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ABSTRACT

This paper discusses issues related to the introduction of computer uses for bilingual education into bilingual teacher education programs, including equity with mainstream education programs, the functions for which computers are used in the schools, differential student access to resources in the home, and preservice teacher computer anxiety. A successful Title VII program that developed and incorporated computer applications as a major program component within the bilingual teacher training sequence is described. Evaluation data are discussed in the context of the question of how to provide adequate coverage of the full range of competencies needed by bilingual teachers within the time constraints of conventional teacher education programs. (MSE)

COMPUTERS IN BILINGUAL EDUCATION: NEW DIRECTIONS IN BILINGUAL TEACHER TRAINING

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Introduction

Over the past five years, there has been a marked increase in the numbers of computers making their way into public schools. As of September 1984, 85% of all public schools had at least some micro supported instruction (Daugherity 1985), and current projections indicate that the number of computers in middle and senior high schools across the U.S. will grow at an annual rate of sixty percent.

The introduction of computers into the public schools on a widespread basis presents a number of significant challenges for bilingual teacher education programs. The primary challenge, of course, involves adequately preparing bilingual teachers to deal effectively with this technology in their classrooms, within the context of bilingual teaching. This is no small task, given the broad range of competencies that are already assumed to be essential for quality bilingual teacher preparation (McKeon 1985, Saville-Troike 1985). It is commonly acknowledged that bilingual teachers, as a part of their preparation for work with limited English proficient (LEP) students, must develop certain linguistic and cultural skills above and beyond what is required for work with "mainstream" children. In addition, there is a broad range of knowledge related to assessment, bilingual program development, second language teaching, and bilingual

methodology that bilingual teachers need to possess (Center for Applied Linguistics 1974, Acosta and Blanco 1978). Ironically, the more refined that research in the area of bilingual instruction becomes, and the more we learn about effective modes of dual language instruction in the content areas (Tikunoff 1985, Jacobson 1983), the greater the pressure that is created on bilingual teacher training programs to incorporate additional skills and competencies. In a sense, the more we know, the more that has to be taught in our training programs, and the more difficult it becomes to satisfactorily address the full range of identified competencies within the constraints of a conventional training program. Moreover, to further exacerbate the problem, current political trends are clearly away from the broadening of teacher education requirements. As Collier (1985, 83) points out, "while we are discussing increasing coursework for our specialization, general teacher education is getting heavy pressure to shorten the process and provide alternate routes to certification". Clearly, it is important for future bilingual teachers to acquire skills related to computer applications in bilingual education, but what aspects of our current training programs are we willing to sacrifice in order to make room for these additional skills?

In this article, we will first examine some issues that explain, at least in part, why it is imperative that computer training be incorporated into bilingual teacher education programs. We then describe a specific Title VII program that developed and incorporated a computer applications component as a primary focus within its sequence of training activities, with favorable outcomes overall. Finally, some of the evaluation data will be presented in order

to address the fundamental issue of quality teacher preparation for bilingual education -- namely, how can we attain adequate coverage of the full range of competencies needed by bilingual teachers within the time constraints of conventional teacher education programs?

Computers in Bilingual Education: The Equity Issue

Although some educators have suggested that computer technology, with the support functions it is capable of providing in instructional settings, may help to address the issue of equity in education for language minority students, there are a number of reasons to question this argument. First, despite some attempts to address the issue of equity in school financing, profound disparities in access to funds and economic resources to support public school programs continue to exist. An analysis by Market Data Retrieval "revealed that 80 percent of the 2000 largest and wealthiest districts have at least one educational computer, whereas this is true for only 40 percent of the 2000 smallest and poorest districts" (Benderson 1983, 13). The amount of funds and resources available to school districts with high concentrations of language minority children continue to remain significantly below what is available to districts composed of predominantly "mainstream" children. Hence, the capability of many districts with bilingual education programs to acquire the hardware and software needed to incorporate this technology into their ongoing instructional programs is severely constrained.

