learning in sign language), they also learn writing skills by sending messages to each other, by writing group stories, commenting on each others' work, and writing back and forth with their teachers. At the college level, entire classes are conducted on the network. As students discuss subject matter or compositions they are working on via the network, they develop

---

29.   Anecdotal information from teachers at the sites indicates that striking results come from the English as a second language students being able to communicate with their peers in a Spanish-language dominant society.   With their newly-found communicative power has come improved self images, resulting in their becoming more active participants in their regular school classes. Dennis Sayers, Center for Language and Culture in Education, University of Hartford, "International Computer Networks and Bilingual Literacy,"unpublished paper, December 1986.   For another example of computer networking for literacy and language skills, see reference to Esteban Diaz in the Technical Summary portion of this report.
30.   Joy Kreeft Peyton and Trent Batson, 'Computer Networking: Making Connections Between Speech and Writing,"ERIC/Clearinghouse on Languages and Linguistics News Bulletin, vol. 10,No. l, September 1986.

and refine their skills in written English (which for them must be learned as a second language), in the same way that a non-English speaking student learns English grammar, idioms, phrasing, and discourse structure by participating in authentic communication that is focused primarily on content rather than form. Before the network was introduced at Gallaudet, hearing impaired students' use of written English in school was confined to structured drills, worksheets, and formal compositions.

Technology's Role in the ESL/Bilingual Teacher Shortage Problem

Another area where technology can play a role in bilingual education is as a means of providing instructional support where qualified teachers are not available to meet student needs. Although figures are not available for overall national shortages in bilingual or ESL teachers (due to variations in defining target students, as well as in State counts, certifying requirements, and emergency hiring procedures), in California alone there is a need for 10,000-11,000 more certified bilingual teachers at the elementary level this school year.[31] Fellowships awarded for graduate study in bilingual education teacher training decreased from 560 in 1980/1981 to 514 in the academic year 1985/1986, and the number of students in degree-oriented programs (pre and inservice teacher and administrator training) decreased from 11,000 to 5,590 in this same period.[32] Fewer than half the States require certification of ESL or Bilingual Education teachers, although 16 States have legislative initiatives under development to revise or upgrade certification requirements in ESL or Bilingual Education.[33]

---

31. Gold, op. cit.
32. Irwin, et al., op. cit.
33. A recent study of certification of language educators (unpublished draft) showed that 19 States require certification of English as a second language teachers, and eight States require certification for bilingual education teachers. Endorsement, which is defined in the study as State recognition of the right of an individual to teach a certain specialty area although his or her certification is in another specialty area, is required in 11 states for English as a second language teachers, and in 17 States for bilingual education teachers. Endorsements are usually granted for completion of a minimum number of credit hours, generally substantially fewer than the required minimum for specialty area certification. Five States provided for emergency or temporary

States and districts are turning to technology as one means of providing resources where fully certified teachers are not available. Again, ESL and bilingual education programs may benefit from the example of technological approaches to meeting teacher shortages in other areas. For example, Utah has developed an innovative instructional program combining television and computer technologies, called the Distance Accelerated Learning Program (DALP) to teach Spanish across widely scattered rural sites across the State, in schools where certified teachers are not available. Students in grades 6-10 in **45** schools in 26 districts across Utah (and subscribing Districts in 5 other States) are provided instruction via this combination of technologies. Research results show that the program has met its goal of covering 2 years of Spanish instruction in one school year. Based on the program's success, the project designers are now working on turning the program around, to provide English language instruction to native Spanish-speaking high school students where similar teacher shortages preclude ESL instruction. The interactive computer activities, classroom management techniques, and video/audio components will be structured as in the original Spanish instructional program.[34]

The interactive videodisc is another technology that shows promise, as it can take the best of a scarce educational resource — good teaching — and multiply the instructional impact, reaching a much wider audience. Videodiscs can also provide the personalized pacing and cognitive reinforcements found in advanced computer programs. With dual audio tracks, the use of video to present language use in dramatic context, and branching capabilities, interactive videodiscs are now being developed to

certification in the English as a second language/Bilingual teaching areas. Karen Willetts, Center for Applied Linguistics, unpublished paper, 1986.

