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# Integrating computerized speech and whole language in the elementary school : a study with limited English proficient students.

Roser Salavert

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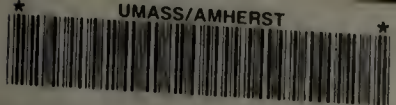
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# FIVE COLLEGE DEPOSITORY

**INTEGRATING COMPUTERIZED SPEECH AND WHOLE LANGUAGE  
IN THE ELEMENTARY SCHOOL: A STUDY WITH LIMITED  
ENGLISH PROFICIENT STUDENTS**

A Dissertation Presented

By

Roser Salavert

Submitted to the Graduate School of the University of Massachusetts in partial  
fulfillment

of the requirements for the degree of

**DOCTOR OF EDUCATION**

May, 1988

Education

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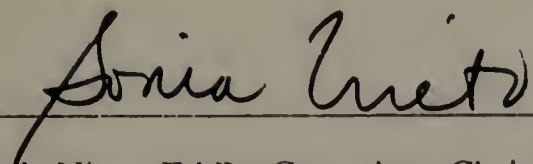
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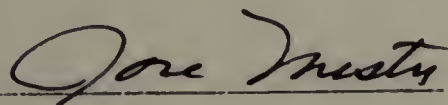
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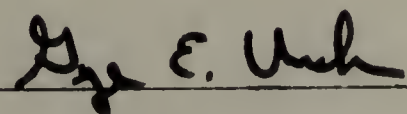
Sofia Nieto, Ed.D., Committee Chairperson

  
\_\_\_\_\_

Catherine Walsh, Ed.D., Member

  
\_\_\_\_\_

Jose Mestre, Ph.D., Member

  
\_\_\_\_\_

Dr. George E. Urch, Acting Dean  
School of Education

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## ABSTRACT

# INTEGRATING COMPUTERIZED SPEECH AND WHOLE LANGUAGE IN THE ELEMENTARY SCHOOL: A STUDY WITH LIMITED ENGLISH PROFICIENT STUDENTS

May, 1988

Roser Salavert

Teacher's Certificate, University of Barcelona, Spain  
B.S., M.Psy., Autonomous University, Barcelona, Spain  
C.A.G.S., Rhode Island College  
Ed.D. University of Massachusetts at Amherst

Directed by: Professor Sonia Nieto

This investigation links the knowledge gained from studies of the development of literacy in a second language to the knowledge in the use of computer technology for educational purposes. More specifically, this study demonstrates the effectiveness of an integrated use of computerized speech and whole language in the development of literacy in young limited English proficient (LEP) children.

The population sample was composed of twelve Puerto Rican children from grades pre-1 to 3, who represented four different levels of English proficiency. All children participated in the transitional bilingual education (TBE) program of a small Massachusetts town.

Within the experimental computer learning environment, the children were instructed on the use of highly interactive and open-ended software programs. They used these programs to create, narrate, listen to, read and write stories in their preferred language. Mediated learning strategies were adopted in order to elicit the child's

optimal performance. Data on each child's progress in reading and writing were gathered during the ten weeks of the investigation.

As the major findings of the study report, the combination of whole language and computerized speech empowered these children to become active participants in their learning. This approach, which challenged the children according to their level of expertise, fostered feelings of competence, promoted metalinguistic awareness, and contributed rather significantly to literacy progress in their first language and in English.

The significance of this study lies in that it provides a highly motivating approach to reading and writing for young LEP children. Secondly, this study enables teachers to discover the endless possibilities of holistic, experimental, and child-centered methodologies while offering specific suggestions illustrated in four case studies. Finally, this study is significant in that it contributes to the understanding of the role of the teacher as a mediator of learning, and the role of the first language in the acquisition of literacy in English.

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## GLOSSARY

1. Basic Interpersonal Communication Skills (BICS), refers to the degree of language proficiency that it is necessary to be able to communicate in a social situation.
2. Cognitive Academic Language Proficiency (CALP), refers to the degree of language proficiency that it is necessary to learn in a particular language.
3. Computer-Assisted Instruction (CAI), can be defined as a varied number of drill and practice programs and tutorials geared to engage the student in practicing determined skills.
4. Computer-Assisted Language Learning (CALL), can be defined as a variation of CAI, in that it encourages the student to generate original utterances, instead of having to manipulate prepared ones.
5. Computerized Speech refers to the voice or speech output produced by a computer.
6. Comprehensible L2 Input, a construct developed to describe understandable and meaningful language directed at L2 learners under optimal conditions.
7. English as a Second Language (ESL), refers to the teaching of English to speakers of other languages.
8. First Language (L1) refers to the student's native language, i.e. Spanish.
9. Immersion Program are programs where all subjects are taught in the second language. Vocabulary and grammar are simplified so that students will comprehend the content area while learning the L2.
10. Limited English Proficient (LEP) refers to persons who cannot function effectively in either oral or written uses of the English language.
11. Second Language (L2) refers to an acquired second language, i.e. English.

12. Submersion Program can be defined as an organized curriculum designed for native speakers of a language but often used with language minority children. No special instruction activities focus upon the needs of language minority children.
13. Transitional Bilingual Education (TBE), refers to a program which uses both the student's native language and English as modes of instruction to facilitate transition into the English-only curriculum. A TBE program model is the one mandated in the Massachusetts bilingual law for linguistic minority students.
14. Whole Language Approach refers to an instructional methodology activities support all aspects of language. Students learn about reading and writing while listening; they learn about writing from reading, and gain insights about reading from writing.



# CHAPTER 1

## INTRODUCTION

### Statement of the Problem

A large proportion of limited-English proficient (LEP) children fail in U.S. schools, where success is measured in terms of literacy skills in English. Despite the success of transitional bilingual education programs (Dolson, 1985; Hakuta and Gould, 1987; Willig, 1985; Walsh and Carballo, 1986) in helping students acquire both oral and academic English proficiency, the controversy around the use of the child's first language in the classroom continues. Emphasis at both federal and local levels has become increasingly focused on English-only compensatory programs. The urgency to make LEP children proficient in English in the shortest period of time possible has been done at the expense of literacy. There is enough evidence, including my experiences as coordinator of bilingual and ESL programs for the Massachusetts Department of Education, to indicate that schools in general, focus on the instruction of English communication skills, disregarding the cognitive stages in language development. As a result, LEP children often do not develop the language proficiency skills that are required to handle higher thinking skills, i.e. reading and writing, which are essential for academic success. This situation partly explains the overrepresentation of linguistic minority students in special education classes (Ortiz, 1986).

While schools nationwide struggle to achieve "excellence" in education, the expectations for LEP children often remain far removed from that goal (National Commission on Secondary Schooling for Hispanics, 1984). Therefore, it is necessary to refocus our attention, and set a goal for excellence in education where LEP children are concerned (taking into account the overall functioning of the child). One way in which this goal can be accomplished is by better utilizing the resources now available to schools in the



area of computer technology. According to a report prepared by the Office of Technology Assessment of the U.S. Congress (1987), elementary and secondary schools in the United States spent between \$400 and \$600 million on computer hardware, and between \$130 and \$150 million on software during the 1985-86 school year. The same report, however, points out that despite the number of LEP students currently in the United States (from 1.2 million to 6.6 million) access to computer technology for these children is very limited. As this report points out:

Where computers exist in a school, the line to use them is still a long 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 (page 81),

Language is not their only barrier. According to Johnson (1985), linguistic minority students also face a social barrier:

. . . patterns of use observed in white schools versus minority schools represent two very different philosophies regarding the appropriate role of computers in teaching. The low SES predominantly minority schools used computers in a compensatory manner, to raise achievement levels through drill and practice for low achievers . . . The other approach . . . , is to provide faster-learning students with a challenge so that they do not become bored while the teacher gives extra personal attention to slower-learning students (Johnson, pages 2-3, 1985).

Johnson (1985) and the Computer Technology Commission (1987) concur in that CAI used for compensatory purposes does not consider the overall development of the child, but the mastery of the formal aspects of the English language. The use of computer technology as facilitator of the LEP child's natural development of literacy skills has barely begun (Johnson, 1985). The few attempts that have been made to introduce the child to literacy through word processing in the native language first, and then in English, have

been acclaimed as successful (Office of Technology Assessment, 1987). However, little is known about the process of acquisition of literacy in this context, similarly no research has been conducted on how the utilization of synthesized speech with LEP students can contribute to this process. Therefore the present study, which examines the effects of a computer learning environment on the development of literacy through the use of child-created stories, and with synthesized speech as auditory support, is considered of interest. It is also perceived as a promising and educationally sound methodology to assist LEP children not only to become literate in English, but to achieve "excellence" in their education.

### Purpose of the Study

A computer learning environment appears to facilitate the children's natural process of literacy development. Therefore, the incorporation of the use of computers in the teaching of LEP children broadens the possibilities of success for these children in U.S. schools (Johnson, 1985).

It is the purpose of this investigation to study the process of learning to read and write using a whole language approach to literacy, within an experimental computer learning environment. The LEP child is encouraged to develop literacy in her preferred language, through stories created by herself. Also, the experimental computer learning environment incorporates the use of voice synthesis, which is expected to facilitate this process. The rationale for this approach, which is documented and explained in more detail in the overview of the literature is:

1. Urgency expressed in current literature to deal with the high rate of academic failure among limited-English proficient children, especially Hispanic, in U.S. schools.

2. Evidence from research suggesting that the problems many LEP students experience in the high school are rooted in the elementary school years.
3. Studies which claim that literacy is the capacity to comprehend and to communicate critically, both orally and in writing.
4. Evidence from studies that suggest that many current instructional practices in the teaching of LEP children focus on non-functional aspects of the language, i.e. grammar, rather than comprehension.
5. Developmental research indicating that children learn to read and write in the same way and for the same reason that they learn to speak and listen.
6. Evidence from research that a whole language approach, that is, a method that integrates the four processes of language into a comprehensive and a developmental way of teaching, is the most sensitive approach to literacy.
7. Studies which suggest that storytelling and storywriting are of primary importance in the development of literacy, since they stress meaning making process and self-assurance which are critical to help children to learn on their own.
8. Research indicating that to develop literacy skills in a second language, the LEP child needs to use his metacognitive and metalinguistic skills very critically.
9. Studies which suggest that the role of the school is to facilitate the learning process.
10. Educational research which indicates that a computer learning environment appears to facilitate the child's natural process of literacy development.

11. Current literature which encourages the incorporation of the use of computers in the teaching of LEP children as means to broaden the possibilities of success for these children in the U.S. schools.

12. New technology advances that suggest that the integration of voice synthesis into computer-based instruction increases the rate of quality of learning.

13. Studies which suggest that the use of computers by young children is a promising practice, especially if perceived as an aid to the child, and not the child as being aided by the computer.

Research will begin with the following primary and implementing questions:

### **Primary Questions:**

1. What are the effects of an experimental computer learning environment on the process of developing reading and writing skills in young LEP Hispanic children?

1.1. How does the incorporation of voice synthesis facilitate the progress from oral language to print?

1.2. Does the use of computers help the LEP child who is academically at risk due to environmental circumstances?

### **Implementing Questions:**

1. What is literacy?

2. How do young children develop literacy in their first language (L1) and/or English within a computer learning environment?



3. How does language proficiency relate to literacy? What are the crosslinguistic effects of the L1 and L2 in the development of literacy?
4. To what extent does the power of stories influence the development of literacy?
5. How effective is the use of voice synthesis in reinforcing the child's metalinguistic awareness of the phonemic structure, and thus in building comprehension skills?
6. To what extent does a computer learning environment foster a sense of academic competence?
7. How does the use of computers help develop those learning behaviors, such as risk-taking, hypothesis-testing, persistence and focused participation which are essential in learning to read and write?

### Significance of the Study

This study links the knowledge gained from studies of the development of literacy in a second language to the knowledge in the use of computer technology for educational purposes. It is significant in three major ways. First, it integrates whole languages with computerized speech; second, it promotes literacy skills through story making (with the computer), storytelling and storywriting, and finally, it contributes to the development of critical learners, since it develops the child's sense of control over both the computer and over learning.

An important change in the use of computers in education has been the shifting of the focus from the computer to the student. The identification of the computer as an electronic teacher, e.g. as a mechanism for drill and practice, is being replaced by

interactive programs where students are the focus of use of the tool. Thus, the use of computers to tap children's cognitive and social skills, creativity and literacy development is growing at a very high speed (Bergin, 1986; Clements, 1986; Constanzo, 1985; Dede, 1984). The incorporation of voice synthesis is the latest development, and it is emerging as a powerful resource and promising practice (Sauve and Schnuer, 1984). However as Robbat (1985) indicates, current research has neglected the study of microcomputers on learning. Also, and as Johnson (1985) points out, limited-English proficient (LEP) students' access to the use of computers is growing at a comparatively slow rate, its use being reduced almost exclusively, to drill-and-practice type programs. Moreover, there appears to be no studies in the current literature on either the shift of focus or the impact of computers on the learning process of LEP child.

The relevance of the use of stories in this investigation is based on the current theories of the critical role of storytelling and storywriting in learning how to read and write. Sawyer's (1987) recent review of research on literature and literacy, confirms the important role of literature in the development of reading and writing skills. His review highlights recent research findings on the significance of the narrative as a fundamental mode of meaning making for children as well as for adults. He reiterates the concept that "reading" cannot be separated from "reading stories" to children, and that the concept of "what happens next" is a key in motivating the child to read and hence to literacy development. Storytelling and storywriting are of primary importance in the development of literacy. They stress the value of the meaning making process by helping the child to understand better her own experiences. When the child writes a story, she is not driven by spelling, syntactic structures or grammar. Rather, she is driven by her intimate need to find meaning and to be heard (Mikkelsen, 1987), and

hence writing becomes a very powerful learning process. Mikkelsen's (1987) example illustrates its importance as an alternative to teaching:

"The usual classroom bill of fare - worksheets, workbooks, skills, fill in the blank - was simply not working for her (one of her students). She didn't speak English, they told me. Like Leo (another student), they claimed, she couldn't read, couldn't write, couldn't speak, couldn't bloom. Yet when I left her alone to write that first day, she worked quietly and easily. . . . That night, as I read the children stories, I noticed Samantha's was jumbled, chaotic and confusing, as were many of the others. But there was something different about it too, I could see, as the days went on . . . It seemed almost as if the story were telling her something." (p. 62).

Whereas literacy is the goal of public education, and excellence is the drive that motivates schools to improve upon their curriculum, the complexity of the issues around the particular educational needs of LEP children often has led the schools to the belief that the acquisition of proficiency in English, and not literacy, should be the goal for these children. It is expected that the incorporation of voice synthesis in this computer environment will facilitate making the connection between the oral and written language forms. Therefore, this investigation will uncover some of the relationships between language proficiency and literacy in young LEP children, and offer specific suggestions on how to utilize the computer technology to develop literacy in a second language. By integrating whole language and word processing with speech output, the purpose of this study is significant because it refocuses the goal for education of LEP children, and attempts to outline a sound pedagogical practice that incorporates the advantages of the computer technology.



### Limitations of the Study

This study centers around the concept of literacy through literature, and describes the LEP child's process of reading and writing development in his first language and/or English in a computer learning environment. More specifically, oral and written samples of stories created by the children using the computer will be analyzed to study the child's progression from native language proficiency to the acquisition of literacy skills.

The qualitative nature of this study as well as the size of the sample (12 children), imposes some limitations on its generalizability value. The results provide a picture of the progress made by a small group of LEP children from one particular cultural/linguistic group, Puerto Rican, residing in a small industrial town. Although some general trends will be identified, in order to be able to generalize the results of the study it will be necessary to replicate the study not only using a larger sample but using children from different linguistic backgrounds.

The use of computerized speech in the classroom is a rather new technology, thus Talking Text Writer (1986), the word processor program with voice synthesis selected for this study, has some technical limitations. Talking Text Writer has adopted a text-to speech mode with unlimited vocabulary and because of that it produces a robotic voice. This model has again the advantage of using unlimited vocabulary, but because of the quality of the synthesized robotic voice it cannot be used as a role model for language. Another significant drawback for this project's specific purpose, is that Talking Text Writer has been designed to read English and therefore, it presents a potential problem since most of the LEP children of this study are Spanish dominant,

and need to develop literacy skills in this language first. However, the program does use a text-to speech synthesizer and theoretically, it should read whatever is typed. Thus, while the machine has been programmed for the English language it should be capable of reading Spanish text, within certain limits. And it does so; Talking Text Writer reads whatever is typed in Spanish although many of the sounds are not pronounced correctly. The problem with the pronunciation of some sounds also happens when reading English text. Talking Text Writer is not capable of reading all the English sounds correctly, some of the sounds need to be spelled phonetically for the machine to read them right. Talking Text Writer acknowledges the program's inability to spell every English word correctly, and thus it offers the possibility of fixing a mispronunciation in just a few strokes. To fix a mispronunciation phonemically, the user needs to type in any combination of letters that will produce the sound expected. The machine saves this information and will read that word as it was changed. Talking Text Writer also uses this capability to encourage children to explore the relationships between sounds and written words. The program responds well to Spanish phonetics and thus it offers a new possibility for Spanish LEP children even within the limitations above mentioned.

The capabilities of Talking Text Writer in Spanish have been critical in this study. It has allowed the children to listen to their own oral stories (narrated on the basis of their picture stories), experiment with the sounds of the Spanish language and develop literacy skills in their native language. Most advanced children have learned to fix the pronunciation of the words so that the computer can use Spanish, or as the children say, they, 'can teach Spanish to the computer'. Technical limitations, on the other hand, have prevented younger children from using the voice to learn the sound of the letters in Spanish (the machine is programmed to make the sound of the letter as you

press a letter key). Fixing the pronunciation, the child would hear both the English sound - the moment he would press the key-, and the Spanish version when pressing the space bar to move to another sound or word. The dual message in two languages occurring at the same time was confusing to these children.

### Predictions

It was predicted that LEP children's process of literacy development can be facilitated through the use of a whole language approach within a computer learning environment. It was also expected that the addition of computerized speech would prove to be of significant importance in that process. LEP children were thought to be empowered by having the control over the computer, and therefore over their own learning. It was expected that this approach would increase the need for communication beyond face-to-face situations, stimulate reading and writing in either L1, L2 or both. It was also thought that speech output would work as a partner in a dialogue, as a member of a team - since children were to work in pairs-, and that it would improve children's oral proficiency. In addition, it was expected that the speech output would provide children with information and feedback about their written text. For early writers, it was expected to promote an improvement in the recognition of sounds and in the understanding of the sound-symbol relationship.