A second equity concern goes beyond the availability of resources and relates to a very real disparity in terms of the kinds of applications to which

computers are put in different settings, with students in poorer districts receiving experiences with computers that relate primarily to remediation (e.g., drill and practice of basic skills) and to a "babysitting" function (e.g., games to keep the students occupied). By contrast, students in wealthier districts are found to be involved in computer applications that include simulations, problem-solving, and, in some instances, programming (Cheek 1983; Benderson 1983).

A third potential source of disadvantage relates to societal and cultural assumptions about what kind of students might be particularly "good at computers". Recent research conducted by the American Institutes for Research in the Behavioral Sciences (AIR) found that "teachers, parents, and even students themselves seldom encourage -- and sometimes actively discourage -- computer use by female and minority students" (National Education Association 1986, 2).

A final area of concern related to equity is potentially the most problematic, because it is tied to the larger societal reality of differential access to resources within the homes of individual students. There is a good deal of evidence to suggest that children growing up in middle-class families are increasingly acquiring significant learning opportunities with computers on their own outside of school due to the presence of micros in their homes. This is clearly not the case for minority children, and thus presents perhaps the strongest rationale of all for bilingual teacher education programs to incorporate a computer training component -- if bilingual education programs do not provide their students with significant computer-based experiences, the odds are that these children will not receive these experiences outside of

school, leading to a profound disadvantage in what appears to be an increasingly fundamental skill for advancement in educational and occupational arenas.

In sum, despite the promise that computers hold for profoundly improving instructional programs for minority children, the equity issues outlined here lead us to wonder if perhaps the computer revolution will not actually end up further widening the already existing gap between educational opportunities for minority and mainstream children in this country.

Computer Anxiety and the Bilingual Pre-service Teacher

Although the construct "computer anxiety" has not yet been fully validated, there is a widespread sense that there does exist a significant "fear and apprehension associated with computers and their use" that impacts on the willingness and ability of certain individuals to deal with this technology (Cambre and Cook 1985, 41-42). Descriptions of the construct include a "complex array of emotional reactions" that include a sense of confusion and helplessness combined with a feeling of being overwhelmed. These emotional reactions can be triggered by merely "planning" to interact with a computer, and can occur even when sessions with the computer are presented in a totally non-threatening situation with no pressures to perform or achieve. The behavioral correlates that accompany computer anxiety include avoidance of the computer, excessive caution when using it, and negative remarks about the technology (Cambre and Cook 1985, 42).

Little data exist related to the question of whether computer anxiety may

be more prevalent among some groups than others. One survey conducted among secondary school and college students did not find significant sex differences related to computer anxiety (Gressard and Lloyd, 1984). In this same study, however, it was found that how students scored on a math anxiety scale explained a significant addition of variance for how they responded to a computer anxiety and computer liking scale. The investigators in this study speculate that these findings may be due to a prevalent (albeit unwarranted) association of computers in the minds of many people with mathematics (Gressard and Loyd, 1984). Because of this association, however, it may be reasonable to assume that those groups that have been found to be at high-risk in terms of math anxiety (particularly, females and, in some cases, minority students), may be expected to include within them individuals who, for whatever reason, experience computer anxiety. If this turns out to be the case, bilingual teacher educators interested in incorporating a computer applications component into their program are presented with a significant additional challenge, given the presence of predominantly female and predominantly minority students in many of our Title VII teacher training programs.

Preparing Teachers for Computer Applications in Bilingual Education: A Case Study

The case described here involves a university in South Texas that has been preparing bilingual teachers for over twelve years. The surrounding region is heavily bilingual, with many local school districts reporting over 75% Mexican American student populations. The local demand for bilingual teachers is extremely high, and the university has never been able to adequately meet this

demand.