34. Videotaped instruction is transmitted by satellite for 40 minute sessions five times every 2 weeks. On nonbroadcast days the students work with voice-synthesized vocabulary drills on the computer, and with traditional written instructional materials. Classrooms can be managed by non-Spanish speaking teachers or classroom aides. Evaluation results have been positive on measures of listening, reading, and oral proficiency skills. Kenneth L. Neal, Coordinator, Instructional Technologies Unit Utah State Office of Education, Office of Curriculum and Instruction, materials and personal communication, 1987.

BOX D

"Skillpac: English for Industry" is an interactive videodisc that teaches English language and cultural skills in a vocational context appropriate to the petroleum, construction, and other industries. While learning about such job skills as inspecting shipments, maintenance of equipment, reading meters and gauges, planning meetings, and dealing with industrial accidents, the learner also is guided from a low to intermediate level of English proficiency to a relatively advanced level, with focus on such language functions as greetings, introductions, and leave takings; following oral and written directions; asking for and giving clarification; making small talk; describing and explaining; analyzing and responding; comparing and contrasting; using the telephone; and reporting orally and in writing, among other uses of language in context. The videodisc, originally designed for petroleum workers in Indonesia, has instructional assistance in Indonesian. In the United States, different versions for native Spanish and Portuguese speakers have been used with displaced workers in Massachusetts. These materials provide not only visual images but also opportunities for listening in context as required for effective language learning, and maybe equally useful with non-English speaking high school students in vocational education programs.[1]

1. Allene Guss Grognet, "Skillpac: English for Industry," Center for Applied Linguistics, Washington, DC, materials and personal conversation, January 1987.

provide foreign language training for the military.[35] Other videodiscs just coming on 'he market, such as Optical Data Corporation's "Principals of Biology" and 'Physical Science" videodiscs, provide bilingual audio tracks.   These comprehensive science curriculum materials can assist the non-Spanish speaking teacher who would otherwise have difficulty teaching science concepts to his or her English deficient students.

BARRIERS TO FULLER IMPLEMENTATION OF TECHNOLOGY

The factors which are barriers to fuller implementation of technology in bilingual education are similar to the factors which hinder educational technology in general. They are the lack of quality software, the need for further teacher training, restricted funding sources, and gaps in educational research.

The Software Problem

Educators have lamented that good-quality software is one of the missing links to full utilization of microcomputers in the schools. Nevertheless, in the last few years many excellent programs have been developed in the fields of mathematics, language arts, social studies, and the sciences, as well as utility software packages such as word processing, databases, and spreadsheets which can be used in various subject areas. In the field of bilingual education and English as a second language, however, the software picture is not as encouraging as in other academic areas, both in terms of quantity and quality.   For example, the 1988-1987 edition of <u>The Educational Software Selector</u> (TESS)[36] lists only 34 entries under ESL out of a total 6,838 instructional products in the directory (Table 2).   Furthermore, although the 1985 guide to 'Microcomputer

---

35.   Brigham Young University, CAI/CALL Research, materials provided by Frank Otto, December 1986.
36.   <u>The Educational Software Selector</u>, 1986-87 edition, EPIE Institute (Southampton New York, Teachers College Press).