Differential use of the computer was expected to occur depending upon a child's language proficiency in the L1, level of skills in English, age and cognitive capabilities. The use of mediated learning was perceived as the most efficient method to optimize such capabilities. The overall goal of the project focused on the need to achieve "excellence" in the education of LEP, which can only be accomplished when children become critical learners.

## CHAPTER II

### REVIEW OF LITERATURE

#### The Development of Literacy Skills

##### Defining Literacy

A large proportion of limited-English proficient (LEP) children fail in U.S. schools, where success is measured in terms of literacy skills in English. To understand the reasons for the failure of these children, it is necessary to define the concept of literacy. A good example of what literacy means in our western society is given by Thomas Jefferson who said that:

Were it left to me to decide whether we should have government without newspapers, or newspapers without government, I should not hesitate a moment to prefer the latter. But I should mean that every man should receive those papers and be capable of reading them (in Hirsch, 1985).

Literacy in Jefferson's statement does not only imply that ability to read facts, but the ability to understand them, which brings up the genuine concept of literacy. Reading is more than a perceptual and sensory-motor process, it is a cognitive process in which the reader supplies the context; and this tacit knowledge is fundamental to literacy (Thonis, 1984; Hirsch, 1987, 1985). Reading is not a general skill easily transferable from one language to another. The mechanical aspects of reading as well as writing, such as eye movements and the understanding of speech-print connections, are transferable, but the background knowledge that is necessary to interpret text is specific to a subject matter and to the child's (reader's) experience, and thus it cannot be automatically transferred (Thonis, 1984).



This dependency of literacy on cultural literacy is illustrated in Scribner and Cole's (1981) study of the Vai language. In describing the main findings of the study of the language used by the people from Vai country (Liberia), Scribner point outs that:

The Vai boast a writing system of their own invention that they use in their commercial and personal affairs. From a theoretical point of view, the existence of the Vai script (which we were told was not taught in school, but rather in the home) offered an occasion to resolve some of the scholarly disputes about consequences of literacy. We could separate schooling from literacy. We could look at the acquisition of literacy in a social context radically different from any that had provided the basis for speculations about literacy's effects (pp. 14-15).

Therefore, literacy cannot be approached as a skill to be learned at school, rather it should be understood as an extension of natural language learning for all children (Forester, 1977; Goodman and Goodman, 1976; Heath, 1986). In that sense, and as Freire (1974) and Cummins (1986) argue, the development of literacy is closely related to the development of critical conciousness, that is, a critical understanding of the printed word. And, this critical understanding of reading and writing occurs only when the child is exposed to material which is meaningful to her and creates a need for communication which transcends the present situation.

An important consideration that derives from this definition of literacy is the influence of social factors in this process. As Walsh (1987) explains it:

Language is a sociocultural phenomena. In its concrete totality, language involves persons who speak to both themselves and to others in a meaningful way; people whose voices reflect a cultural, historical, economic, and political reality which says much more than is immediately heard in the surface of words (p. 196).

This study has adopted the above definition of literacy, and thus it is centered around the construction of meaning and the acquisition of literacy in a second language

as a process of learning a new linguistic system and the accommodation of a different way of communicating.

## The Relationship Between Oral and Written

### Language (L1 and L2)

According to the traditional view of literacy, reading is an acquired skill, usually taught at school. This Rousseauian position represented by researchers such as Mattingly (1972), claim that oral language is innate while written language is acquired. This position is grounded in a belief that literacy is not universal but school-dependent. Within this traditional view, the written language is a secondary system of signs, a reference of the oral language system. Reading, is thus perceived as an oral translation of the text; meaning arises from oral reading, transforming a series of phonemes into words.

Current arguments in the literature do not support this traditional view. Instead, a contemporary perspective defines written language as an alternative system of signs, which refers directly to meaning and not to the oral language code (Ferreiro and Teberoski, 1979; Freire, 1974; Goodman and Goodman, 1976; Halliday, 1969; Smith, 1978; Thonis, 1982; among others). Thonis (1982) and Nickerson (1975) claim that the importance of language in the development of literacy skills lies in the nature of reading. Reading is based upon oral language, but it goes a step further. In addition to oral proficiency, reading requires a language capacity which builds upon individual experiences and which supplies the context to what an individual reads. As Nickerson (as cited in Thurber, 1986) illustrates:

Reading now is viewed as a process of imposing meaning on print as much as one of extracting meaning from it . . . this is not to deny the importance of decoding skills, but simply to recognize that reading is a process that depends heavily on knowledge of various types that the reader brings to the task: knowledge of linguistic conventions, of the specific topic, of the world in general, of the writer's (assumed) purpose and intended audience, of the genre of the written material, and so forth. Comprehension is not an either-or affair, but a matter of degree (p. 20).

Goodman and Goodman (1976) distinguished two main differences between oral and written language interaction:

- One is the absence of supportive situational context. Writing shares this condition with telephone use. . . . But telephones provide immediate response, written letters results in delayed responses. The second attribute of written language which distinguishes oral and written interaction is that the writer, the partner in communication with the reader is most often unseen and unknown; the young reader may in some sense be aware of the message but not its source. . . . Signs tell you to "keep of the grass". Who wrote and put them there may not be something children have considered. (p. 10).

Byalistok (1985) proposes a framework (Figure 1), which conceptualizes the correlation between oral and written language use along two continuums, which represent the common cognitive skills underlying "the mental underpinnings of language proficiency" (p. 209). The first, which is horizontal, is related to the mental representation of knowledge, and is described as the knowledge that we have of our language system, i.e. rules of grammar, semantics, phonology, and discourse. This knowledge varies along the dimension of the degree to which it is analyzed. For example, children's tacit knowledge of language and its structure vs. metalinguistic awareness that is much later in appearing. The second continuum, graphically depicted in a vertical form, addresses the developmental aspects. As Byalistok (1985) notes:



The cognitive control is an executive function that is responsible for selecting and coordinating the required information within given time constraints (. . .). As learners become more skilled or fluent in performing a given task, the demands of the cognitive control dimension, such as controlling the direction of search for information, are reduced. (. . .), increased automatically in the execution of basic operations expands the cognitive capacity for higher level-processing (p. 213).

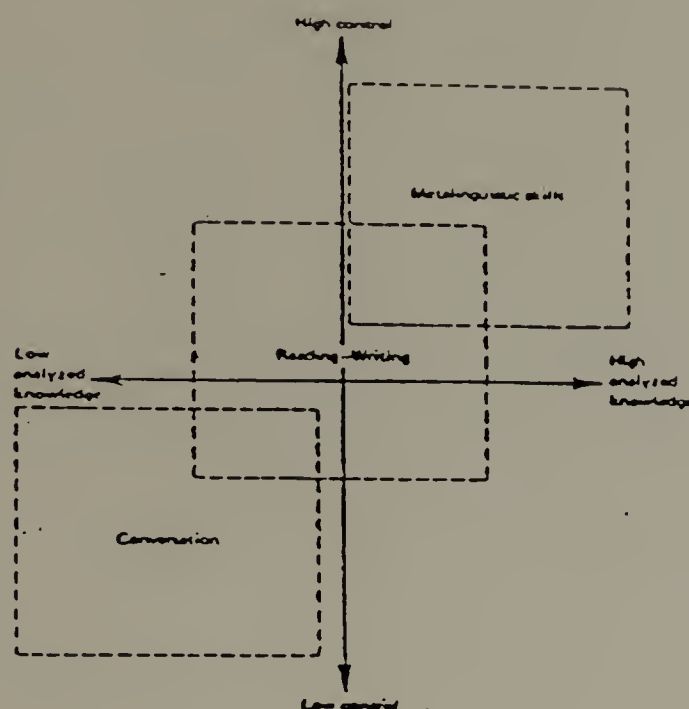


Figure 1. Metacognitive Model of Language Skills. Byalstok, 1985.

These two dimensions, analyzed knowledge and cognitive control, yield a coordinate system in which Byalstok places and relates three language-use domains: conversational, literacy (reading/writing), and metalinguistic. The conversational domain represents the interactive uses of language; literacy uses, include reading and writing and metalinguistic uses are identified with those language tasks that "demand high values both for analyzed linguistic knowledge and for control to direct deliberate attention to language forms" (p. 234). Based on this framework, the relationship between oral and written language derives from a common cognitive basis. The

difference between the two being the degree of analyzed knowledge and control that each language use requires. Conversational uses of language are placed at a relatively low value for both cognitive dimensions, even considering the fluctuations imposed by the type of conversation and the familiarity with the interlocutors. Literacy uses, on the other hand, share some of the characteristics uses- at their highest degree of complexity-, but they have most in common with metalinguistic tasks, and thus literacy (reading and writing) involves an awareness of the linguistic system, and higher order thinking skills.

Another theory which emphasizes context distinctions is that developed by Cummins (1981). In an attempt to explain the correlation between oral proficiency in the first and a second language and literacy, Cummins distinguishes two levels of language proficiency, the Basic Interpersonal Communication Skills (BICS) and the Cognitive Academic Language Proficiency (CALP), which he puts into perspective in a two dimensional theoretical framework (Figure 2).

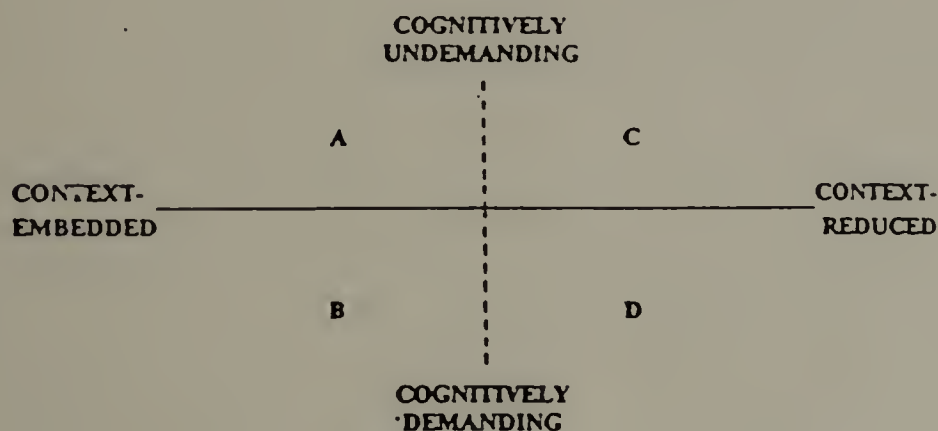


Figure 2. Range of Contextual Support and Degree of Cognitive Involvement in Communicative Activities. Cummins, 1981.

This framework, which is comparable to that of Byalystok's (1985) is comprised of an horizontal and a vertical continuums. The horizontal continuum represents the degree of contextual clues in a communicating act (from context - embedded to context-reduced situations), and the vertical continuum, the developmental aspects of communicative competence. Within that context, BICS would take place in a context-embedded situation where the reality is shared by people involved in the situation, and where non-verbal clues facilitate the transmissions as well as the reception of the message. CALP would respond to context-reduced and cognitively demanding tasks, such as reading a technical text.

Cummins uses this framework and the BICS/CALP dichotomy to explain the interrelations that exist between first and second languages. In his theory of linguistic interdependence, Cummins (1981) states that developing academic proficiency in the first language will transfer to the student's second language given adequate exposure and motivation to learn the second language. This interdependence is represented using a dual-iceberg (Figure 3).

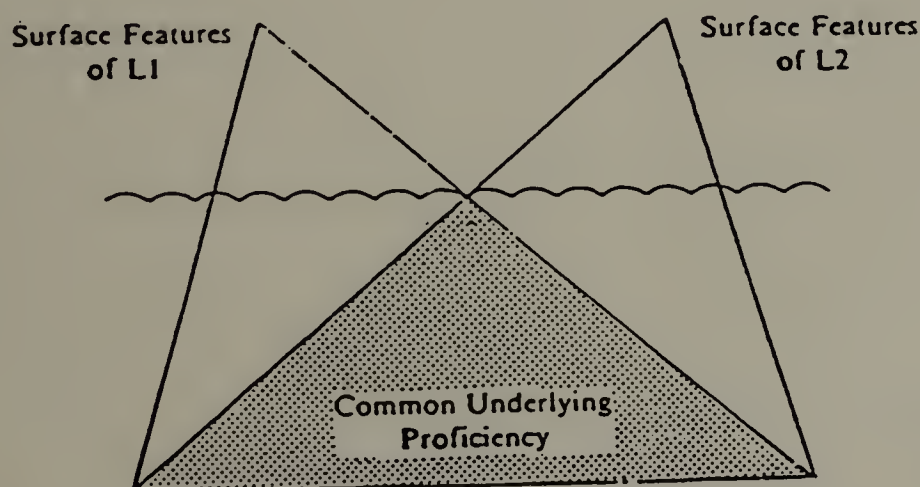


Figure 3. The "Dual-Iceberg" Representation of Language Proficiency. Cummins, 1981.

Cummins suggests that BICS constitutes the tip of the iceberg, whereas CALP corresponds to the hidden section of it. BICS would therefore, represent the surface/automatized language features and CALP the bulk of language knowledge that is not readily apparent or automatized. Thonis (1981) expanded on this model to represent the development of literacy skills in a second language (Figure 4).

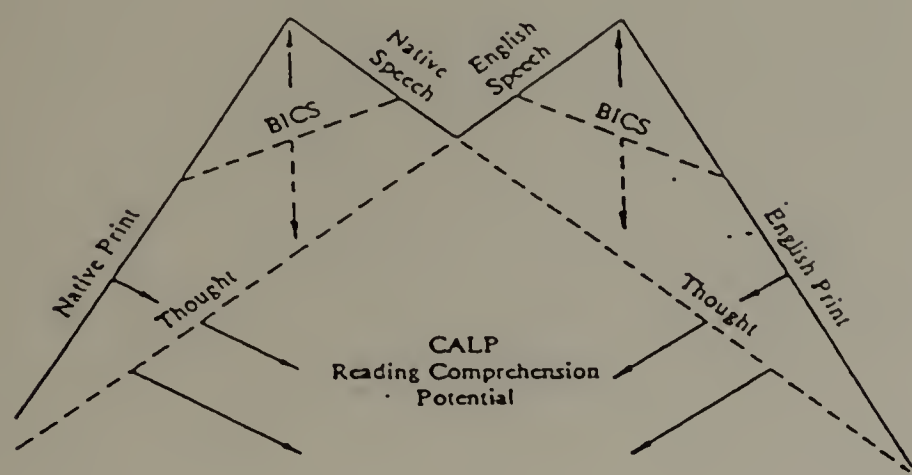


Figure 4. The Iceberg Metaphor. Thonis, 1981.

According to Thonis, the development of CALP is based upon BICS. Also, BICS in one or two languages requires thought, but less than the thought that it is necessary for the successful development of CALP (the core of language proficiency). This model reinforces Cummins' theory of the transferability of skills from one language to another, and how proficiency in the first language is a pre-requisite to the development of literacy in a second language. Moreover, it illustrates the complexity of the relationships between oral and written language within the context, i.e. the interplay between oral L1 and oral L2 between oral and written L1 and oral and written L2, and the existence of a common reading comprehensive potential.



## Beginning Literacy and Metalinguistic Awareness

For Goodman and Goodman (1976) children learn to read the same way and for the same reasons that they learn language:

It is communicative purpose that motivates language development and which moves children toward the language around them. . . . The ability to create language makes it possible for individuals to express original thought in original, yet understandable, language and for society to cope with new situations, new circumstances, new insights. Children growing up in a literate society begin to encounter written language before they personally experience the need to communicate beyond face-to-face situations. All of them become aware of and able to use written language to some extent (p. 2).

These authors suggest that the acquisition of literacy is then, an extension of natural language learning. They contend that the child's ability to internalize the function of written language is a determining factor in the acquisition of literacy. When the functions of language that children learn in school are meaningful to them, they become successful in their learning of the use of the written code.

Halliday (1975) claims that function precedes form in language development, and thus he identifies the beginning of literacy with the child's ability to differentiate between the two. For Halliday, the child will be able to build up literacy skills to the extent that he is aware of how the different forms of oral language, e.g. instrumental, imaginative, etc., are used in the written system. One example which illustrates Halliday's viewpoint is that of the child who is familiar with the regulatory functions of language, i.e. "do what I say", and therefore has no difficulty in understanding and reading signs such as STOP. Similarly, the child soon understands the meaning of the labels in items from his environments, such as his ability to "read" certain cereal boxes, the golden arches of McDonald's, etc. Byalistok (1985) describes the relationship



between the metalinguistic skills and the onset of literacy in terms of the two dimensions - analyzed knowledge and cognitive control- which she proposes as indicators of the underlying cognitive skills of language proficiency (see Figure 1, in page 16). According to her, reading would progress in a natural three-stage sequence:

1) realizing that print conveys meaning in much the same way as speech, 2) attending to printed features (e.g. letters, letter combinations, spaces between words, capitalization, punctuation), relating these to linguistic features, and interpreting them; 3) incorporating the attention to forms with the goal of extracting meaning. Stage 1 is analyzed knowledge; Stage 2 involves both analyzed knowledge and control; and Stage 3 is an achievement of cognitive control (p. 138).

Bussis et al. (1985) claim that the ability of a child to read, that is to construct meaning from text, entails the orchestration of several knowledge sources. These sources include: knowledge of the context treated in books, or grammar, literacy skills, and letter-sound correspondences and spelling patterns. Moreover, the organization of all this information in the act of constructing meaning requires "a reasonable fluency and reasonable accountability of the information contained in writing". The authors represent this conception of reading in the form of a triangle (Fig. 5) "with two sides (anticipation and accountability) converging toward the apex of meaning, and the whole supported by a base of knowledge" (p. 113).