Two Title VII training projects, implemented over a five-year period (1978-1983), served as a strong stimulus for expanding the concept of bilingual teacher education to include experiences and skills not normally addressed in university coursework. Of particular significance were extra-curricular requirements, many of them off campus, that enabled students to observe bilingual classrooms through a structured field experience component, as well as to participate in community-based cultural events that served to increase the students' identification with their local bicultural heritage. Based on follow-up survey data, it appears that these experiences played an important role in preparing trainees to carry out their teaching roles with greater effectiveness than they might have otherwise (Clark and Milk, 1983).

The training projects' strong emphasis on goals related to professional development, cultural awareness, and Spanish language proficiency sometimes placed a strain on participants. Despite the success of the grants in preparing effective bilingual teachers, project staff were painfully aware of the significant sacrifices made by trainees in order to fully complete program requirements. A major dilemma emerged, therefore, in the mid-1980's when it became increasingly evident that the increasing importance of computer technology would necessitate the incorporation of one more component into future training projects -- i.e., applications of computers in bilingual education.

This challenge was met directly in 1984-85 when a Title VII project was funded that included, in addition to the goals outlined above, a computer

training component. This component, described in the next section, was designed to help trainees develop the skills needed to utilize computers effectively in their future roles as bilingual teachers.

Computer Training Component

The increase in computer usage in the public schools, and its increasing relevance in the preparation of teachers in bilingual settings, led to the inclusion of a computer component in the UTSA Title VII Teacher Training Program in the Spring of 1985. The component included: (a) a computer practicum which provided on-going hands-on experience with micro-computers, (b) a special academic course on computer applications in bilingual education, and (c) guest lecturers who presented their ideas on the use of instructional technology in bilingual settings. The main objective of the computer training was to provide knowledge and skills concerning utilization of computers for educational purposes to individuals who had no experience or very limited experience with computers.

Skills Areas. Specific skill areas for the component included:

1. the ability to read, write, and execute simple programs
2. the ability to use educational application software
3. the ability to speak intelligently although not necessarily as an expert about computer technology
4. the ability to recognize examples of the kinds of educational problems that can and cannot be solved by computers
5. the ability to locate and use alternate sources of up-to-date information on computing in education
6. the ability to discuss, at the level of an intelligent lay person, the history of computing in general and that of computing in education in particular
7. the ability to discuss ethical or social issues regarding computing in general and of educational computing in particular

These skill areas were determined on the assumption that computer technology will play an important role in the education of all children. They were presented and reinforced by guest lecturers, the practicum, and the academic course.

Educational Activities. A practicum consisting of activities and workshops on computer assisted instruction and curriculum development was designed and implemented in order to provide technological knowledge concerning utilization of computers for educational purposes. Activities were planned to expand the skill areas identified for the computer component, and for the academic course.

The director and coordinator of the Title VII Teacher Training Program were responsible for designing the educational activities of the practicum, which offered an introduction to the hardware, and to software designed for educational purposes. Exercises provided for on-going hands-on experiences, and the application of technology in bilingual education. In January and February, study in the computer lab focused on review and evaluation of software packages, practice for reading and executing simple programs, and on problem-solving learning situations. Because we wanted computer application exercises presented in non-threatening situations, students did not receive a grade for the practicum. However, failure to fulfill the requirements could result in the dismissal of an individual from the program.

Informally, trainees met on a biweekly basis with the coordinator. They were given a time table which outlined the activities scheduled for each month

and the topics for discussion for each meeting. Trainees were expected to attend all meetings, to complete practicum assignments, and to participate in small and large group discussion. They were encouraged to use Spanish in meetings.

Two Apple IIc computers, and a software library, were set up in the coordinator's office. Students signed up for a time most convenient for them between the hours of 9 and 4, Monday through Friday on sign-in sheets placed outside the coordinator's office. The coordinator acted as facilitator and consultant during these sessions. Only four students could sign up at any given time to allow for more interaction among the students and the coordinator, and to facilitate individualized instruction and questioning strategies to help students reach their own conclusions about computer application in bilingual education. Instruction on the various activities was based on hands-on experience.