Table 2

Distribution of Commercial Software Products by
Individual **Subject** Matter Areas

Subject Matter	Number of Software Products
Agriculture	16
Aviation	12
Business	189
Comprehensive	536
Computers	**306**
Driver **Education**	
Early Learning-preschool	10:
English-Language Arts	751
English as a Second Language	34
Fine Arts	172
Foreign Language	305
Guidance	110
Health	92
Home Economics	113
Industrial Arts	57
Logic and Problem Solving	111
Math	1,646
Medicine	67
Miscellaneous	27
Physical Education	37
Reading	636
Religion	24
Science	1,013
Social Science	375

1.   Generic software that **can be used** in all subjects.
2.   Computer programming and computer literacy.

Courseware for Bilingual Education"[37] has total of 466 entries, many of these are standard software programs in reading, language arts, mathematics, and counseling — materials which, while possibly usable in an ESL setting, have not been specifically developed for use with limited English proficient students. Consequently, teachers of limited English proficient students are in a situation similar to that experienced by special education teachers: taking general purpose software and adapting it for use, or trying to use it as is, for their students with special needs. As mentioned earlier, teachers often hesitate to use software written in English with their LEP students, thereby limiting the students' access to computers.

Although some software used with LEP students employs the concept of "sheltered English" (see definition section above) in subjects such as science and social studies, this type of software is rare.[38]

Software developers and distributors, as well as educators looking for materials suitable for LEP students, emphasize that the bilingual education/English as a second language market is a thin one, discouraging the investment of development dollars necessary to create state-of-the-art software to suit the varying language needs across the K-12 grade spectrum. This difficulty is further compounded by publishers' concern over the current uncertainties of bilingual education as an accepted educational approach for LEP students, due to such political questions as California's recently enacted Proposition 63, interpreted by some as an "English only" mandate. Much software used in classes is teacher-designed, with resulting mixed quality. Some exciting work is coming

37.   Deborah Sauve, National Clearing house for Bilingual Education, InterAmerica Research Associates, "Guide to Microcomputer Courseware for Bilingual Education," 1985.
38.   Lawrence **Stolurow,** Center for Education Experimentation, Development, and Evaluation, College of Education, The University of Iowa, Iowa City, IA, personal communication, Feb. 17, 1987.

BOX E

The Houston independent School District serves 42,000 limited English proficient students, a high percentage of whom are at the lower elementary and elementary school levels and who also have severe academic problems. The district staff searched among available English as a second language software for units appropriate for this population, and found that many publishers took reading software and called it ESL, while others simply made word-for-word translations of existing language arts software, which the Houston staff found equally unsatisfactory. They looked particularly for software which contained audio output, as they felt this was especially important for their large preliterate population of LEP youngsters. When they found little to meet their specifications, they approached major software publishers and invited them to produce ESL software meeting their specifications; the results were bids beyond their budget, on systems requiring large investments in new hardware. As a result, Houston developed its own ESL software over a 2-year time period, involving a staff of 15 and a cost of approximately $1 million. The product includes 14 instructional units of computer-assisted instruction, utilizing digitized speech playback of human voices of all types (male, female, child, grandparent) and in dialog conservation, all in English. The software has been extensively tested and implement across the district in existing Chapter 1 programs serving the LEP student population.[1]

---

1. The software, called "Harmony," works with the Euphonies system, an audio output device and card for use with the Apple computer. It is now marketed by Jostens Learning System and the royalties have already repaid Houston's initial investment in the product development. Dan Daniels, Executive Director, Technology Department, Houston Independent School District, Houston, TX, personal communication, Feb. 13, 1987.

out of university settings, where industry contributions of equipment and resources has begun to stimulate courseware development, but the applications in bilingual and ESL materials remain a small piece of the overall effort.