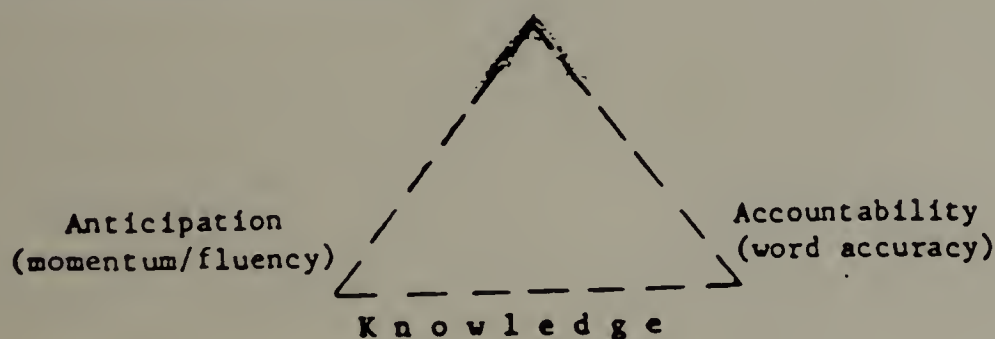


Figure 5 A schematic conception of reading. Bussis et al. (1985).

Bussis et al. (1985) conducted a six year investigation on beginning reading using the framework outlined above. They collected data on a total of 84 children from kindergarten to grade five, who represented a range of low-to middle-income English speaking families. The results of this investigation indicate that learning how to read depends primarily upon how the child organizes and integrates knowledge rather than the possession of such knowledge per se. They summarized this evidence as follows:

1. Children's reading proficiency often improved as they moved along in a text even though the general level of text difficulty would remain basically constant. This phenomenon, they argue, cannot be explained by theories that view reading as the straight-forward application of knowledge, but by a theory of reading as a dynamic process.

2. Children were more likely to be successful in their attempts at self-correction under situations of greater control.

3. The finding that as children lose control their reading proficiency deteriorates. They identified four major conditions for deterioration: fatigue, inventions, entanglements in grammar and lack of background knowledge.

Another consideration derived from Bussis' investigation is the influence of learning styles in the acquisition of reading skills. The learning style of the children manifested in their ways of expressing meaning, of working, of focusing attention, and of thinking had a significant relevance in the organization of knowledge and thus in how to read. Bussis et al. (1985) describe two basic types of reading styles (Table 1) each of them with very distinctive characteristics. These styles are described below as Cluster A and Cluster B.

Cluster A: The child prefers to uphold momentum to accuracy. That is, he skips over words or phrases, and moves right on. He may also invent portions of the text or guess words. This type of child is also the one who might offer word substitutions based on memorized vocabulary, picture clues, or some other combination of resources. In addition to that, the type A child has a tendency to repeat "easy" words that had appeared in the text previously in an apparent effort to "gain time before hitting the real trouble spot". Although making corrective attempts is unusual in the type A child, if such an attempt is done, it is always of the "after-the-fact variety".

Table 1. A Summary of Style Clusters. Bussis et al. (1985).

<i>Style</i>	<i>Preferences</i>	
	<i>Cluster A</i>	<i>Cluster B</i>
Preferred Expressions of Meaning	Imaginative & Divergent	Realistic & Convergent
Manner of Work	Mobile & Fluid	Contained & Methodical
Attentional Scope and Emphasis	Broad & Integrative	Narrowed & Analytic
Sequencing of Thought Processes	Parallel Sequencing	Linear Sequencing

Cluster B: The child of cluster B displays a preference for accuracy over fluency. She is the child that attends to every word on a page, and that at times, shows no evidence of reading ahead. She makes long pauses, as long as 30-60 seconds, she may "engage in a head-on struggler of phonic analysis," and often waits to proceed until the teacher offers her some evidence of support, e.g. letter-sound clues. The type B child normally recognizes an error and seeks to remedy the problem before attempting to read the "problematic word."

On the other hand, Ferreiro and Teberosky (1979) affirm that much sooner than the child is able to read is she able to understand (at least intuitively) what the function of the written code is. As they demonstrate through their research:

. . . learning reading, understood as the child's explorations of the nature, function and value of written language as a cultural object, begins long before the school imagines and takes unsuspected paths. . . Children are active seekers of knowledge and not simply willing or unwilling to acquire a particular skill (Preface).

Ferreiro and Teberoski believe that children learn primarily through their own actions on external objects, and that it is through their own experience with the environment that they discover what letters mean and thus the use of the written system. The child's awareness of the function of the written language characterizes the beginning of metalinguistic awareness, and the active way in which she goes about developing such ability will constitute the first step towards the development of literacy. These authors illustrate this process of the discovery of the written language in a developmental theory outlined below. Based on the results of their research, Ferreiro and Teberoski (1979) define five successive levels:

Level 1. At this level the child is able to differentiate drawing from writing, but their graphic characters are very much alike (basically curved and/or straight lines). Reading at this level is global, each letter standing for the whole.

Level 2. At this level there is an important cognitive breakthrough: the discovery of the combinatorial system, that is, the awareness that the same elements arranged in a different order can represent different meanings/things. Therefore, the child tends to use a minimum number of elements that she combines to write a variety of names. The child uses upper-case print almost exclusively. Reading is still global,



the child does not make any attempt to read the text, rather he "reads" the accompanying pictures; he uses the pictures to give some meaning to the written characters.

Level 3. The child makes attempts to assigning a sound value to each letter that she has written, each letter standing for one syllable (syllabic hypothesis). As a consequence, the child begins overcoming the global correspondence between the written string and the oral expression and starts establishing a correspondence between parts of the text (individual letters) and parts of the utterance (syllables).

Level 4. It is the transitional passage from the syllabic to the alphabetic hypothesis. The child discovers the need to analyze the written strings beyond the syllable, and thus she begins alphabetic writing. In this transition, however, the child normally encounters some difficulties between her internal demand for a minimum number of characters (level 2), and the graphic strings provided by the environment (which do not respond to that demand).

Level 5. The child applies the alphabetical principles to reading and writing (natural spelling). Orthographic problems being to appear.

In a broader sense, Rosegrant (1986) proposes a developmental approach which also incorporates the evolution of attitudes. From her educational perspective, the beginning of literacy is characterized by four basic elements: First, the expression and comprehension of written language to express meaning; second, the knowledge about how written language works; the child's awareness that ideas take on form and structure through printed words, that language can be used in a variety of forms and for a variety of reasons, e.g. a formal and informal letter; third, the master of three skills



which are essential to master the use of the written code, e.g. phonics, letter recognition, and finally, a positive attitude and interest.

The research results and theories of the above authors are an important contribution to the understanding of the developmental progression of the reading and writing of the child, and its relative dependence on schooling. It illustrates how children's progress in literacy development involves an increased understanding of the communicative power of print and a growing desire to use this power to relate to others and to gain a better understanding of the world around them.

### Developing Literacy in a Second Language (L2)

- As discussed in the previous section, learning to read depends heavily upon oral proficiency, and the child's ability to understand the function of the written code. The development of literacy in a L2 is directly related to the degree of development of the learner's L1, and the stage that he is at in the process of developing literacy in this language. Studies conducted by Lofgren (1980, in McLaughlin, 1985), with Finnish immigrants in Sweden indicate that proficiency in the first language is the most powerful predictor of proficiency in a L2, and school achievement. It is interesting to note, however, that most researchers agree that to develop literacy skills in a L2, the child does not need to first develop oral proficiency in this language (Goodman et al., 1979; Hudelson, 1984). Goodman et al. (1979) acknowledge the benefits of having oral proficiency in the L2 before reading in this language, but given the fact that language is motivated by functional needs, the development of reading skills may be parallel to the development of the oral language. In a similar fashion, Hudelson (in Crespo, 1984) presents some research evidence which suggests that:

1.- Even children who speak little or no English are reading some of the print in their environment and are using the reading to increase their English; 2.- ESL learners are able to read English before they have completed oral control of the language; 3.- reading comprehension in a second language, as in first, is influenced by the background knowledge and the cultural framework that the reader brings to the text; 4/- as in the first language, writing in the second language interacts with reading- the two processes complement each other; and 5.- the processes of writing, reading, speaking, and listening in a second language are interrelated and interdependent (p. 20).

UNESCO (in Brisk, 1981) recommends the teaching of reading in the L1 before introducing reading in a L2, since learning to read is acquired more easily in a language the child has already oral proficiency. The recommendation given by UNESCO finds great support among researchers based on the concept of transferability of skills. From a behaviorist perspective, language transfer refers to the influence of established linguistic behaviors on the learning of new habits,- "an invariable automatic activation"- (Osgood, 1953). In contrast, some contemporary researchers define transfer within a cognitivist paradigm (Faerch and Kasper, 1986). Faerch and Kasper focus on the cognitive aspects of transfer. When discussing L2 acquisition, they distinguish two main types of transfer: 'borrowing' and 'foreignizing'. Borrowing would refer to the transfer strategy in which a learner uses an L1 lexical item with L1 pronunciation, and foreignizing to the selection of an L1 lexical item or compound of words which are pronounced using the L2 phonological code. Therefore, for Faerch and Kasper transfer is a decision-making procedure or strategy, by which knowledge in the L1 is used to solve a learning or communicative problem in the L2.

In Thonis terms (1981), transfer occurs when "learning in one situation influence the potential for performance in a new situation" (p. 15). Applying this concept to reading, Thonis claims that common features are transferable from L1 to L2,

e.g. visual-perception training. In her attempts to demonstrate the degree of transferability of skills as well as the type of skills that can transfer, Thonis developed a table (Table 2) with a comprehensive list of potential skills which can transfer from L1 to L2. This concept of transferability of skills is based on Cummins dual-iceberg theory of L2.

Table 2. Potential for L1 Reading Skill Transfer to L2. Thonis, 1981.

Skill Areas	Language Specific Transfer	Language General Transfer
<b>I. Sensory-Motor Transfer</b>		
<b>A. Visual Skills</b>		
1. Eye-hand coordination		■
2. Fine muscle control		■
3. Visual attention to detail		■
4. Figure-ground awareness		■
5. Visual perception		■
6. Visual discrimination	■	■
7. Visual memory	■	■
8. Visual sequencing		■
<b>B. Auditory Skills</b>		
1. Figure-ground awareness		■
2. Auditory perception	■	■
3. Auditory memory	■	■
4. Auditory discrimination	■	■
5. Auditory sequencing		■
<b>C. Spatial Skills</b>		
1. Directional organization		■
2. Top-to-bottom orientation	■	■
3. Lateral orientation	■	■
4. Spatial integration		■
<b>II. Transfer of Identical Elements</b>		
<b>A. The Common Features in Writing Systems</b>		
1. Logographs, ideographs	■	
2. Alphabets	■	
3. Sound-symbol associations	■	
4. Capitalization	■	■
5. Punctuation	■	■
6. Lines or other spatial constraints of the writing	■	■
<b>III. Transfer by Principles and Generalizations</b>		
<b>A. Reading as a Process</b>		
1. Understanding speech-print relationships		■
2. Speech-print connections	■	
3. Concepts of words, syllables, sentences, paragraphs		■
4. Comprehension (thinking skills)		
a. Main idea		■
b. Sequence of ideas		■
c. Supportive details		■
d. Inferring		■
e. Predicting outcomes		■
f. Drawing conclusions		■
g. Recognizing omissions		■
h. Seeing cause and effect		■
i. Distinguishing fact from fiction		■
j. Recognizing propaganda		■
5. Rule-governed aspects of reading	■	
6. Study skills		■
<b>IV. Transfer of Habits and Attitudes</b>		
<b>A. Non-cognitive Transfer</b>		
1. Attention		■
2. Listening skills		■
3. Concentration		■
4. Persistence		■
5. Task completion		■
<b>B. Self-concept Transfer</b>		
1. Being literate		■
2. Feeling capable		■
3. Possessing specific competencies		■
4. Achieving		■
5. Believing in one's ability to learn		■

Krashen (1980) claims that the acquisition of a L1 and L2 are similar in that both are basically determined by the learner's cognitive development and experience. In the L2 process, however, it is experience combined with comprehensible input that makes the learner develop proficiency in this L2. Based on Krashen's theory, learning of the L2 structure occurs as a result of understanding the message. Based on the same rationale, Krashen (1985) shows that "reading for genuine interest with a focus on meaning" (p. 89) can help develop grammatical competence, vocabulary building, reading comprehension, and writing skills. This type of reading is referred to by Krashen as 'reading exposure', and according to him it includes: sustained silent reading programs, self-selected reading programs (in contrast to basal readers), print environments and pleasure reading. Reading exposure will help develop L2 literacy to the extent that it provides comprehensible input.

In addition, social factors constitute the second - and sometimes the first - most important condition affecting the L2 literacy development process. As Walsh (1987) points out:

In learning their first language, children subconsciously take from the past while they create in the present, drawing from their own discoveries and experiences as well as those of others. Through the generations, family members pass to children the words, concepts, and ways of communicating that they were taught and that their children will too some day pass down. It is in this way that children learn the use and significance (i.e. meaning) of their language and, at the same time, build sociocultural and historical alliances with the speech community of which they are a part. (Therefore) Language is . . . the development of speech along with ways of thinking, feeling and acting that are culturally embedded and socially determined . . . (p. 197).

The influence of the environment in the process of developing reading skills in a L2, is corroborated by Thonis (1981), who claims that L2 learners often know the mechanics of reading but they fail in their attempts only because they cannot grasp the



concepts represented by the text. In other words, there exists too much distance between the child's background and experience and the reality of the written words. Thonis (1981) also asserts that despite the array of transferable skills, transfer is not the only condition to develop literacy in a L2. In order to become a good reader in a L2, the LEP child needs to learn to become familiar with the background of the L2 culture, and be able to interpret a text according to the norms and values of the L2 society. Brisk (1981) highlights not only the relevance of the socioeconomic status of the child but "the relevance of the status of the language and the group it represents, attitude towards both L1 and L2, and the amount of L1 in the literate environment.

It is the status of the language and the access to the use of the L1 at home and in the environment that explains the success of immersion programs in Canada where children from the dominant linguistic group (English) receive all his instruction in the second language (French) (Swain, 1986; Brisk, 1981; Cummins, 1986; Hernandez-Chavez, 1986). According to Swain (1986) "the students have achieved high levels of proficiency in the second language while developing and maintaining normal levels of first language proficiency" (p. 107).

Therefore, as the research discussed above indicates the critical issue is that the child's first language be developed and maintained, and that the development of literacy just being in this language. Ideally, the development of the child's first language begins at home, continues in school and it is reinforced through the environment. However, these ideal conditions frequently do not take place when the child's first language is a minority language.



## Conclusion

The focus of this section has been on current literature regarding the development of literacy skills. To that purpose, I have discussed what literacy means to different authors, the relationship that exists between oral and written language, the role of metalinguistic awareness in the onset of literacy, and the process of developing literacy in a second language. Literacy has been defined as a critical understanding of the printed material. Reading is therefore perceived as an extension of the natural language development in all children, rather than an acquired skill. This definition of literacy also implies the existence of a strong correlation between the ability to read and write and world knowledge, which is referred to by Hirsch as cultural literacy (1987). For the child who is expected to develop literacy skills in a L2, becoming literate in this second language will entail the mastery of the linguistic code as well as the learning and accommodation to the values and cultural characteristics of the L2 group.

As Goodman and Goodman (1976), Byalystok (1985) and Cummins (1981) state, oral and written language systems are similar in that they both refer to meaning, and aim at communication. The differences between oral and written language lies in the manner in which the code is used (Goodman and Goodman, 1976). For Byalystok (1985), oral and written language share a common cognitive basis. The only difference between the two being the degree of language knowledge and cognitive control that each of them requires. From a developmental perspective, Cummins (1981) argues that the major distinction between the two systems is the degree of contextualized support in which the communication takes place. At one end of the continuum there would be a dialogue on a very casual and familiar subject, e.g. wheater, whereas at the other

extreme one would find the reading and comprehension of a complicated document written in a very technical group.

According to Cummins (1981), and Thonis (1981), among other researchers, while there are distinct features between the oral and written forms of the different languages, L1 skills can be transferred to the L2, while maintaining a comprehension reading potential which is common for all of them.

A need for communicating beyond face-to-face situations, together with an ability to internalize the functions of the written language appear to be the best indicators of beginning literacy. In his progress towards the development of literacy, the child moves from reading globally to establishing a correspondence between the words and sounds using the alphabetical principle (Ferreiro and Teberoski, 1979). At the same time, the child gathers the different knowledge, e.g. familiarity with context, that it is necessary to interpret a text.

According to Lofgren (1980), proficiency in the L1 is the best predictor of proficiency in a L2 and school achievement. The stronger the child's abilities in his L1 language the stronger his ability to develop literacy skills in a L2 because: a) a child's positive attitude towards his own culture and values facilitates the understanding of the respect and values of the L2 culture, b) there is a transferability of L1 skills to the second language, and c) the child is capable of using the L1 to solve communication problems with the L2 that is, the use of transfer as a problem solving strategy (Faerch and Kasper, 1986). In conclusion, research has shown that the development and maintenance of the child's L1, is the most critical issue in the process of developing literacy skills in a L2. Whether the first language is developed and maintained at home and/or at school will depend primarily upon the status of the language in a particular

context, and the child's access to the use of the L1 at home, and at school. The application of these theories in the classroom, and in particular, in the teaching of linguistic minority children is being discussed in the following section.

### Teaching of Literacy Skills

#### Reading and Writing Methods

The developmental view of beginning literacy presented above, is shared by many researchers (Ferreiro and Teberosky, 1979; Goodman and Goodman, 1976; Piaget, 1969, 1977; Smith, 1975; Veatch, 1979; Vygotski, 1978), but it is at odds with traditional schooling.

Traditional methodologies have usually focused on the mastery of specific skills, e.g. grammatical structures, and have tended to develop along narrow lines, justified by success in achieving limited goals, such as evaluation measures imposed by the same institution (Holdaway, 1979). Traditional methods also have the tendency to regard reading, writing, spelling and composition as separate programs, and as such they are taught in quite an unrelated manner. Moreover, the acquisition of reading and writing skills is often broken down in sub-skills, as if they were different subjects. For example, Ferreiro and Teberoski (1979) highlight the emphasis posed by traditional instruction on the teaching of the sounds of spoken language assuming that unless children distinguish them adequately they will not be able to write in an alphabetic system.