Students were first introduced to software designed for computer assisted instruction (hereafter CAI). The first two weeks of the practicum focused on an introduction to the computer lab. Trainees familiarized themselves with the computers and the introduction disks. This initial introduction to the practicu unfolded the trainees anxieties and fears of computers. Students were hesitant to work with them. Most avoided the computer lab and the few that went in exercised extreme caution. During the second meeting, the coordinator addressed this reaction. She assured students that computers are machines which need to be commanded to function. With a great deal of encouragement, students started

to come into the computer lab.

Trainees were next requested to preview and evaluate software. The objective of this exercise was to again to expose students to software designed for CAI. Most of the software was ordered from Scholastic and Sunburst. Following two weeks of previewing, students were introduced to various evaluation forms for software. After four weeks of evaluating, students were directed to identify the student population in their field experiences, and to determine the appropriateness of the software for the specific student population. They evaluated four commercial programs and shared their ideas in five minute presentations where they explained to the trainee group why they thought the program was good or bad. Students found that most of the programs they had reviewed consisted of drill and practice of skills and, not of exercises that build problem-solving skills. Students concluded that the forms would be more useful if they were modified, so an analysis of the evaluation forms became the focus of the next activity.

Students analyzed the evaluation forms they had been using to determine their value. Students considered (a) cost, (b) time involved, (c) target population, and (d) skills being developed. Students were also asked to answer the following questions: (1) Does it provide a section addressed to bilingual education? (2) Is the program effective for the student population you are working with? (3) Is the program a drill type exercise, or does it contain problem-solving opportunities for students? (4) Can all levels of LEP students work with the program? Which can and which cannot? Students presented their

their revised forms to the group in mid April.

By April students were becoming more and more curious and began asking if other computer language existed. At this time LOGO was introduced by first explaining what it is, its purpose, and current application in educational settings. Students were asked to read the literature accompanying the software packages and work through the introductory program. They were given two weeks to complete five exercises using LOGO. Exercise 1 was designed to acquaint them with LOGO commands -- students had to merely copy a program written by the coordinator. Exercise 2 introduced multiple commands of LOGO. Although information was given, exercises 3, 4 and 5 involved some initiating, solving and designing on the individual user's part. Students were given one and a half weeks to complete assignments. An extension exercise which required students to write their own program was also designed to allow students to expand their experiences with LOGO, and to write their own programs. The purpose of the extension exercises was to provide for more hands-on experience and problem-solving opportunities.

Workshops. During the Spring semester (1985) two in-services were offered to teacher trainees. These included a session in January which focused on computer technology and was presented by Dr. Lento Maez, and expert on CAI for students of limited English proficiency (LEP). The second session was conducted in April by Dr. Berta Perez, director of CAI for Intercultural Development Research Association (IDRA) in San Antonio. This session concentrated on instructional and classroom management issues related to the use and place of

computers in the education of LEP students. Both sessions provided valuable information for trainees. Mr. Maez' session was an introduction to computer technology. It was helpful to students who had never worked with computers because it provided them with the opportunity to explore the different components of a computer. This session proved helpful in encouraging students to explore the computers. After attending Dr. Maez' session, more students signed up for the introduction sessions with the coordinator. Dr. Maez also spoke of the application of software for educational purposes and ethical and social issues regarding educational computing for bilingual classroom instruction. Dr. Perez' session helped students in the adaptation of commercial software for bilingual settings. Dr. Perez identified problems that deal with the use of computers in education, and discussed some sources of up-to-date information on computing for bilingual education. Like Dr. Maez, Dr. Perez discussed some of the social issues regarding the use of computers in bilingual classrooms.