Allied with the problem of quality is the problem of distribution. The software that is produced by teachers, whether on their own or with Federal funding, as in Title VII projects, may sit in the teacher% desk drawer, its existence and potential hidden. Furthermore, although the National Clearinghouse for Bilingual Education has a contract to maintain a database of all materials; including software produced under the Office of Bilingual Education and Minority Language Affairs (OBEMLA) funding, it does not have the capacity to evaluate, reproduce, or distribute this material to interested schools who might find it useful.[39]

Teacher Training

For teachers to be able to use technology effectively and creatively, they need appropriate training. For most teachers of LEP students, technology training, when available, has mainly concentrated on computer literacy and the use of very specific types of materials used in the instruction of the LEP student.[40] There is a general agreement among educators that teachers working with Limited English proficient students need more training in the use of computers to aid instruction.[41] They need experience with identifying and evaluating software, information on where to go to find appropriate software, and familiarity with the authoring software which provides a shell

---

39. As one means of addressing this need, Ohio University's Program of Intensive English and the Department of Linguistics have set up a Clearinghouse for ESL Public Domain Software. Users can purchase any disc listed in the catalog for the price of reproduction and mailing (about $5.00-$7.00) or they may trade a piece of software they have designed for another disc. The catalog currently lists 18 titles, but the clearinghouse coordinator is optimistic that interest in the field will generate many more listings in the future. Jeffrey Magato, ESL Software Clearinghouse, personal communication, January 1987.
40. Ron Saunders, COMSIS, personal communication, Feb. 20, 1987.
41. "The New Information Technology and the Education of Hispanics: The Promise and the Dilemma," op. cit.

for them to fill with their own materials based on their curriculum and the students' needs. They need to develop a sense of mastery over the computer which allows them to understand and apply its potential in their instructional activities.

Research

OBEMLA's Office of Research has outlined many areas where better research data is needed to assess the impact of various educational treatments of limited English proficient students. The role technology has or can play in these various educational treatments needs to be explored as well. Given the scarce resources (dollars and teachers) available to serve the large educational needs of LEP students, are distance learning and CAI/CALL cost effective uses of scarce resources? And, more generally:

- How do people learn a second language? What cultural differences come into play in language learning environments? What is the effect of peer learning? Of motivation? How can technology be used to enrich what research says about the importance of listening skills, comprehensible input, language learned in context, and content-based language instruction? Blending the expertise of linguists, cognitive researchers, child development specialists, sociologists, and technologists would enrich the research well beyond what any individual field can offer on its own.

- What can we learn from longitudinal research? Most ESL studies look at results after one to three years of treatment, yet the complex analysis of language acquisition, and important spillover into other academic areas, may need fuller follow-up than this, in technology treatments as well as in more traditional educational approaches.

Funding

As in all educational activities, cost is a factor. For technology, it is a big factor. Although the cost of computing power has decreased dramatically (an investment of $2,000 to $3,000 today will secure a microcomputer with peripherals which can provide the capability offered only by a mainframe computer of 10 years ago),[42] and although there are over a million personal computers in K-12 schools today, technology remains a heavy investment for any school system, whether it be the startup costs of hardware, or costs of software, maintenance, communication lines, teacher training, improved school security to house expensive equipment, insurance, and so on. It takes dollars to remove the roadblocks to implementation listed above. If innovative educational materials are to be developed which utilize the full potential of current technology (e.g., expanded use of voice synthesizers for audio components in language training or the development of interactive videodiscs), heavy investments will need to be made.[43] For school systems to do the necessary planning and create programs targeted to district-wide approaches to LEP educational needs will cost them both time and dollars that might otherwise be spent on other competing educational needs.

SUMMARY AND IMPLICATIONS FOR FEDERAL POLICY

Findings concerning limited English proficient students and educational technology are summarized below, followed by policy implications raised by these findings.

The population of limited English proficient students is a large one, and will continue to grow in the decade ahead. These students present a significant challenge to

42. **Dunkel, op. cit.**
43. For example, the **Skillpac** videodisc described above cost over $300,000 to create, according to estimates of its developers. The funding for this project came from a private business that saw the cost as a worthwhile investment asa means of **developing a** skilled work force. **Allene** Guss Grognet, Center for Applied Linguistics, personal communication, February 1987.

the education establishment, since they must learn more in school (the normal academic skills along with English) than do their English-speaking peers.   At present, the educational needs of large numbers of these students are not being met, as evidenced by their disproportionately high failure and school dropout rates. Consequently, there is a clear and pressing need to optimize the reach of programs and services for students handicapped by their English language deficiencies.