Since learning to read and write has been the central function of traditional schooling, a vast amount of research has been undertaken in the last ten-fifteen years on



reading instruction methodologies. Holdaway (1979) summarizes the results of this research effort as "the search for the perfect method". In Holdaway's view:

In almost every conflict of reading method it would be true to say that both sides had been right in insisting that their insights were crucial, but both sides had been abysmally wrong in insisting that the insights of the other side were totally mistaken. Both sides have usually been culpable also in focusing on low level, perceptual skills and in failing to see the matter of literacy whole and in relationship to other disciplines. All the characteristic mistakes of abstraction and factionalism have compounded the debate in tragically irrational ways ( ). Extreme polarities of method developed as the pendulum swung. First rational system, grammatical structure have to be correctly formed, and if you are lucky, communicable meanings have to be encoded. It is little wonder that many children escape dangers of the corrective environment by producing a little written language as the school will allow. Here again, the developmental model contrasts strongly with the instructional model as implied by actual teaching. If we were to expect immediate correctness and perfection of articulation from children learning to speak, the learning of spoken language would be almost as hazardous and its production as sparse. (p. 26-27).

At present, most reading methods can be classified from the viewpoint of code or meaning approach. As it is reported in Thonis (1981), reading methods can be grouped into three major categories: 1) synthetic approaches, 2) analytic approaches and 3) a synthetic-analytic combination approach (Figure 6).

MAJOR CATEGORIES:

- . SYNTHETIC METHOD
- . ANALYTIC METHOD
- . SYNTHETIC-ANALYTIC METHOD

ANALYTIC METHODOLOGIES:

- . MAJOR FEATURES: FOCUS ON WHOLE WORDS  
MEANING, THEN CODE
- . EXAMPLES OF ANALYTIC METHODS:
  - . LANGUAGE EXPERIENCE
  - . GLOBAL
  - . GENERATIVE

SYNTHETIC METHODOLOGIES:

- . MAJOR FEATURES: STRESS PART-WHOLE RELATIONSHIPS  
MASTERY OF CODE, THEN MEANING
- . EXAMPLES OF SYNTHETIC METHODS:
  - . ONOMATOPOEIC
  - . ALPHABETIC
  - . SYLLABIC
  - . PHONIC

Figure 6. Reading Methods. Thonis, 1981.

A major feature of synthetic methods is the emphasis on part-whole relationships, and the mastery of code. Among common synthetic methods, Thonis (1981) mentions the onomatopoeic, the alphabetic, the syllabic and the phonic approaches. All of them stress the teaching of the code over meaning. In an onomatopoeic method, for example, each visual symbol is associated to a single sound in order to facilitate the acquisition of the speech-print relationships. The alphabetic method is also based upon the synthetic principle, but differs from the onomatopoeic in that it focuses on the teaching of the letter names rather than sounds. The syllabic method, depends heavily upon auditory memory. Children are taught patterns of consonant-vowel blends that they put together to create words. The syllabic as well as the phonic methods are extensively used to teaching Spanish because the written language is a rather consistent and predictable representation of speech, or as Thonis (1981) says it: "there is a good fit between speech and print" (p. 168).

Some of the commercial programs available which use a synthetic-oriented methodology are Addison-Wesley Reading Program (1979), and Lippincot Basic Reading Program (1975).. For example, Addison-Wesley's "Meet the Superkids" uses nonsensical language to play with letter sounds.

### Tug

Cass Tugs.  
 Oswala tugs Cass.  
 Alf is hot. Icky sits.  
 Tic tugs Tac. Ettabetta is last.  
 Golly is left.  
 Sal tugs.  
 Doc tugs Sal.  
 Frits is hot. Lily sits.  
 Toc tugs Lily. Hot Rot is last.  
 Golly has a fuss.  
 Ug! Ug!  
 Golly tugs fast.  
 The Superkids hit the dust.



All these programs stress individual letters and the sound they represent. Words are learned by blending individual letter-sounds, word analysis skills are usually taught in isolation, and the language of the stories is limited to vocabulary that follows the spelling pattern of the lesson. Word attack is a primary objective of the first few years. Sounds are taught in sequence and the program is structured by levels of books. The learner must master a given skill level before she can move to the next level. Therefore, and to optimize success, repetition and reinforcement activities are also an important component of such programs.

In contrast to the above, the analytical methods are meaning-centered; they stress comprehension, focus on the whole word and study skills. Thonis (1981) identifies three major models: 1) the global, 2) the generative and 3) the language experience approaches. The global method presents whole words and entire sentences that are read to the children who memorize them. This method disregards the writing system as a code at the expense of meaning (Thonis, 1981). Unlike the global approach, the generative method introduces the children to sentence and word analysis of the memorized words. Among a variety of synthetic commercial programs developed based on an analytical method are: GINN 360, 720 from GINN and Co. (1973, 1976). GINN is introduced by the publishers as an excellent literacy and unique language arts program with a strong phonics component; the Houghton Mifflin Reading Series (1971, 1978), for example, provide students with an anthology of selections which are used as the vehicle for the development of reading skills (Hillerich, in Publ.'s brochure, no date):

### Jim's Going Fishing

Here comes the school bus!  
 Come on, Jim!  
 I am not going to school.  
 You have to go.  
 I'm going fishing. And I can't fish in school.

Where is Jim?  
 Jim isn't going to school, Mr. Wills.  
 Jim isn't sick. He wants to go fishing.  
 Jim! Get on the bus! You have to go to school.  
 I want to go fishing. And I can't fish in school.  
 This is a school day, Jim.  
 I'm not going today, Mr. Wills, I have to go fishing.

The third analytic method mentioned by Thonis (1981), is the language experience approach. Initially tested in the Reading Study Project in San Diego County during the 1959-60 school year (Cromwell, 1980), the language experience approach is a reading method that derives from the child's own language and experience. The focus is the child as a learner, and his process in the development of literacy skills. According to Cromwell (1980), the language experience approach is a natural reading program that:

- . provides a sound and positive foundation for early experiences.
- . creates a context for self-development through direct experiences that are familiar and important to the learner.
- . fosters affective and cognitive development by permitting the learner to experience himself while he is discovering important things about learning.
- . permit each learner to progress in his or her own ways, at his or her own rate.
- . promotes self-expression experiences as a integral part of the communication process.
- . facilitates a sense of togetherness between adults and children.
- . costs little and contributes significantly to early language development, and
- . makes reading meaningful and purposeful experience for young children (p. 22).

This model is consistent with the understanding that the acquisition of literacy is an extension of the natural learning process, as claimed by Goodman and Goodman (1976) among others. According to Goodman and Goodman (1976) teachers could create a classroom environment which is rich in written language, e.g. good library, and instead of having children read for practice, they should be encouraged to read to get something else: a message, a story, information. Learning to read and write should be enjoyable and meaningful, and for this reason, reading should be integrated with other academic areas such as science or social studies. Thonis (1981) claims that this model has been used with some degree of success. This approach, she claims, demands much of both teachers and learners. "The teacher must manage an enormous amount of material, different for each child, since each pupil's language and experiences are unique . . . (For the child is demanding especially because) there is little or no control of vocabulary so that practice needed for mastery may not occur and words learned today may be forgotten tomorrow" (p. 170).

Finally, the eclectic method is one that combines successful elements of both synthetic and analytic. A whole language approach to literacy would be classified in this category. In Swedo's (1987) view, in this type of approach which incorporates components of the language experience, synthetic and/or analytic methods, the learner is perceived as an active constructor of meaning in "both language and literacy, with the construction built on cues from the context of the activity". Within this framework the four language domains - oral, listening, reading and writing skills - are integrated and always taught based on the learner's activities and self-initiated projects, e.g. story writing. A tenet of this approach is the interaction of the student with the adult (Swedo, 1987; Rosegrant, 1986). According to Rosegrant (1984) scaffolding, acknowledgment, facilitating, informing and extending are adult behaviors associated

with children's achieving in reading and writing. The role of adult/teacher in the whole language approach is one of collaboration whereby the teacher provides the opportunity for dialogue between him and the student as he guides and facilitates the student learning process.

The Kamehameha Early Education Project (KEEP) is a good example of a whole language program. The KEEP project was developed to teach reading and writing to native Hawaiian children. In this culture 'talk story' is an important component of adult cultural activities. Taking this cultural feature into consideration, Hawaiian children were taught how to read and write using a 'talk story' model, to which children responded very positively. Similarly, the teachers from Roadville and Trackton (Heath, 1986) were effective in their attempts to teach the children from the two communities described in the book, because they were able to bridge the gap between school and community. Again, teaching success was due to an interactive, non-threatening, methodology which incorporated the ways of talking, knowing and expressing characteristic of the students.

### Teaching Methods for Linguistic Minority Students

When considering a reading method for a linguistic minority student, in addition to preference over code or meaning a decision has to be made in regards to what language to use (L1 or L2) to introduce reading. There is no argument among researchers (Brisk, 1981; Cummins, 1980, 1986; Fradd, 1982; Hakuta and Gould, 1987; McLaughlin, 1985; Thonis, 1981) that there are linguistic, psychological and educational reasons to support initial reading in the first language.

Linguistic reasons are found in that most writing systems operate on some kind of alphabet principle, and therefore as soon as the learner knows one system, he will be



able to crack the code of another one (Thonis, 1981). Psychological reasons can be found in the cognitive effects of bilingualism. The process by which individuals develop additive bilingualism results in positive cognitive effects on the child. In contrast, the process by which the first language is being replaced by the second language, thus preventing the learner from developing less than native-like proficiency in their first language, results in subtractive bilingualism, and in negative cognitive effects (Lambert, 1975; Cummins, 1981). An important educational reason for supporting initial reading in the L1 is that true equal education can result only from programs that optimize the potential of linguistic minority students by developing literacy in the two languages (Cummins, 1980).

Current school practices, however, reveal that there exists a major controversy in regards to appropriate teaching methodologies for LEP students in U.S. schools. This debate though is not based on the linguistic, psychological or educational reasons mentioned above, but rather on the many and complex social and political factors involved.

Two basically oppositional philosophies regarding the teaching of English skills to LEP children are currently in practice. Baker and Kanter (1981) among others, advocate monolingual English instruction, on the grounds that an immersion program is the most straightforward methodology to ensure that linguistic minority students acquire proficiency in English. A radically opposite view is that of bilingual education.

Extensive research shows that the use of the student's first language to learn the second language (English) is most appropriate, since the cognitive abilities developed in the first language are readily transferable to the second language. The benefits of this approach are that it establishes a deep sense of social and cultural identity which is of utmost importance for students to achieve academic success (Genessee, 1986; Hakuta,

1986; Hakuta and Gould, 1987; NABE Statement, 1986; Waggoner, 1986; Walsh and Carballo, 1986; Walsh, 1987). Immersion programs have been implemented rather successfully in Canada (Lambert, 1984, 1981), Lambert and Tucker (1972), and also in the United States (Campbell, 1984). In both instances, however, the goal of the program has been to develop additive bilingualism in children whose first language is that of the majority group.

In discussing this debate around bilingual education, Brisk (1981) again emphasizes that the core of the question in the education of linguistic minorities is to decide what language to use to introduce reading:

Three choices are apparent: subordination of the native language to the dominant language; simultaneous teaching of both L1 and L2; and development of reading skills in L1 before proceeding to L2. A second issue is the relationship between different language skills and their contribution to the learning process. And third, if L1 is used initially, when should L2 be introduced and for how long should L1 continue to be taught? (p. 2).

Brisk (1981) proposes that LEP students receive intensive instruction in their first language in the initial stages, since a solid L1 has a better and long-lasting effect on the acquisition of the L2 and education in general. In regards to the transition from L1 to L2, Brisk proposes a three-stage model, whereby students develop oral and pre-reading skills in their first language before they are exposed to the L2 (Table 3). In this model the development of oral and pre-readiness skills in the first language are the first steps towards literacy in the two languages. Once the child masters the basic skills in the first language she is introduced to oral English (L2 listening skills). In stage II, the child continues her progress in L1 reading and writing, as well as oral and listening skills in the L2, and is introduced to L2 reading. Eventually, and after a strong literacy foundation in the first language, the language minority child develops reading and

writing skills in the second language. According to Brisk (1981), the progression through this language development path can be enhanced and/or hindered by different factors (Table 4); among them, the status of the first language, attitude towards the first and the second languages, and the degree of exposure to literacy in the first language. The higher the degree of these variables, e.g. L1 development, or the higher the status of the L1 the faster the development of L2 literacy, and viceversa.

Table 3. Language Development Path for Linguistic Minority Children. Brisk, 1981.

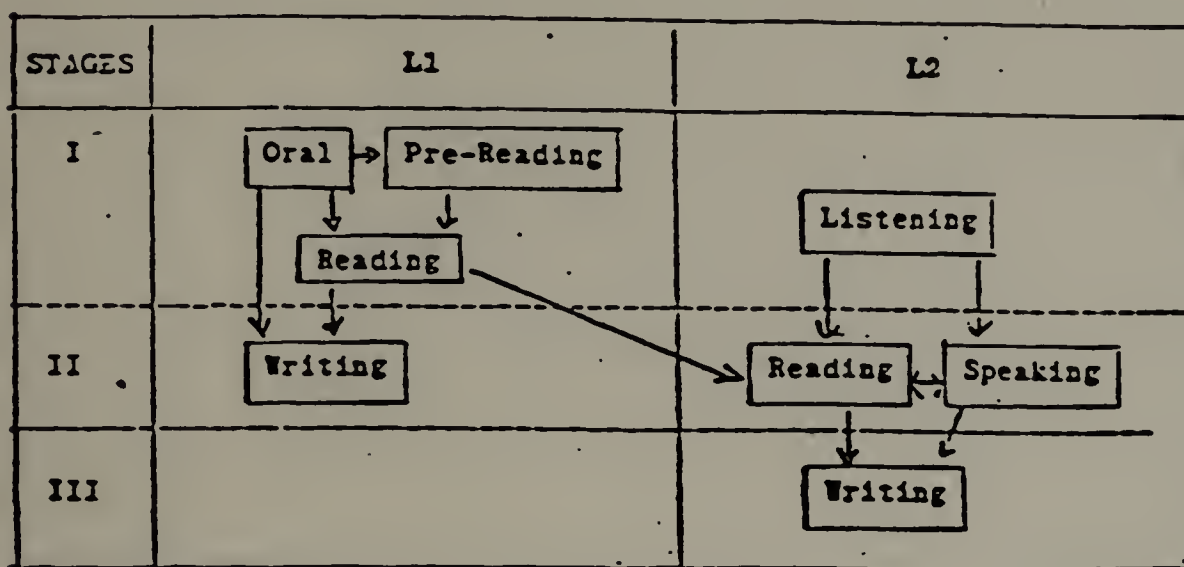


Table 4. Variables Affecting Introduction and Development of L2. (Brisk, 1981).

	LOW	HIGH
LEVEL OF L1 DEVELOPMENT	- .....	+
STATUS OF L1	- .....	+
ATTITUDE TOWARDS L1	- .....	+
ATTITUDES TOWARDS L2	- .....	+
LITERATE ENVIRONMENT IN L1	- .....	+
	SLOWER	FASTER
	Progression through language dev. path	

McLaughlin (1985) concurs with Brisk that learning basic skills of reading and writing should be done in the child's first language. Moreover, McLaughlin expands on this concept and suggests very specific pedagogical principals geared to the achievement of active bilingualism:

Table 5. Suggested Principles for the Organization of Teaching to Achieve Active Bilingualism.

1. Learning the basic skills of reading and writing take place in the home language.
2. The semantic system in the home language must be established before systematic teaching of the second language begins.
3. Learning the second language must begin before puberty (about 12); so as to take advantage of the child's ability to learn a new phonetic system. After this age, the likelihood of a foreign accent is much greater.
4. There must be ample and continuous linguistic stimulation in both languages throughout the school year.
5. There should be language arts courses in both languages that are functional and reality-based.
6. The prestige of both languages should be safeguarded. This means that the home language should be used as the language of instruction in such courses as history and mathematics.
7. Language teaching should be based on principles of contractive analysis, and teachers of the home language and of Swedish should have a sound knowledge of the other's language and culture (p. 37).

Another important consideration is the treatment of the two languages and teaching styles. Studies by Legarreta (1979), McLaughlin (1985), Wong-Fillmore (1982), provide enough evidence to suggest that the simultaneous teaching of both L1 and L2, (often practiced in bilingual education programs) is not an effective method. Research results indicate that children tend not to pay attention to concurrent translations, and that they avoid the extra-effort to make sense out of an unfamiliar sentence and wait for its translation. The alternate method, thus the teaching of each language separately, appears to be a more effective approach. This method can take



different forms, e.g. AM/PM switch, and it is good in that it demands an active effort on the part of the learner to listen to the teacher, and make use of the context and other cues to comprehend the lesson. When using this alternate method, the teacher does not repeat the lesson in the other language, rather the content is covered in the two languages at different times. This methodology responds to Krashen's (1981) hypothesis that the acquisition of a second language does not come from learning rules and grammar, but from an understanding of the message. Krashen (1981) proposed that comprehensible input is the "only causative variable in second language acquisition" (p. 62). On those grounds Krashen emphasizes that it is more important the way in which instruction is delivered (comprehensible input) than the type of program in which the LEP child is involved with. As it is illustrated in Table 6, a model program will work only if there is adequate input in the second language.

Table 6. Requirements to be met by Programs for Non-English Proficient (NEP) Children and Current Options. Krashen, 1981.

Requirements for Programs (predicted by theory)	SUBMERSION ("SINK OR SWIM")			IMMERSION		BILINGUAL EDUCATION	Ideal Bilingual
	Only	+ Informal CI	+ ESL	Majority Child	Minority	Concurrent Translation	
1. Comprehensible input in weaker language.	no	yes	yes <sup>b</sup>	yes	yes <sup>c</sup>	no <sup>d</sup>	yes <sup>e</sup>
2. Maintain subject matter.	no	? <sup>f</sup>	? <sup>f</sup>	yes	yes <sup>c</sup>	? <sup>f</sup>	yes
Additional: 3. Maintain and develop first language.	no	no	no	yes	no	? <sup>f</sup>	yes

a: This program will work if second language ability grows fast enough to reach subject matter threshold before children are too far behind.

b: Yes, if the ESL method supplies comprehensible input.

c: *De facto* immersion programs do not succeed as well as bilingual education, however. May be due to attitudes, teacher expectations, low development of first language, and inappropriate materials.

d: Students tune out weaker language in concurrent translation programs (Legarreta, 1979).

e: Yes, if second language skills are adequate for those classes taught in the second language.

f: Will not succeed unless there is adequate input in the second language.