Academic Course. The first half of the summer session (1985) was devoted to the computer course designed for the trainees. The goal of the course was to provide students with both an awareness and a functional command of technological and computer history, problem solving, application of technology in bilingual classrooms, as well as, laboratory experience in operating a computer learning a programming language, writing simple programs and developing and evaluating software that is applicable to bilingual classrooms. The course lasted for three and a half weeks. Students were asked to review software and write their own program. The practicum had provided practice for these tasks. The laboratory experience provided students with an opportunity for hands-on

experiences.

Internal Evaluation

The overall design for the internal evaluation was conceived by Dr. Stephan Jackson, educational researcher and consultant, and Dr. Sandra E. Mendiola, coordinator of the teacher training program at UTSA. Dr. Mendiola conducted the interviews and administered the pre-post tests. The data collected for this evaluation resulted from:

1. a taped oral interview with set questions designed to assess attitudes towards computers and computer application
2. an objective pencil-and-paper test designed to measure basic knowledge about computers
3. an application exercise that required the trainees to develop lesson plans using computer application for bilingual settings

Ethnographic Interviews. Based on the initial set of interviews with the trainees, four naturally occurring categories emerged that described the trainees' var, knowledge and experience with computers:

Category A: Limited Knowledge, No Experience

Trainees have no hands-on experience with computers. The individuals in this category have a limited technical computer vocabulary. Although most have no extensive knowledge, most show interest in learning about computers and CAI. They have limited knowledge about computers, and almost no knowledge about software. Most have just seen computers and, some have Atari or PAC MAN games at home.

Category B: Knowledgeable, No Experience

The individuals representative of this category have almost no contact with computers except for possibly one workshop on CAI. They have some knowledge about computers but they have no hands-on experience, and no course work on computers. They are unfamiliar with software. They have no first hand experience and no knowledge of how computers can be used in classrooms.

Table 1

TRAINEE KNOWLEDGE AND EXPERIENCE WITH COMPUTERS

	PRE-TEST	POST-TEST
CATEGORY A	3	0
CATEGORY B	3	0
CATEGORY C	6	11
CATEGORY D	2	3

A = LIMITED KNOWLEDGE, NO EXPERIENCE

B = KNOWLEDGEABLE, NO EXPERIENCE

C = KNOWLEDGEABLE, LIMITED EXPERIENCE

D = KNOWLEDGEABLE AND EXPERIENCED

Category C: Knowledgeable, Limited Experience

Most of the trainees (6) were placed into this category, which consists of students who have had some practice with computers. Trainees have worked with computers in bilingual classrooms where computers are being used. They have not been responsible for planning instruction, nor for analyzing software. As classroom aides, they have assisted students in loading computers (mostly TRS 80).

Students can have some hands-on experience. Some have computers at home, but they do not have any course work. They may have seen different computers but they only have experience with one program, i.e. one individual is very familiar with an IBM word processing program. The trainee also has a TRS 80 at home.

Category D: Knowledgeable and Experienced

Two trainees had more in-depth and broader experience with computers than those in the other three categories. Students in this category have experience with writing programs, have taken a university computer course, and are familiar with different software programs.

The basic differences between this group and those students in categories B and C are the students' abilities to manipulate a program, their long experience with computers, and their extensive use of computers.

As Table I shows, most of the fourteen inidividuals were initially placed into Category C, Knowledgeable with Limited Experience. Three of the trainees had limited knowledge and no experience with computers. Another three had some knowledge, but no experience with computers. The most experienced had both knowledge and considerable experience with computers.

The post-test revealed that the six student trainees who were originally placed in Category A, Limited Knowledge, No Experience, and Category B, Knowledge, No Experience, moved to higher categories. The majority of the trainees, eleven in number, were found to fit into Category C, Knowledgeable, Limited Experience. One student originally in Category A was placed in Category D, Knowledgeable and Experienced, raising the number of those students fitting into that category to 3.

Test. Trainees were administered a short written test to assess computer knowledge. The test consisted of ten items measuring computer related vocabulary. Scores for the pre-test range from two to ten. Scores for the post-test range from eight to ten. Of those taking the pre and post-test, the mean for the pre-test was 5.1, while the mean for the post-test was 9.8. The data clearly

indicate an increase in knowledge of technical language and computers.