Technology can play a role in programs for LEP students, as well as bridge their transition into the educational mainstream.   Where technology is being used, LEP students are assisted in the learning of basic skills and acquisition of English. Programs that utilize computer-based instruction find that the technology can provide immediacy of reinforcement, positive feedback, extensive practice, individualized pacing, and a greater degree of student control over the learning process. Advances in technological capability add dimensions such as graphics, sound, music, and video that can provide a broader real-life context to language learning.   Newly affordable digitized speech generators can play an important role in the development of oral language skills.

There is one particular area where computers seem to be making a special impact on language development — that is in the field of writing. Word processing capabilities and in some instances, local or long-distance networking capabilities of computer-based technology, are being used to encourage LEP students to write and communicate more effectively in highly functional contexts, both in their native language and in English. When used in this context, the computer can provide a means For students to breakout of the traditional mode of thinking, to enhance their sense of mastery, and to enrich the learning experience by providing access to role models and speakers from their native culture.

With a shortage in the number of trained bilingual or ESL teachers, some States and districts are finding that technology can provide one means of addressing this problem.

Instruction through distance learning, electronic networks, and computer-based instructional systems or combinations of these are being tried.

Finally, the potential for computer use exists and in some sites is operational, the general picture reveals that technology is still a small part of bilingual/ESL education. Currently, only one in five bilingual or ESL teachers uses computers in working with their LEP students. Among possible reasons for this low level of usage are numbers of computers available in the school and who has access to them (in Chapter 1 programs computers are used for ESL instruction half as often as in other instructional computer uses) lack of appropriate courseware or teacher awareness of its availability and possible usefulness, and absence of school policy promoting computer-assisted language learning for this group of students.

These findings raise several policy implications and suggest next steps and further directions which might be pursued.

Research can play a role in defining the problem of adequately serving this growing percentage of American students and identifying possible solutions. Federal, State, and local policymakers need abetter fix on the numbers of LEP students in school today and coming in tomorrow, on the ways that technology can serve these students, the access they have to appropriate technology, and ways current roadblocks to access could be removed. Current research may not be adequate to this need.

Federally funded projects have produced some exemplary programs using technology to serve LEP students. This suggests that Title VII funds might be targeted to support more and expanded demonstration projects that point to meeting local needs through technology.

New advances in technology create even greater capabilities for meeting needs of this specialized group of students. Seed money investments by the Federal Government might be considered to develop state-of-the-art software that fully utilizes the capabilities of computers, speech synthesis, interactive videodiscs, compacts discs, and other devices which can be used for teaching limited English proficient students.

Evidence that currently available materials (e.g., good computer courseware) are not adequately known and/or readily made available to schools suggest that the need for dissemination is clear. Consideration should be given to providing expanding resources for evaluation, duplication, and dissemination of public domain ESL software.

Given the current interest and experimentation with distance learning, policies might be adopted and investments made to encourage the use of distance learning strategies to meet common educational needs of limited English proficient students, using satellite, cable, interactive television, and other forms of technologies to share instruction across and among schools, districts, or States.

Teacher training, both preservice and inservice, could be expanded to increase bilingual or ESL teachers' understanding of technology as a tool to enhance LEP student learning and help remove barriers to equal access to computers in schools.

Finally, it should be understood that technology is only one means, though a powerful one, to improve the educational service provided to the Nation's growing cohort of limited English proficient students. Children who have such special needs require special attention; as a high risk educational group, extraordinary resources may be called for. Education, a labor-intensive industry, can be supplemented by the resources technology provides, but this supplement cannot ever take the place of a dedicated and talented teacher. The classroom teacher whose students are limited in their ability to communicate in English should be provided the most efficient tools of the trade in order to help these children move into the full mainstream of the educational system.