CI = Comprehensible Input

Ideal Bilingual = Subject matter in primary language, plus comprehensible input in English, either as ESL and/or subject matter instruction in comprehensible English.

Teaching styles are relevant because they involve attitudes and relate to culture awareness and sensitivity. There are classroom situations where the teacher plays an active role in imparting information and knowledge to the students, and the students passively respond to it, e.g. language modeling drill and practice, repetition. This type of instruction hinders self-esteem and prevents students from becoming critical learners. According to Cummins (1986), this form of instruction or transmission model is particularly negative for students from linguistic minority groups due to socio-economic factors, i.e. dominant vs. dominated culture:

The intrinsic value of the group is usually denied, and "objective" evidence accumulated to demonstrate the group's "inferiority". This inferior status is then used as a justification for excluding the group from activities and occupations that entail societal rewards. It is in these interactions that students are disabled. In the absence of individual and collective educator role definitions, school will continue to reproduce, in these interactions, the power relations that characterize the wider society and make minority students academic failure inevitable. (p. 33).

In contrast to this model, Cummins advocates for a reciprocal interaction pedagogy which is based upon real dialogue between the child and the student, and emphasizes the development of higher order thinking skills and generates intrinsic motivation on the child. For a linguistic minority student, it gives them an opportunity to express themselves, and to share their language and cultural values. It enhances self-esteem and builds up a positive attitude towards the L1 and L2 languages and cultures.

In regards to teaching methodologies per se (code vs. meaning), holistic approaches are the most abundant in the current literature (Thonis, 1981; Cummins, 1984; Swedo, 1987). Similar to a code oriented method, a holistic approach aims at facilitating the task for the child. The code oriented method, however, teaches reading by segmenting the task into simpler and meaningless units i.e. drill and practice, lower-

level questions (Swedo, 1987), whereas a holistic approach focuses on meaning, and simplifies the task for the child by adding sufficient context to make the task comprehensible to him (Cummins, 1984). Within this framework, Thonis (1981) and Terrell (1981) stress the advantage of a whole language approach based on the child's experience for the teaching of reading and writing in the L1 and L2 language to LEP students. This method incorporates the uniqueness of the student's background thus facilitating comprehension. Children see the relationship between thinking, speaking, reading and writing. They assimilate written language in whole phrases or sentences that make instant sense because they are their very own thoughts. Thonis (1981) recommends this approach with a phonics component for the transitional period, that is, the time when the child is introduced to literacy in the L2. In Table 7, Thonis provides recommendations which are supported by current research results.

Table 7. Teaching Reading to Linguistic Minority Children. (Thonis, 1981).

**SELECTION OF METHOD: CRITERIA**

- . APPROPRIATENESS TO STUDENT'S BACKGROUND
- . APPROPRIATENESS TO STUDENT'S EDUCATIONAL NEEDS
- . APPROPRIATENESS TO STUDENT'S LEARNING STYLES
- . METHOD USED FOR L1 DOES NOT NEED TO BE THE SAME AS FOR L2.
- . READINESS IN L1, AND READINESS IN L2

**TRANSITIONAL PERIOD: CRITERIA**

- . SUCCESS IN L1 LANGUAGE READING CLASS
- . ORAL L2 PROFICIENCY
- . SPECIFIC EAR-TRAINING FOR THE L2 SOUND SYSTEM
- . ATTITUDE TOWARDS L2 / INTEREST IN READING IN L2
- . STUDENT HAS BEEN GIVEN SUFFICIENT TIME TO ESTABLISH STRONG LITERACY SKILLS IN L1 (CONFIDENT LITERATE LEARNER)
- . AWARENESS OF PHONOLOGICAL, LEXICAL AND STRUCTURAL DIFFERENCES BETWEEN L1 AND L2
- . OPPORTUNITIES TO PRACTICE L2 READING
- . MASTERY OF SKILLS THAT MAY TRANSFER IMMEDIATELY

**POSSIBLE METHODOLOGICAL CHOICES:**

- . LANGUAGE EXPERIENCE APPROACH SUPPORTED BY A "CAUTIOUS" PROGRAM OF PHONIC SKILLS BASED ON SOUNDS THAT STUDENT CAN HEAR AND SAY
- . A LINGUISTIC PROGRAM SUPPORTED BY RICH ORAL L2 POEMS, STORYTELLING, DRAMATIZATIONS AND SONGS.
- . A "CAREFULLY" PACED BASAL READER APPROACH SUPPORTED BY CONTENT OF CULTURAL RELEVANCE TO LEARNERS, SUCH AS NEWS EVENTS AND DESCRIPTIONS OF LIFE IN THE L1 COMMUNITY AS WRITTEN IN THE L2.



The results of a recent study by Swedo (1987) on effective teaching strategies for handicapped bilingual students (but applicable to regular LEP children) indicated that those academic activities that result in higher levels of task engagement were those grounded on the students' experiences, that focused on content rather than linguistic forms, provided student choice and control, opportunities for student participation and use of both L1 and L2, team work, and peer feedback and accountability.

### Teaching Effectively

The adoption of a particular methodology does not guarantee effectiveness of instruction. According to Tikunoff (1987), an understanding of effective classroom instruction is fundamental to successfully address the varying educational needs of all students. From his three-year long study on the significant bilingual instructional features, Tikunoff identified three main dimensions of effective instruction: 1) the congruence among instructional intent, 2) the organization/delivery of instruction, and 3) the student outcomes. Based on this paradigm, Tikunoff concluded that:

Effective teachers exhibit congruence between their instructional intent, how instruction is organized and delivered, and resultant student outcomes. They clearly communicate to their students the nature of tasks and procedures for accomplishing them, as well as their belief that students can accomplish assigned tasks successfully. Effective teachers get their students engaged in task completion and keep them engaged, maintaining a businesslike and productive classroom atmosphere. They monitor students' work frequently and systematically, and provide appropriate feedback to students needing it with regard to how to complete assigned tasks successfully (p. 132).

Taking a more individualized approach, Jensen and Feuerstein (1987), proposed the use of mediated learning to enhance a child's learning. Jensen and Feuerstein argue that individuals learn most often through direct exposure to



environmental stimuli. However, under these circumstances the organism/child receives the stimuli in a random and disorganized manner, and thus he can benefit from them only partially. By contrast, when these environmental stimuli are channeled by a human mediator, someone who selects, and organizes them in time and in space before they are received by the child, they can be easily assimilated, and therefore help expand the child's experience.

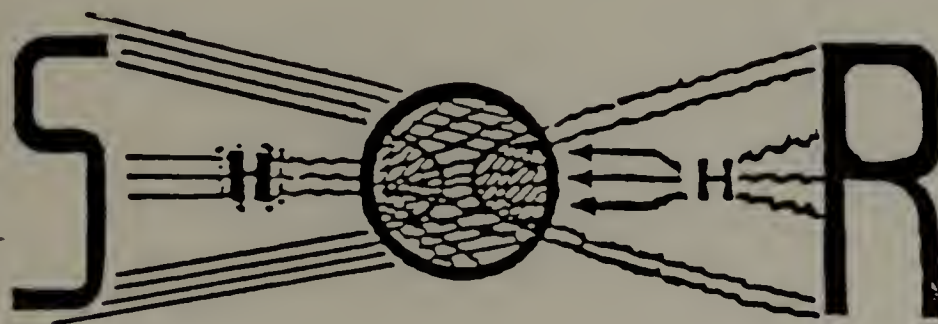


Figure 8. The Mediated Learning Experience Model (Jensen and Feuerstein, 1987).

Jensen and Feuerstein (1987) argue that mediated learning is very powerful in the development of higher levels of cognitive functioning given that:

In this . . . modality of learning and contrary to the fragmented, disassociated and even random fashion in which stimuli reach the organism's systems through direct exposure experiences, Mediated Learning Experiences (MLE) are selected by a mediator, their appearance is scheduled in time and organized in space. They are framed by goals and attributes, regulated in intensity through repetition, and enhanced through being connected by purpose and imbued with meaning. (p. 4).

Jensen and Feuerstein utilize Piaget's developmental proposal of the stimuli being transformed within the individual according to his degree of development (accommodation and assimilation), and take a step further by adding the role of the mediator between the stimuli and the individual and the response. Progressively, and when the role of the mediator is no longer necessary Jensen and Feuerstein's diagram will be that of Piaget's.

The above rationale led Jensen and Feuerstein (1987) to develop a learning paradigm which proposes mediated learning as means to improve the child's capacity or degree of modifiability which they define as - the readiness to bring about changes in cognitive structures. The main features of mediated learning as described by its authors are: -

1. Intentionality and Reciprocity. They are considered essential to interact in a meaningful way. Intentionality affects the mediator's face, eyes and voice expressions, which should help in guiding a response and a state of vigilance in the individual. The individual's reaction enables the mediator to determine the rate at which the interaction should progress "producing a readiness to slow down if necessary, to frame stimuli, to exaggerate movements and to model parts of whole sequences of behaviors as needed (Ibid: 385).

2. Transcendence. This characteristic refers to the need for carrying the goals of the mediated interaction beyond the task at hand. The property of transcendence may be illustrated by the instrument Organization of Dots - one of the instruments of the Learning Potential Assessment Device, LPAD<sup>1</sup>. The task of the Organization of Dots (Figure 9) involves the connection of dots within a given frame to reproduce models of a square and a triangle. "With proper mediation task the connection of dots to form the

model figures can be utilized, among many possible transcendent goals, to restrain impulsively and regulate behavior, to institute modalities of thinking such as the search for and use of relevant information, to enhance the projection of virtual relationships (the ability to apply a recognized relationship to new situations), and to develop comparative behavior" (p. 386).

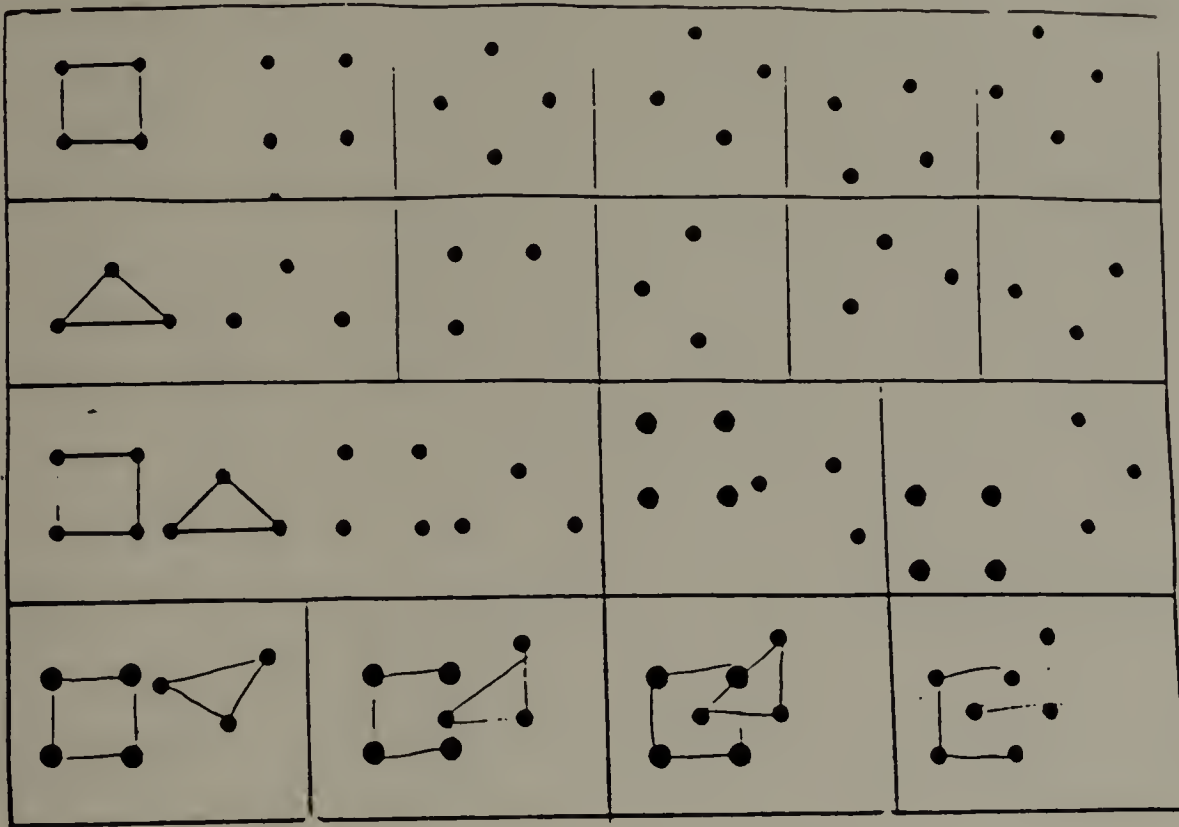


Figure 9. Task of Organization of Dots, Learning Potential Assessment Device. Feuerstein (1980).

3. Meaning. "The examiner detects changes that are taking place in the examinee's (individual) performance and attributes meaning to them . . . The mediation of meaning thereby permits experience to be the point of departure in the formation of more robust propensities within the individual to apply acquired cognitive functions and mental operations as components of need systems they may go far beyond those elicited by the specific task" (p. 386-387).

4. Regulation of Behavior. The mediator uses modeling and focusing to assist the individual in the gathering of information, elaboration of a response and its proper communication. Among others, the mediator may "target the development of systematic exploratory behavior, need for precision and accuracy at both input and output levels, and need for logical evidence" (p. 387).

5. Mediation of a feeling of competence. The mediator "creates a climate wherein a feeling of competency follows successful mastery . . . The mediation of a feeling of competence provides a motivational enhancement to seek mastery of increasingly complex and difficult tasks and is necessary to secure the development of autonomous, independent function" (p. 387).

6. Sharing. This property is perceived as a primary criterion for a Mediated Learning Experience (MLE) to occur. It is through sharing that the mediator can establish true communication with the individual and ensure an effective mediation of learning.

7. Individualization/Psychological Differentiation. By considering the child as a unique individual, the mediator "assesses the student's locus of control and provides mediation to establish an internal locus along with the regulation of behavior, mediation of competence and strengthening of both cognitive functions and mental operations that may be required to maintain it" (p. 387).

8. Goal Seeking, Goal Setting and Goal Achievement. "Assessing the modifiability of the examinee's cognitive structure through the mediated provision of intensive, focus learning experiences, the examiner seeks to forge conditions for the establishment of goal-seeking, goal-setting, and goal-achieving behavior". A child's



episodic grasp of reality, planning behavior, and hypothetical reasoning are among frequent goals targeted for mediation.

9. Challenge. The characteristic is closely related to that of mediating a feeling of competence. It is identified separately to emphasize the significance of the "development through mediation of the propensity to seek out tasks for their novelty and complexity (which) is required above and beyond the mediation of competence to overcome the insecurity and anxiety associated with the unfamiliar" (p. 388).

10. Change. "The mediation of change is undertaken to equip the child with insight into his or her group proficiency, thereby permitting the establishment of internalized expectancies for reinforcement and reward. . . . The mediation of change both forges and supports the incremental widening of applications for newly acquired modalities of functioning through appropriate revisions of the import of both success and failure" (p. 388).

The learning paradigm as described above is the basis of Feuerstein's (1980) assessment instrument, the Learning Assessment Potential Device (LPAD) which aims at eliciting the child's optimal performance in the testing situation. This information is then used to devise a treatment plan for the child with its goal being the achievement of structural cognitive changes.

### Conclusion

This section has reviewed a variety of reading and writing methods. A major distinction has been established between those methods that focus on code and those that emphasize meaning.

A synthetic approach, in its multiple expressions, e.g. syllabic, phonic or alphabetic methods, stress individual letters and the sounds that they represent. There is a sequential and gradual progress of skills, the mastery of a set of sub-skills or a particular level being a pre-requisite to move to the next one. Repetition and reinforcement are therefore, important components of these methodologies.

Methodologies which are meaning-oriented (analytical in nature) value reading and writing as a global skill and thus they de-emphasize the learning of code at the expense of comprehension.

Whole language has been presented as a eclectic approach, one that combines analytical and synthetic methods. Based on the understanding that the four language domains are interdependent and interrelated, whole language approaches the four domains holistically, usually based on children's initiated projects and/or classroom activities.

In discussing teaching methodologies for linguistic minority children, it has been shown that the use of holistic methods are among those with higher success. In addition to the focus of the approach, there are several other important aspects that must be considered when teaching literacy skills to linguistic minority children. This section has addressed the issue of choosing a language, the treatment of the two languages, and the relevance of teaching styles. After considering all these factors, it has been proposed that children should be introduced to reading in their first language through meaningful tasks, and that the need for a phonic component should be considered especially during the transitional period, when the child is being introduced to reading in the second language (Thonis, 1981).

## The Function of Computers in the Development of Critical Literacy

### Major Trends in Computer Use in the Classroom

The emergence of the computer and its use in the classroom has provided a new teaching tool and has led to the development of new instructional methodologies. One of the major roles for the microcomputer in education is to promote school learning, and research suggests that computers have helped students in many different ways. Rosegrant (1986) reports that the use of word processing with synthesized speech, builds up essential learning behaviors such as risk-taking, hypothesis testing, persistence and focused participation. Mylona (1984) indicates that some students increased their speed learning through the use of computers. Constanzo (1985) reports that computers helped students strengthen their ability to visualize what they read. Computer-oriented programs also appear to provide positive socializing experience and thus help improve self-esteem and interpersonal skills (Genishi et al., 1985). The use of computers to promote the development of English as a second language and literacy skills in LEP children also holds promise, despite the fact that LEP student's access to computers is limited and that where access is available, programs tend to be remedial in nature (Johnson, 1985).

Two basically different approaches to the use of computers in the classroom are currently in place, one which focuses on the computer and the other which focuses on the student. Bell (1984), Dede (1984), Stonier and Conlin (1985) are among those who represent the conventional thinking about computer use in the classroom. They perceive the child as being assisted by the computer. They also see the computer as a tool that can often relieve the teacher from some of his multiple responsibilities. The

computer may help meeting each child's individual learning needs. It may also assist the teacher in those facets of teaching that can become tedious and/or cumbersome, e.g. practice of a specific skill.