Lesson Plans. Pre and post assessments were made measuring trainees' ability to develop appropriate lesson plans incorporating computer applications for a bilingual class. Two categories, acceptable and not acceptable, were created. Evaluation of lesson plans was done by the program director and coordinator. A lesson plan which would be of teacher level quality, or acceptable to a supervisor, was deemed "acceptable". A lesson plan which would not be teacher level quality, or would not be acceptable to a supervisor was labeled "unacceptable". In the pre-test, seven students' lesson plans were judged to be unacceptable; while on the post-test only three wrote unacceptable lesson plans.

Summary of Results. Most of the students began their UTSA teacher training program with limited experience and knowledge of computers. They entered the teacher training program expecting to get some information about computers and their effective use in bilingual settings. Although most were interested and curious about computer use, students were apprehensive and shied away from using the computer lab for the first month of the program. Their anxiety may have been a result of their misconceptions of computers which surfaced during the half hour interview. They correlated computers with advanced technology. Trainees stated that children work on their own and do not need a teacher when computers are used in classrooms. The idea that the human element is missing and that teachers are very important also was voiced either directly or indirectly by many of the students. These ideas coupled with the opinion that teachers

lack adequate training, understanding, and knowledge of computers may have caused the infrequency of visits to the computer lab during the first four weeks.

Before training, most of the students believed the use of computers was mostly for drill type skills. After the training, however, many saw beyond this to the use of computers as a tool for learning where students can develop and share concepts, and where students can work in problem-solving situations.

Hand-on experience and exercises with the Apple IIc led to many positive results with the adult students, and helped alleviate the anxiety level. The computer practicum helped trainees gain:

a. familiarity with what computers can do in education
b. an awareness of what computers can do in society in general
c. hands-on experience which leads to ability to analyze utility of software, and to the development of programs
d. experience and knowledge of computers
e. skills in programming

One of the most important findings from the internal evaluation was that adult students can gain familiarity with computer in education, and can gain a lot of experience in a short period of time in a program such as the one executed at UTSA, leaning to the application of CAI and actual classroom instruction. In many cases, the practicum showed the students how to use computers for other things in daily life i.e. word processing, averaging of grades, spread sheets, etc.. It does not take extravagant amounts of money or time in order to move student teachers from a state of inexperience and unfamiliarity with technology to a level where they become critical and effective users of state of the

art technology.

Conclusion

The evaluation data presented above refer only to the computer training component. Other data collected during the life of the project indicated good results with respect to three of the program components (field experiences, cultural awareness, and professional development), and mixed results with respect to the final program component (Spanish language proficiency). Specifically, there was some evidence that those students who came in a little weak in terms of their Spanish proficiency did not advance sufficiently in terms of this aspect of their preparation for bilingual teaching. Perhaps this is not really surprising, given the short duration of the project. Nevertheless, it is a source of concern, given the critical importance of L_1 use in the implementation of quality bilingual instruction (Tikunoff 1985).

This project has demonstrated that a computer training component can be effectively integrated into bilingual teacher training with minimal resources over a relatively short period of time. Evaluation results also suggest, however, that there may be a certain trade-off between a substantive focus on computer training and a focus on the continuing development of proficiency in the home language of the target population (in this case, Spanish). Because of the importance of both of these training areas, future efforts in bilingual teacher education must begin to explore the possibility of integrating these two components, perhaps through the deliberate conceptualization of computer training activities as an important vehicle for the development of Spanish

language skills. The domain of technology is one that is often allocated to English, even in non-English speaking countries. But there is no reason why the computer training component could not become, in a project such as the one described in this paper, a primary vehicle for expanding Spanish language proficiency into new domains of use related to bilingual instruction, thus complementing whatever language development is already taking place in the context of formal academic coursework.

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