Computer-Assisted Instruction (CAI), the most common use of computers, can be defined as a varied number of drill and practice programs and tutorials geared to engage the student in practicing determined skills. For example, the computer can present flashcard-type exercises to help the student become more familiar with the spelling of a given set of words. Another form of CAI is the tutorial, in which the computer guides the student through a program of learning, setting the pace to suit the student. In this type of program the response of the student may determine the degree of difficulty of the exercise; only when the student reaches a predetermined score or level of difficulty does the computer move to the next level or to a set of different exercises. Because of its repetitive nature, it is not surprising to find in the literature that CAI is effective in raising performance test scores (Been, 1984). CAI has not proven to be that effective in other studies with LEP children. Ellis' study (1984) with 11-15 year old students, indicated that computer work in Wh-interrogatives had no effect on new language-use situations. Similarly Johnson (1985) argues that:

It is my suspicion, based on observation of young (LEP) children working on form-based software, that they will often play the game of doing the exercises, memorize the correct answers, and pass the activity, while not having understood the concept that they were dealing with. (p. 3).

The limitations of CAI have been acknowledged by some authors. Underwood (1984), for example, proposes a new form of CAI, the Computer-Assisted Language Learning (CALL) which attempts to encourage the student to generate original utterances instead of having to manipulate prefabricated ones, and has some program



flexibility in that it allows for more than one answer. In Papert's (1979) view, computer-assisted instruction is far from desirable:

The teacher plays the role of an authority figure who prescribes the exercises and judges their performance, while the child . . . is also learning how to accept authority in a way prescribed by school and society. Replacing a human teacher by a machine changes nothing, except that perhaps it makes the process more effective by giving it a mechanical image that is in fact more resonant with what is really going on. (p. 1979).

Papert (1980) envisions the child as a programmer who has control over the computer. To that purpose, Papert created Logo, a computer language specifically developed for children's use, which encourages the discovery of geometrical shapes, and leads to an intuitive learning of formal mathematics. Logo has had a significant influence on the field of educational technology, and has probably been a decisive factor in the way that computers have begun to be perceived in many schools today (Becker, 1982; Carlson, 1983; Johnson, 1985), in the development of more interactive version of CAI, such as exploratory CALL (Underwood, 1984), and in computer curriculum design (Oman and Wilson, 1986).

According to Mylona (1984), computer based instruction that is meaningful for the student and that occurs within an academic content is: ". . . an accountable, responsible and credible system which can help the learner master prescribed knowledge and skills, concepts, rules, and . . . a certain attitude about school, native and English language and culture." (p.13).

Carlson (1983) advocates teaching programming to children. Programming, he claims, will give children an opportunity to learn and practice with procedures in a way that it is far more effective than in traditional schooling where the use of procedures is

confined to long divisions in mathematics. Oman and Wilson (1986) also believe that the child should be in control over the computer, and to that purpose they created a computer curriculum designed for grades K-8, the goal of which being to develop computer awareness and programming. Clement's research study (1986) indicates that Logo programming affects children's ability to solve problems involving analogies and sequences, and has a moderate effect on mathematics computation. Clements' findings are not unique. Linn (1985) and Mandinach and Linn (1986), among others have also conducted studies concluding that programming does have some positive cognitive consequences in children. Mandinach and Linn (1986) also highlight the importance of the software in a computer learning environment. According to them, software programs with the capability for precise and interactive feedback, are those that take better advantage of the environment. These programs, characterized by giving the students control over their own learning, not only assist the student in the acquisition of specific skills, but contribute to the motivation that the environment provides (Mandinach and Linn, 1986).

Among the different applications of computer based instruction, the use of computers in the process of writing and composing is widely recommended (Daiute, 1983; Johnson, 1985; Perkins, 1985; Tucker, 1985; Underwood, 1984). Perkins (1985) argues that since you learn how to write by writing, word processor programs are very valuable because students tend to write much more at the computer. The results of his study lacked conclusive evidence regarding the improvement of the quality of writing of the subjects of the study, but it demonstrated that students write significantly more. In an ethnographic study involving QUILL, an interactive writing program, Cazden et .al. (1984) found that the group whose teacher was identified as

the expert and was enthusiastic about the use of the program, children wrote more and better stories (grammatically and semantically).

A new concept, that of a computer learning environment, is emerging. Rather than advocating for a specific approach or software program, a learning environment proposes an integrative use of the computer. According to Joyce (1974), a computer learning environment is:

. . . a general design, one that can guide the development of alternative educational forms and create a congenial institutional framework in which these forms (CAI as well as student learning activities) can be applied. **THE STRUCTURE OF THE SCHOOLS IS IN MANY SENSES THE MEDIUM OF INSTRUCTION-** it facilitates certain kinds of learning modes and inhibits others (p. ).

-An example of this more comprehensive approach is that proposed by Robbat (1985). His student-centered computer model includes:

Student as designer: Students develop programs to use computers as a medium for learning.

Student as practitioner: Students select and apply programs to learning situations.

Students as receiver: Students are given program to use for instructional purposes (CAI).. (p. 23).

In all cases, the student "develops a frame of mind that emphasizes their control of the technology" (p. 23). And, according to Robbat, when programming, the student becomes familiar with the capabilities of the computer and with the possibilities of altering the coding of existing programs. He also learns to program using authoring systems and/or menu-driven programs. By student as a practitioner, Robbat (1985) means the capability of the computer applications to facilitate the gathering, storing and manipulation of data generated by the student himself, thus allowing the student to develop and discover processes for acquiring knowledge- as proposed by Papert



(1980). As a practitioner, the student may have access to simulations which encourage experimentation based on "real situations". In the third category, the student as receiver, the computer supplements the teacher-taught curriculum through drill and practice, tutorial activities and/or dialogue systems. Robbat claims that the three categories are not mutually exclusive, even when subscribing to Kay's (1983; in Robbat, 1985) understanding of computer use:

The computer is not a tool- that is a very weak characterization of the thing. The tools on the computer are the programs that make it into various kinds of levers and fulcrea. The computer itself is a medium like paper- zillions of degrees of freedom, used in many ways that the inventors of it can't and don't need to understand, making a fundamental change in the way people think about the world. (p. 22).

### Adding Synthesized Speech Output to Computer-Based Instruction

Another technological innovation of great potential in the classroom is the use of synthesized speech. The addition of voice to a computer-based environment has been in existence for some time, but its use had been limited to visually-impaired students (American Printing House for the Blind, 1987) and to other speech-impaired individuals (Fishman, 1987). Fishman (1987) reports that despite some common complaints about their sound - too mechanical or artificial -, the use of computerized speech is rated high in projection, and in the ability to gain the user's attention and to resist interruptions.

More recently, speech synthesizers have been advertised for the standard classroom and the number of software programs that incorporate some type of synthesized speech is growing every day. Recently released programs include, for example, the Jungle Book Reading and The First Man in the Moon Math from



Spinnaker, and the Tandy ESTC system from Radio Shack. Sauve and Schbuer (1984) stress the importance of the use of voice in the teaching of a second language. "The computer-voice connection offers seemingly endless possibilities in the bilingual classroom, in ESL instruction, in foreign language education, and in other educational settings where the spoken word plays a key role." (p. 29).

According to Fishman (1987) and Street Electronics (1986) there are two basic types of voice or speech output aids: text-to-speech synthesizers and digitized speech. A text-to-speech synthesizer or the simply called "synthesizer", is a machine that creates speech output based on programmed instructions. Because the synthesizer creates the speech output rather than playing back previously recorded speech, it enables the machine to speak anything than one can spell just by instructing the machine how to read it aloud. However, the capacity of the synthesizer to imitate all the characteristics of the speech mechanism is limited, and for this reason speech synthesis often sounds unnatural even unintelligible at times.

In contrast, digitized speech uses human speech as its basis. The speech is being stored in the computer memory, once converted into a sequence of numbers. At a signal, those numbers are sent through another circuit which reconverts them into speech signals. This latter type of computerized speech is more powerful and produces a very high quality of voice (Apple II GS). Despite its fine intelligibility, digitized speech is not widely used for two main reasons: 1) It takes a large amount of computer memory, and thus it requires more expensive equipment, and 2) the vocabulary of the system is limited to prestored words. The advantages of a speech synthesizer is that it does not require a large memory, so its cost can be kept low, and the words can be

rapidly and easily constructed. At present most of the educational software with speech output utilize text-to-speech synthesizers.

Using the Echo IIb, a speech synthesizer from Street Electronics (1986), Rosegrant (1986, in Trachtman, 1984) conducted several studies on the effectiveness of the use of speech output with handicapped youngsters (1984), and more recently with Talking Text Writer (1986), a word-processor with synthesized speech. In her initial study with handicapped students, Rosegrant found that the youngsters opportunity to have control over the electronic voice helped them to unlock their own abilities to speak, read and write. Rosegrant's approach was to build upon what the students could do, rather than focusing on their defects. Like in the case of Alice, a 14-year old diagnosed as retarded and emotionally handicapped-, Rosegrant found that the speech output was instrumental in breaking the barrier between the child and her environment. As Rosegrant (in Trachtman, 1984) explains:

She had a tentative way of walking as if she hadn't used her body much. She always hung her head, and I couldn't get any eye contact. She could not even spell her name". With Rosegrant's help, Alice typed her name, listening to the computer say it. The she went on writing things that she liked, and after eight half-hour sessions, Alice wrote sentences like "Alice is smart" and "Alice has friends at school". At this point the children had begun to read each other's writing, and Alice started using the pronoun "we". We had tacos in class. We like to eat them. We had fun. More importantly, Rosegrant points out that Alice's behavior had changed significantly to the point that "she would come skipping down the hall to see me, really chatty, telling me everything she was doing in class. In our sessions she was reading a lot more vocabulary than I thought she could, and when she wrote she would tell me, "I can spell that, you don't have to write it out. (p. 49).

Rosegrant's most recent research with Talking Text Writer (1986) involved one hundred children in the regular program from kindergarten through grade 3. The results of this five-year project indicate that children used the speech output provided by

Talking Text Writer to help themselves in their beginning efforts to learn how to read and write. Also, and apparently because of the immediate aural feedback, children spent longer periods of time reading and writing, wrote longer texts and showed more enthusiasm for literacy than the children in the control group that used the same word processing program. Finally, Rosegrant's findings suggest that:

- . The particular form of support used by the children varied depending upon their age.
- . Five-year old most often heard a letter name, followed words on the page with the cursor, printed words, and changed letters at the keyboard.
- . Six-year olds most often heard a line or a page of text, printed a line or page of text, and changed letters at the keyboard.
- . Seven-year olds most often heard a word or line of text, printed a line or page of text, changed letters of words, and added words at the keyboard.
- . Eight-year olds most often heard a word or line of text, printed a page of text, changed a letter, word or sentence, and added a word at the keyboard. (p. 81).

Rosegrant's research appears to be the only study in the literature that investigates the impact of computerized speech on literacy development. Rosegrant's study, however does not address the particular ways of learning of a second language learner. Similarly, little is known about the process of writing with word processing with bilingual students (Herrmann, 1987). Herrmann's study on the use of word processing by ESL youngsters highlights some successful strategies for teaching writing composition, but as she points out, "there is still much more for us to learn from our students about the process of teaching writing with computers" (p. 11).



## The Psychology of the Child-Computer Interaction

This section reviews the current literature as it relates to the nature of the relationship between the child and the computer in a CAI environment and in a student-computer integrated environment. It also reviews the literature available on the effects of other important factors affecting the nature of the child/computer interaction, namely motivation, the role played by the teacher and equity issues.

From a pedagogical perspective, Computer-Assisted Instruction (CAI) appears to conform with traditional schooling (Papert, 1980), whereby the child plays a passive role as the recipient of information given by the teacher. In Cummins' view (1986), CAI would follow a transmission model of instruction, that is:

The teacher's task is to impart knowledge or skills that she or he possesses to students who do not yet have these skills. This implies that the teacher initiates and controls the interaction, constantly orienting it towards the achievement of instructional objectives. (p. 28).

Constanzo (1985) claims that in drill-and-practice type activities, where the computer assumes the role of authority, the learner may soon detach himself from the computer, work passively and develop mental drudgery. By contrast, in programming or in some computer applications, e.g. word processing, the child is perceived as an active learner, in control over the computer (Carlson, 1983; Johnson, 1985; Papert, 1980; Rosegrant, 1986). This disposition generates a different attitude towards the computer and it encourages a different type of relationship. A relationship defined by Papert (1980) as: "An intimate contact with some of the deepest ideas from science, from mathematics and from the art of intellectual model building," (p. 5). From a pedagogical viewpoint, programming Logo, word processing and similar activities, are



based on a reciprocal interaction model of instruction , which according to Cummins (1986),

. . . requires a genuine dialogue between student and teacher in both oral and written modalities, guidance and facilitation rather than control of student learning by the teacher, and the encouragement of student talk in a collaborative learning context. (p. 28).

The child's response to the computer also depends upon her own personality (Turkle, 1984). In general, Turkle explains that the way a child views the world, the way she approaches problems, and how she relates to others, all these determine how she interacts with a computer. In my own experience with young children, computers are attractive to the extent that they are part of the child's environment. The computer in itself, its boxy appearance and lack of color is not that attractive to a young child (with the exception of the keyboard, which keys they love to press). It is only when by trial and error, by experiencing with it or by observing others, that the child discovers the 'magic' attached to the computer, and becomes involved with it.

Older children become motivated for similar reasons. For example, Emma, (in Stonier and Cotlin, 1985) an eight year old student says:

I like the computer because it played games with us.  
 I think the best game was hangman.  
 It helped to do my time's table.  
 The first thing it says is hello, then it said what is your name.  
 So I type my name.  
 It was very polite.  
 It never got cross.  
 It was like a typewriter with a telly on top.  
 I like it because it did all the writing.  
 All we did was the thinking.  
 It was like a friend and it's very helpful.  
 There are very exciting pictures (p. 20).

And an eighth grader (Brownstein, 1984):

This kind of learning gives you a personal like feeling, because you're working by yourself and you're learning by yourself on the computer. And the computer would be like a friend, you know. It would work with you. You know if you would do something wrong. It wouldn't reject you or anything. It would just like tell you. You could just keep on working. And you could get a lot of information, because when you're at the computer there's no limits to what you can start to learn. (p. 99).

The motivation of the teacher also appears to have an effect on the student's attitude towards the computer and the nature of their relationship with it. In Project Literacy (Cazden et al., 1984), two teachers who received the same training and support, who began the use of computers in their respective classroom the same day, and implemented the same program - QUILL interactive writing program-, achieved significantly different results with their sixth grade students. In the classroom where the teacher was perceived as a computer expert and where her enthusiasm for the program increased with experience, students responded more positively, and produced more written papers. The teacher's management style also had an impact on the students' attitude, pattern of computer use, access and integration with other classroom activities. A survey conducted by the John Hopkins University's Center for Social Organization of Schools (Becker, 1984), indicated that there is a difference in attitude between experienced and non-experienced teachers. Experienced teachers view computer as a resource for students to learn more, whereas teachers with little experience or no experience appeared to be inclined to define computers as a teaching tool, and prefer to use drill-and-practice type programs. With time, it appears that teachers come to understand that: "We are in the midst of an era in which the teacher is not yet responsible or not expected to know everything, an era that allows for a new working relationship (between teacher and student)," (p. 100).

Equity issues are another important factor to be considered. The student's gender, age, social status and national origin affect computer use as well as the nature of the relationship that is established between the student and the computer. According to Anderson et al. (1984):

One such undesired effect (of rapid technological change) is computer inequity, especially unequal access to computer learning as a consequence of a student's social and economic status (. . .). Educational computer inequities threatens to separate groups and communities by giving some people more effective tools for living in the age of computer information systems. (p. 7).

For Lockhead (1984) and Hawkins (1985), the stereotype of computers as a male machine appears to be highly related to the functions that computers serve and the organization of the learning settings that they are part of. Hawkins (1985) argues that in addition to the problems of access, girls have systematically received less support for learning with computers. Computers, he says, tend to be conceptually associated with math and science, and thus they acquire some of the traditional qualities of differentiated interest between boys and girls. A survey on summer computer camps conducted by Lockhead (1984) and MacGregor (1985), revealed that female enrollment decreased as the difficulty of the computer curriculum increased, and as the camp became more expensive:

Parents seem more willing to invest in computers and related materials for their sons than for their daughters (. . .). Explanations for this circumstance range from parents belief that it is worthwhile to make the expenditure for boys than for girls to the premise that activities are unappealing to girls. (p. 2).

In regards to age, there is enough evidence in the literature indicating that drill-and-practice type programs are used more extensively at the elementary level, because they are commonly perceived as easier (Anderson, 1984; Becker, 1984). Papert (1979,



1980), Watson et al. (1986) and Clements (1986) among others, argue against this assumption and strongly advocate for the introduction of programming and child-driven programs at an early age.

Economic disparities among schools and students also account for differences in computer use by students (Anderson et al. 1984; Becker, 1984; MacGregor, 1985). Anderson (1984) reports that among junior high school students, less than 17% of the students from rural and 'ghetto' areas use the school computer equipment. In contrast, 32% of students in 'urban/rich' schools use computers in school. In addition, there are differences in the way that computers are used in schools with different economic bases. In 'urban/rich' school students learn programming and problem solving skills, whereas in poorer schools, the computer is used for remediation purposes (MacGregor, 1985). Becker (1983) examined the differences between low socioeconomic status (SES) schools that were predominantly white and those that were predominantly minorities. His study showed that different pattern of computer use among these two groups of schools exists. Overall, minority schools used drill-and-practice programs, whereas the low SES white schools reported higher teaching of programming skills. Even more striking, is Becker's finding that in low SES white schools computers are mainly used by above average students and that in low SES minority schools the computer is primarily used by below average students.

Both racial and linguistic minorities are reported to have significantly less access to computer use in the classroom than other students (Becker, 1983; Anderson, 1984; Johnson, 1985). However, and according to the results of a study conducted by Becker (1983), the differences found in computer use by race are not consistent. The



difference seemed to stem from the fact that a large proportion of black students attend low SES schools.

Access to computers is clearly an issue for linguistic minority students. As the Office of Technology Assessment of the U.S. Congress (1987) reports: "... 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." (p. 81).

Johnson (1985) maintains that:

To the extent that language minority students are systematically excluded from experiences using computers in school on the basis of their ethnicity, socioeconomic status, or English language proficiency, they are not being provided with experiences comparable to those of their peers and this could indicate that the system is continuing to follow deficit models for educating LEP students. (p. 1).

Johnson (1985) notes the existence of a 'double-barrier' faced by LEP students, their lack of English skills, and the fact that most of them come from a low SES background. Johnson further explains that experts agree that software specifically developed for English-as-a-Second language (ESL) is poor and primarily of the drill-and-practice type. Becker (1982) ratifies Johnson's view when adding that highly rapid drills (CAI) for minority students are being used in the schools, whereas other students of the same age and grade are given more opportunities for creative inquiry, programming, problem solving skills and discovery models.

As reported by Arias (1986), data from a survey of 20 high schools in California indicated that another possible barrier to computer access in the upper grades is the course requirements. The survey documented that Hispanic students were less

likely to participate in computer courses because they were part of high level of mathematics and science courses, and often a requirement existed that algebra be taken prior to entry to a computer course (Hispanic students were seldom found to be enrolled in high level courses). Arias also found that poor students, including LEP students have very little or no access to computers outside of class time. The question of access of LEP students to computers is not only quantitative but qualitative; the type of programs and activities the LEP students are engaged when they have access to computers tend to be compensatory in nature (Technology Report , 1987). The policy pamphlet recently published by the Thomas Rivera Center (1986) indicates that the exclusive use of CAI for remedial instruction may diminish a student's self-image; also emphasized is that low achieving students, including LEP students, should be given the opportunity to use the type of programs available to high achievers, mainly word processing, database management and programming.

### The Impact of Computers in the Development of Critical

#### Literacy Skills (in L1 and L2)

Shifting the focus from computer to students has had a major impact on how computers are presently being used in the classroom (Chandler, 1985; Constanzo, 1985; Rosegrant, 1984, 1985, 1986; Seltzer, 1986; Thurber, 1986; Watson et al., 1986). An immediate result from this change has been an interest on the nature of the relationship between the child and the computer (Clements, 1986; Mandinach and Linn, 1986; Turkle, 1984), has evolved in a wider diversity of approaches to computer use (Papert, 1979, 1980; Robbat, 1985; Underwood, 1984), and the integration of computer technology into all areas of the curriculum (Technology Report, 1987). One

example of this current trend is the use of word processing to introduce, develop and strengthen reading and writing skills.

Robinson and Versluis (1985) view word processing as a means to promote literacy. Some of the positive aspects highlighted in their work are: (1) text appearance is enhanced from textbook to TV screen. Computers highlight errors but they are not cause of trouble since they are amenable to correction in a motivating, non-embarrassing form. They add that word processing facilitates writing production, and thus children become book-producers rather than book-consumers; children become highly motivated to write at the computer. Reflecting on the reason why young children respond so positively to word processing, Robinson and Versluis (1985) conclude that it may be that the distance between the author and his creation is significantly higher when looking at a printed than a handwritten text. And it is because of this distance between the author and his creation that the author finds it easier to accept and to correct his own mistakes. Robinson and Versluis (1985) go on to claim that the microcomputer is not a threat to writing:

The computer is a liberating influence, a powerful tool, and perhaps a starting point for new ways of using language" (p. 25). Thurber (1986) considers the computer a technological advance useful to the writer. It is useful in that word processing facilitates editing, focuses attention on the act of writing, and helps to develop a sense of audience. According to Thurber, however, the power of the computer lies on its interactive capability. The computer "points to the need for a genuine new literacy, in which the relations between reading and writing, and even the nature of the book itself, are reexamined (p. 27).

Seltzer (1986) reports significant changes in the attitude of 5-year old children towards writing as a result of using word processing. Seltzer suggests that the main reason for this change lies in that the computer eliminates the limitation imposed by the lack of manual dexterity typical of young children, and helps them concentrate on the



creation of stories. In her study, Seltzer encouraged the children "to 'rehearse' an idea for a topic by drawing a picture or conferring with their classmates prior to writing in the computer. They compose the text for their stories at the computer, and then choose a file name that will recall the piece (this gives them practice in selecting a main idea)" (p. 51). This process helped develop the children's awareness of writing as a process. Seltzer reports a marked contrast between the way in which children accepted the rehearsal, drafting and revising of stories as natural stages of the writing process, and their reluctance to rewriting a handwritten assignment prior to the introduction of the computer.

Neuman and Cobb-Morocco (1987-88) conducted a two-year study on the teaching of writing through word processing to remedial students. To that purpose, they investigated the interactions between teachers and students, and conducted classroom observations and interviewed the teachers. Analysis of the first year of the study showed that: 1) Keyboarding skills should be taught separately from writing: it appeared that it was more effective to teach writing once the students had acquired some keyboarding skills. 2) Students worked better when they were taught strategies for generating and organizing their own ideas. Brainstorming with the teacher at the computer or in small groups being one of the most successful ones. 3) Writing tasks should first focus on composing rather than editing, and 4) One of the most important roles of the teacher was to help the student to overcome her lack of confidence and writing anxiety. Neuman and Cobb-Morocco's study also offers some interesting insights on the use of computers for writing, and especially the feeling of authorship of the student and the sense of public quality "The resource room teachers in the study found that there was public quality about the computer screen. 'Students' early ideas



were accessible for teachers and other students to discuss because the writing was legible and available for all to see" (p. 46).

In combining word processing with speech output, Rosegrant (1984) proposes a new approach - editorial approach - to writing. The main tenet of this editorial approach is the need to develop a writer's ability to read and hear internally what he has written. As Rosegrant (1986) emphasizes:

a good writer is a good editor, and as a good editor the writer must be able to carry out an internal discourse that involves:

- 1) an "inner voice" for reading the text aloud subvocally.
- 2) a "critical ear" to hear and judge how the text sounds.
- 3) a sense of the requirements of the text which go beyond the needs of the writer and involve a concern for the audience.
- 4) a careful eye for meeting the conventions required of text for public presentation in print, and
- 5) a repertoire of skills and categories for writing which are used for deciding how to improve a written text. (p. 3).

The uniqueness of the editorial approach when comparing it to process writing or product writing is its use of speech output as an external voice which fulfills the functions of the internal discourse while helping the child to develop it. While Rosegrant acknowledges the benefits of a process approach - a focus on self-expression -, and the product approach - with emphasis on form -, she proposes the editorial approach as a step beyond them given its additional dimension, that of the external voice, which addresses a critical aspect of good writing. And, in fact, Rosegrant's investigation showed that there exists a positive association between the development of a "critical ear" and the speech output of the word processor.

The use of word processor for LEP students is increasing. Most of the programs and studies currently in existence have been designed primarily for native English speakers, but some of them have found interesting applications with students whose first language is not English. According to Johnson (1985), IBM's Writing to Read program has been implemented in Kingsville, Texas with LEP children. It has been found that some of the "integrative and organizational features are applicable to second language learning, (but) because of its phonics emphasis, its appropriateness for LEP students is controversial and needs to be carefully investigated" (p. 12-13).

Another project described in Johnson (1985) is a Title VII demonstration project in the Tempe Elementary School District in Arizona. Using Magic Slate, a word processor published by Sunburst, Maez and his colleagues designed and implemented individualized computer summer programs for over 300 students. Students wrote daily journal entries, stored the text on a diskette and teachers responded daily to each student. The preliminary results of this project indicated increased quantity and quality in writing as well as increased use of peer editing.

Finally, the international writing network recently established among several countries, and in the United States among several states, is a valuable example of this effort to use computers in the process of writing and composing with second language learners. The international writing network was initially established by the Laboratory of Comparative Human Cognition at the University of California at San Diego (Levin, 1982). Research conducted by Rosa and Moll (1985) on the use of this microcomputer communication network between bilingual children from California and students from Madrid (Spain) indicates the potential of such system in developing children's writing composition skills in their first and second languages, and in enhancing their sensitivity

to the values of their own culture and that of others. The use of this electronic network system is also being promoted by Dennis Sayers from the New England Bilingual Education Multifunctional Support Center in Connecticut. Sayers is presently coordinating a program called from Shore to Shore which facilitates the communication among bilingual children across the United States, Puerto Rico and Canada. In Canada, Cummins is presently participating through the heritage-language project aimed at promoting the teaching of languages other than English or French (Johnson, 1985).

### Conclusion

This section focuses on the function of computers in the development of literacy, and it is subdivided in four parts: a) major trends in computer use in the classroom, b) the incorporation of computerized speech to computer-based instruction, c) the psychology of the child-computer interaction, and d) how all these combined can make an impact in the development of literacy skills.

There are two basically different approaches to computer use, i.e. focus on the computer vs. focus on the student. Bell (1984), Dede (1984), Stonier and Collin (1985) are among those who perceive computers as a tool that can help both the teacher and the student in a variety of ways. The most representative model of this approach is Computer Assisted Instruction (C.A.I.). CAI can be defined as a varied number of drill and practice programs and tutorials geared to engage students in practicing determined skills. By contrast, Paper (1980), Clements (1986), Linn and Mandinach (1986) and Robbat (1985) view the computer as a medium that the child can freely explore. They emphasize the control of the child over the computer, and thus over his own learning.

Closely related to the child's view as a programmer and/or as author, is that of a computer learning environment. According to Robbat (1985), a computer learning environment integrates the use of the computer with the child's abilities as a learner, and the curriculum. The purpose of such an environment being the enhancement of the child's order thinking skills, and problem solving skills in general, and the acquisition of those skills particular to a determined curriculum area, e.g. language arts.

Another technological innovation of great educational potential is the use of synthesized speech. There is a growing number of commercial programs that incorporate the sounds of a speech synthesizer, but little is known about their impact in the development of literacy. Rosegrant's (1986, 1984) appear to be so far the only ones of this kind. Rosegrant's studies with handicapped and also with young children show that speech synthesis is a powerful learning tool. The children participating in her studies wrote more and appeared more enthusiastic about literacy, than those that used the same word processing program without the speech output.

The psychology of the child-computer interaction is also addressed in this section. This interaction is dependent upon the computer approach, the child's motivation, the role of the teacher as well as equity issues.

In a CAI situation the child responds to the computer as he would respond to a teacher in a traditional classroom setting, i.e. passive participation and minimal interaction. On the other hand, when the computer is used as a medium for the child to experiment with and to explore, the relationship that it is established could be defined as that resulting from a reciprocal interaction teaching approach Cummins (1986). Also, if the teacher is enthusiastic about using the computer and capable of transmitting her



enthusiasm and expertise to the students, the overall group performance will be better (Cazden et al., 1984).

The student's gender, age, socio-economic status, and national origin are, according to recent research studies (Johnson, 1985; Anderson, 1984; MacGregor, 1985; Technological Report, 1987) significant contributing factors in the access to the use of computers and the way in which they are being used.

The use of computers to promote literacy skills is centered around the use of word processing programs. These type of programs appear to be rather successful in improving the quality of writing as well as the amount of written work produced by students (Cazden, no date). Of particular interest in the work conducted by Rosegrant (1984, 1986) with a word processor program with speech output. Rosegrant proposes the use of this technique, and suggests a new approach to teaching writing that she calls 'editorial approach'. The uniqueness of this approach is its use of speech output as an external voice which fulfills the functions of the internal discourse while helping the child to develop it. The use of word processor of LEP students is just beginning. Most of the programs available are for monolingual English speaking students; however, and as Johnson (1985) reports, there are a few projects under progress which preliminary data are very encouraging. Because of the potential of Rosegrant's editorial approach and its applicability in the development of second language literacy, this study has adopted the use of a word processor program with talking capabilities to the Spanish language, as detailed in the following chapters.

## CHAPTER III

### METHODOLOGY

#### Justification for the Method

To acquire literacy is more than to psychologically and mechanically dominate reading and writing techniques. It is to dominate these techniques in terms of consciousness; to understand what one reads and to write what one understands; it is to communicate graphically. Acquiring literacy does not involve memorizing sentences, words or syllables - lifeless objects unconnected to an existential universe - but rather an attitude of creation and re-creation, a self-transformation producing a stance of intervention in one's context (Freire, p. 48, 1974).

The above definition sets the tone of this investigation. According to the report prepared by the Office of Technology Assessment U.S. Congress (1987), there are currently from 1.2 million to 6.6 million LEP students in the United States (the fastest growing population). The same source reports the fact that overall, these students perform poorly in reading tests (20-points lower in reading than their classmates on the 1983-1984 National Assessment Progress), that they are educationally deprived, and that they drop out at higher rates. It also documents that despite the evolving and growing use of technology in schools (between 1981 and 1986, the percentage of schools with computers intended for instruction grew from about 18 percent to 96 percent), "the LEP student is put at the back of the line" (Technology Report, p. 81).

According to Johnson (1985), linguistic minority students face a social as well as a language barrier in their access to computer education:

. . . patterns of use observed in white schools versus minority schools represent two very different philosophies regarding the appropriate role of computers in teaching. The low SES predominantly minority schools used computers in a compensatory manner, to raise achievement levels through drill and practice for low achievers ( ). The other approach ( ), is to provide "faster-

learning" students with a challenge so that they do not become bored while the teacher gives extra personal attention to "slower-learning" students. (p. 2-3).

The study of the acquisition of literacy within an experimental computer learning environment fosters the LEP child's overall development and facilitates the acquisition of literacy as a form of self-expression and communication graphically (Freire, 1974). To that purpose this investigation focuses on the child's ways of encoding meaning and his progress in the acquisition of reading and writing skills. The method utilized reflects the rationale of a whole language approach to literacy. That is, the understanding that children, and particularly LEP students, can learn best to read and write when integrating the four language domains, (oral, auditory, reading and writing) into a comprehensive and developmental approach that uses material that is meaningful to them (their own experiences). The integration of computerized speech with whole language permits the establishment of a computer learning environment whereby the children can explore language from all perspectives (four domains). Moreover, the accommodation of the speech synthesizer to the Spanish language has provided these children with a unique opportunity. They have been able to work in their preferred language "teach" Spanish to the computer and begin exploring literacy in the second language.

### Materials/The Computer Laboratory

The set up of the computer learning laboratory included: 1) An Apple IIe computer, with one disk drive and a color monitor. Given that there was no budget for equipment for the TBE program, the computer was gratefully lent by the High School Computer Department. 2) An Apple Imagewriter II printer located in the school library, and to which the TBE teacher and the researcher had access during the morning. 3)

Kidwriter and Talking Text Writer software programs which I gave to the school, 4) a variety of software programs on loan from the resource room which were used on occasion, 5) a cassette recorder, 6) textbooks and classroom materials available at all times, and 7) observation and evaluation forms (Appendices 2,3).

### Software Selection

In planning an experimental computer-based environment for this project, the incorporation of speech synthesis appeared to be a critical component, since it was predicted to facilitate and encourage the concept of a whole language approach. The synthesizer that would work in this particular project had to meet the following three conditions: a) capable of reading Spanish, b) child-centered and c) simple to use. Difficulties were encountered in finding a synthesizer to meet these conditions; most educational programs with voice synthesis are CAI type programs, which use synthesized speech for animation, to read aloud a story to the child or to reinforce an accomplishment.

The only synthesizer that under child-control was Talking Text Writer from Scholastic (1986). This program was originally designed for visually-impaired students and it is now offered for use in the standard classroom. Rosegrant (1986) has led a five-year research on the use of Talking Text Writer in the classroom. Rosegrant used children ages 4 to 13 (grades K to 5) and in primary, Chapter 1, resource and learning-disabilities classrooms. The results of her study with hundreds of children indicated that there were significant differences between the group using speech output and the group not using it. As quoted in the program professional guide:



The children in the group using speech output (group # 1) spent twice as much time writing than those in the group not using speech (group # 2). . . They were more likely to engage in daily writing than those in the non-speech group . . . We also found a significant difference in comparing the number of drafts each child engaged in with a new topic. . . Finally, there were several important qualitative differences between the two groups of writers in the strategies they used for revising, and the nature of the revisions. (p. 84). (See Appendix 1 for program evaluation).

The selection of Kidwriter followed a similar process. Visual resources are a key component in a whole language approach, and therefore it was felt necessary that children would add such a component to their stories. The simplicity of use of Kidwriter along with its combination of pictures and word-processor appeared specially encouraging. The program is highly motivating to young children, even to non-readers: For these children, Kidwriter is very effective in assisting in the development of readiness skills, such as space orientation, Kidwriter also offered a selection of icons which were varied, and practically culture-free. In addition, Kidwriter incorporated the alphabet and the number from zero to nine in the objects selection thus encouraging the use of titles, labels and signs in the picture stories. Kidwriter did offer the possibility of authorship, creation, interaction and team work. It was also possible to write in Spanish although the program does not come with any special character sets (the addition of accents was considered an educational activity in itself). The possibility of obtaining a hardcopy and have the children do it was also considered to be of extreme significance. (Please refer to Appendix 1 for a detailed technical report). Despite its many positive features, Kidwriter presented some technical limitations that , under the present conditions, had to be accepted. Among others, the icons are of a silhouette-type, therefore they were monochrome and did not highlight any of characteristics of the people, animals and objects. Icons were also unidirectional and impossible to be flipped from left to right or from right to left. At any time no more than twenty (20)

items could be displayed in the screen. Finally, another technical disadvantage, especially for editing purposes, was that Kidwriter could not be modified or edited once stored.

### Subjects

The sample consisted of twelve (12) Puerto Rican children from grades pre-1 to 3, who represented four different levels of English proficiency (Table 8). All of them were enrolled in the bilingual program of a small town of the central Massachusetts region (herein referred to as "Towny"). The total enrollment in the TBE program at the time of the study was 54, grades K-12. Although all of these children belonged to the TBE program their schedule was designed to meet individual needs (see next section).

These Puerto Rican children had different homerooms - monolingual classes-, except for two, who were in monolingual resource rooms most of the day (except for ESL). All the children were representative of low socioeconomic status, many of the families were being supported by public assistance. The family environment of the majority of the children was unstable, with some of them living with relatives, or with only one of the parents; some of them had a large number of siblings, and in two cases the child's family was facing serious problems. Another characteristic of the population was its mobility; approximately 30% of the students move back and forth from Puerto Rico at least once a year. Two of the twelve children of the study moved out of town for unexpected reasons, however, shortly after they both returned to the school.

Table 8. - Lau Categories of Participating Students.

<u>Name</u>	<u>LAI Category</u>
Felix	A
Jose	B
Wanda	B
Carmen	B
Bernardette	C
Madelyn	C
Gambler	C
Berto	C
Eddie	C
Anthony	C
Carlos	D
Raymond	D

### Towny's Transitional Bilingual Education (TBE) Program

Towny has had a TBE program for Spanish-speaking children for over ten years, the size of the program always being rather small (between 40 and 80 students). During the 1986-87 school year Towny had a Spanish-speaking enrollment of one-hundred and eleven (111) students, forty-one (41) of them being classified as Limited English Proficient (LEP). All these forty-one (41) students were enrolled in the TBE program. Eighteen (18) out of these forty-one (41) had been in the program one year (including eight Kindergarten children), fourteen (14) had been in the program two years, four (4) were in their third year in the program and five (5) others had been in the program four years. The number of referrals for special education has increased in the past few years. During the 1986-87 school years five of the twelve children in the elementary class (41%) received some type of special education services.

The TBE program is staffed by two certified bilingual teachers (one elementary and one secondary) and one ESL teacher, who is also the Coordinator of the program. The three teachers share the four different buildings where the program is located.

Given the size of the program, every student's schedule is done individually according to his needs. New students are placed according to their previous records, i.e. bilingual program in another system; and the results of oral and written tests. The tests normally used are the I.P.T. oral assessment and the Brigance Assessment of Basic Skills. In some cases the Close Test developed by the Boston Public Schools is also used. Parents or guardians are interviewed at the outset of their child's entry.

At the elementary level, TBE students are assigned to regular homerooms, and go the bilingual class one or more periods a day. For example, a child could receive only one hour a day of bilingual instruction because of his proficiency level, whereas another with a Lau A category most likely will take a virtually full schedule in his native language. All children go back to their homerooms before leaving for home.

In the High School, Civics and American History in Spanish are being offered in alternating years. Spanish language is offered every year and is normally divided into an upper and lower section. As in the past this class is open to students of Hispanic origin who are fluent in Spanish. Students with limited English proficiency receive ESL on a daily basis and tutorial assistance provided by either a peer or a tutor hired for his specific purpose. In the Middle School (Grades 5-8), the ESL teacher offers two periods a day of instruction. Social Studies, Spanish language, and Science are taught in Spanish by the bilingual teacher. Tutorial help is also available when felt it is necessary.

TBE students normally stay in the program for three years (not counting Kindergarten). To determine the child's exit from the program, Towny uses the following criteria: results of oral and written tests, demonstration of competency in



English measured by results on classroom tests, and teacher's observation of the child, in and out of the classroom.

### Setting

The bilingual classroom is located on the first floor of the elementary school. The classroom was created out of a large closet area used by the two contiguous classrooms for the children's coats. The classroom has a large window and has enough space to fit 8-10 desks, a teacher's desk, the computer lab and materials. It has a high ceiling which provides for a larger psychological space. The bilingual teacher is a highly qualified, young and dynamic woman very committed to the education of LEP children. The ESL teacher and Coordinator of the bilingual program is a knowledgeable person with many years of experience in the field of second language teaching. She as well as the bilingual teacher are highly regarded by the parents of the children that they serve and by the community at large. They know every child's family and are extremely successful in bringing together children and parents at meeting times through presentations and performances interpreted by the children.

### Procedure

a. Teacher training. During the summer of 1987, the bilingual and ESL teachers participating in this study reviewed the goal and purposes of this study, and received training on the use of Kidwriter and Talking Text Writer. Plans were also discussed in order to accommodate the computer laboratory in the TBE classroom, and the children's schedule to ensure good coordination with the other subject matters.

b. Language proficiency. IPT from IDEA test was used to determine the child's Lau category. The test was administered the first week of September, prior to the investigation.

c. Treatment of the two languages. Lau A and Lau B children were encouraged to develop literacy in Spanish; Lau C and Lau D children were encouraged to use the two languages but in different sessions. However, the use of a particular language was never imposed; it was always the child who made the decision in story telling, story making and story and free writing.

d. The role of the Teacher/Adult. The adult/children interaction has been modelled after the theory of mediated learning proposed by Jensen and Feuerstein (1987). In the present study, the child is therefore perceived as an open system who is directly exposed to the stimuli of the environment, and who learns from it. It is also understood that the child can gain from these stimuli if they are conveniently channeled by a mediator within this paradigm, the relationship between myself and the children in the present study, has been highly focussed, intensive and interactive, as characterized by the properties adopted from Jensen and Feuerstein (refer to page 47 for detail on this theory).

e. Introduction of the computer in the bilingual classroom. None of the children participating in this study had any experience with computers, either in the school or at home. The effects of having a computer in the classroom, as well as the effects of recording their voices on a tape-recorder, was offset by introducing them before the study begun. Both were introduced in September right at the beginning of the school year. Familiarization with the computer was done through computer games, Print Shop and some drill-and-practice programs. This introductory period lasted two

weeks, although Print Shop was used occasionally throughout the investigation. Similarly, children's voices were recorded on a regular basis and for a variety of purposes during the same period of time.

f. The integration of whole language and computerized speech. The computer learning environment provided extensive opportunities and support to experiment with expressive (oral and writing) and receptive (auditory and reading) language. Working in pairs or independently, children engaged in creating and writing stories, as well as their own ideas and experiences. They were also encouraged to tell these stories, which were recorded, and to listen to them through the speech output.

g. An experimental teaching strategy using Talking Text Writer. One of the features of Talking Text Writer is its ability to correct the pronunciation of a word of the text, including the names on the catalog screen. By placing the cursor on the word that you want to change and by pressing # 2, the cursor moves up to the line where the name of the file normally appears. At the same time, the menu at the bottom of the screen list three 'Fix Speech' alternatives: C)ancel fix, E)xempt word, and S)peech mode. Using Speech mode the pronunciation of a word can be changed either using phonetics (normal letters) or phonemes (symbols specific to the ECHO + Board speech synthesizer).

This capability has permitted the use of Talking Text Writer in Spanish. Using a phonemic approach it has been possible to come up with approximate transcriptions of all the word that children used in their stories (Table 9). Moreover, the simplicity of the procedure have made possible for some of the children to learn to do it themselves.

Another program feature that has been very useful for the purpose of this project is the dictionary. Talking Text Writer includes a dictionary that allows the user to create, store and recall a definition for any word typed on the screen. By placing the cursor on the word you want to define and pressing the zero key, a window will open on the screen.

Table 9. Sample list of Spanish words and their phonemic transcriptions.

<u>Word</u>	<u>Correction</u>
un, una	U'N. U'N;
habia	;B@';
mundo	M':N'DO
bicileta	B'&S&KLE@T;
arbol	; 'R' B * 'L
sobrilla	S * MBR & G;
guagua	H:; ' 'G:;
despues	DESPQE 'SS
el, la	@L, L;
nene, nena	N@'N@, N@'N;
pichen	P&CO'N
escuela	@'SSK:@L';

You type the definition in this window. This definition can then be read by the computer using any of the speech commands. The dictionary feature also allows the user to change the pronunciation of any of the words to ensure its proper pronunciation. The dictionary feature has permitted the teacher/researcher and the children to keep their own definitions of a word. It has also been useful to identify and then define unfamiliar words of a given text, normally typed by the TBE teacher into the computer.



## Treatment

The study duration was from mid-September to mid-December with the actual investigation time to be ten weeks. A follow-up (once a week) was conducted from January to March. The follow-up visits were time that this researcher used to confer with the teacher (who was continuing the program), discuss the children's progress, and do some follow-up work with the students.

Grouping of students for the treatment was done in pairs. The pair selection was done by the bilingual teacher in coordination with the ESL teacher. Initially, each pair was assigned 30 minutes at the computer (15 minutes as user, and 15 minutes as a coach). However, the actual amount was afterwards adjusted to the individual needs and interests of each learner. Authorization forms were sent to the children parents/legal guardians. They were collected prior to the beginning of the project. The 100% return of the forms -most of them the following day -, indicates the degree of support and enthusiasm of the parents for this project.

Step 1: Introductory Period. The introductory phase of the project was during the last two weeks of September, at which time myself and the LEP children developed a rapport. The use of computers was also introduced. Students became familiar with the computer, its parts, and learned about its functions. They played some games and made signs and greeting cards with Print Shop. They also became familiar with the tape recorder, and recorded and listened to their voices.

Step 2: Creating and Working with Stories. During the first week of October, Kidwriter was introduced. The children worked in pairs; one at the computer and the second working as a coach. They worked for 30 minutes; 15 minutes in each role.

Mediated learning was used to ensure the establishment of a meaningful relationship with the child, and to secure an optimal performance. Prior to creating a story with the computer, the child was encouraged to think about a possible story topic, and confer with me and his coach. The average story was three pages long, but not everybody made three pages in one session, and not all the stories were of equal length. Most of the younger children's stories were shorter, of 1 or 2 pages. They had some difficulties in continuing a story that they had begun at the previous session, and they frequently had changed stories from one day to the next. For these children, it appeared to be more appropriate to start and finish a picture story the same day, regardless of its length. The older children, on the other hand, would spend more time with each page, their stories being more elaborated, and would work for periods longer than 15 minutes (the time however, was kept within 15-20). These children did not have difficulties in continuing a story at the following session. Therefore, their stories were usually of three or more pages.

At the end of the story all children were asked to give a title to it. At the following session, the children were given a hardcopy of the picture story, and with this copy in hand, they were asked to narrate the story orally. The oral stories were recorded.

Naturalistic observations were taken during each session. These observations contributed to the data bank, but they were also used to design the computer activities according to each child's individual educational and psychological needs.

Step 3: Adding Speech Output. As soon as a child showed mastery of the basic command keys of Kidwriter, he was introduced to Talking Text Writer, the word processor with speech output. The process was as follows: 1) Prior to session, I

typed the child's story on the computer exactly as it was narrated (including expressive and grammar mistakes). 2) At the computer session, the child listened to her story; I also introduced her to the different commands that control the use of the voice by the computer. The child was then encouraged to experiment with her story, e.g. listen to a word, a sentence, a paragraph or the entire story as many times as she wanted. 3) Based on each particular child's level of skill, I then pointed out the meaning of the story, asked questions about it. 4) Also, and depending upon the level of skills of a child, I explained her the difference between her way of writing, i.e. natural spelling and how the teacher and books would write it, and thus gradually I introduced the notion of grammar and its utility. 5) Finally, at this stage, the child was encouraged to play and venture with the program as much as he wanted. I fixed the pronunciation of free writing on the spot, thus showing the children how to 'teach Spanish' to the computer. The children were always invited to check with me regarding the accuracy of the pronunciation.

Step 4: Practicing and Experimenting. By this stage, the LEP children of the study knew how to use both programs, and had a good understanding on how the computer learning environment was helpful to them. The researcher also had enough data to make a judgement on how each of the students could make better use of this environment. For example, the use of speech output in free text/story writing was not encouraged in pre-literate children because they would often feel frustrated when the computer was unable to read their words. At the same time, beginner writers were encouraged to write letters, and to 'teach' the computer to read Spanish (fixed the pronunciation by themselves).

All along, the TBE teacher would reinforce the activities conducted at the computer. She would read the children's stories aloud, encourage the use of the computers in the absence of the researcher, make copies of the printouts to send them home, exhibit the children's stories in the classroom, and work on story writing off the computer.



## CHAPTER IV

### ANALYSIS OF DATA

Data collection included the information gathered through children's work samples, teachers' feedback, student's records, and observations. Two forms of observations were conducted; naturalistic observations, and also specific observations in regards to how the child used the input stimuli, how he elaborated upon them, and how he reported this response, based on an adaptation of Feuerstein's (1987) mediated learning theory (see form in Appendix 3).

These data were analyzed in a holistic and integrative manner. The data analysis was holistic in that I looked for individual and group trends, as well as the major highlights in the progress of each individual child and the group in general. It was integrative in that I analyzed each set of data separately, cross-referenced the findings obtained, and eventually reported them as they related to the primary research questions of the study (see page , and in the form of four case studies. The reason for adopting a case-study format was to illustrate the impact of the computer learning environment - the results of integrating computerized speech and whole language-, on individual children. It was thought that the case studies would substantiate the findings of the study and also would facilitate the application of this approach in other classroom settings.

In order to proceed with a holistic analysis of the data, I developed a form (Appendix 4) which summarized those aspects of the literature review that were most relevant to the study. These pieces of information were then grouped according to the four major themes mentioned throughout this project: computer learning environment,

whole language, speech output, and the role of the teacher. This form was completed twice for each child. First, it was completed using the data gathered through naturalistic observations, and secondly based on the work samples, which included, picture stories, oral stories, typed text, and handwritten samples. Findings reported for each child were then cross-referenced with each other, and the data gathered in relation to mediated learning. Finally, teacher's observations and feedback were evaluated in relation to my own findings; they were also compared in relation to the information available from the student's cumulative folder, i.e. child's educational and family history, report cards, achievement test results, and Individualized Educational Plan (IEP), where applicable.

## CHAPTER V

### RESULTS AND DISCUSSION

It was predicted that the integration of whole language and computerized speech into a computer learning environment would facilitate the development of reading and writing skills of language minority students. The LEP children in the study have convincingly demonstrated that such an environment fosters the development of literacy.

The present discussion elaborates on the theories and up-to-date research reviewed in the previous chapters. However, the primary source of information comes from the same children. Therefore, and in order to maintain a focus on the learner, this section has been divided into two parts. Part I, discusses the naturalistic observations gathered during the ten weeks of the project, as they relate to the primary research questions addressed by this study (see page ). The evidence of these observations is then amply illustrated by the four child studies that appear in Part II.

#### Part I

##### The Development of Literacy within the Experimental Computer Learning

Environment. The computer learning environment used in this project encourages the development of higher order cognitive skills, e.g. logical reasoning, necessary for reading and writing, while emphasizing the child's control over her own learning process. This approach fits easily into the concept of a chain of cognitive accomplishments described earlier (see page ). The first link in this study's environment was the acquisition of the most elementary features of the various components of the software programs, i.e. Kidwriter and Talking Text Writer, as well

as the acquisition of pre-readiness skills. As the LEP students in this study gained experience with Kidwriter and Talking Text Writer, an increased feeling of competence became apparent. Barbara, a nine-year old girl with special education needs, displayed this feeling when she expressed her interest in reading the computer instructions displayed around the screen, and inquired about some technical aspects of the program.

Student/Adult interaction played a special function at this stage, facilitating an understanding of the basic elements of the learning environments, and thus ensuring the progress of the child along this chain of accomplishments. In Text 1, Juan a non- reader of seven years of age, mastered Talking Text Writer enough to explore the letter sound relationships using some familiar words. It was only through mediation, however, than Juan, working on a free text, was capable of moving from writing "TUF" to "TAPA" and finally "TABAGA" [trabajo] (work).

JUGA      MUCHO  
 JUGA      POQUITO  
 TUF  
 TAPA  
 TABAGA    POQUITO  
  
 YO    COMO    POQUITO  
 YO    COMO    POQUITO  
 YO    COMO    POQUITO

Text 1. Sample of Juan's work using Talking Text Writer.

The mediating role of the researcher not only facilitated the understanding and purpose of word processing and speech output, but also Juan's success. Juan was so happy to have written a statement that the machine could read, that he asked me to write



a sentence for him, "YO COMO POQUITO" (I eat very little), and he enjoyed copying it three times.

Inasmuch the role of the adult influenced the learner's attitude, so did the role of the coach. The children normally worked in pairs; the dynamics of this grouping worked in a variety of ways. There were exemplary teams, such that formed by Benito and Rafael (detailed below), others which worked rather well e.g. Juan and Wendy, and other which did not work at all, Barbara and Maria (detailed below). There were also teams in which one child acted as a role model for the other. This was typified by the team formed by Gabi and Connie. Gabi (8 years of age), was a good learner and soon excelled at the computer. Connie (9 year old), on the other hand, was much slower. Gabi played an important role as a coach; he modeled for Connie the use of the two programs, and it was by observing and teaming with Gabi that Connie was eventually capable of fulfilling the requirements of the first link in the chain (Text 2).

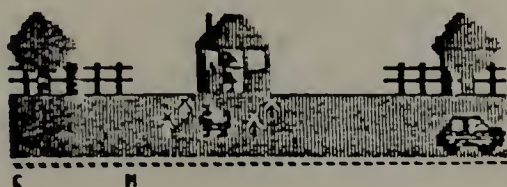
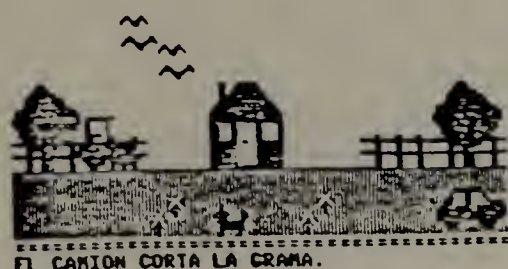
YO YORABA  
 YADO            BYSICLETA  
 MAESTA        MAESTRA

YO YORABA MUSHO  
 GUIANDO      MUCHO

Text 2. Sample of Connie's work (November 11th).

The second link in this chain involved planning and design. At the onset of the study, many of children lacked sequencing skills, while others showed a degree of

impulsivity too high to allow for a good designing or/and planning of the stories as well as free texts. The integration of whole language with the use of Kidwriter and Talking Text Writer served to facilitate the process of planning and design for these children. Gabi, for example, developed an elaborated strategy that he used until mid-November, to establish a sequence in the story (Text 3). He would draw the first page, and when drawing the second he would go back and reproduce on this page all the elements from page one, that remained constant in the story. Once these permanent icons were in place, Gabi would then continue his story, - add or subtract from it -. He would follow a similar process to move to the following page.



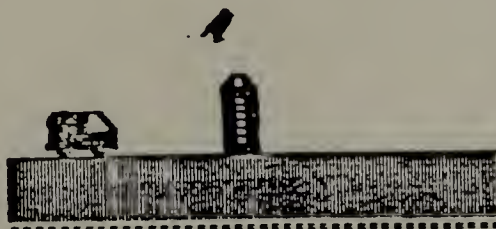
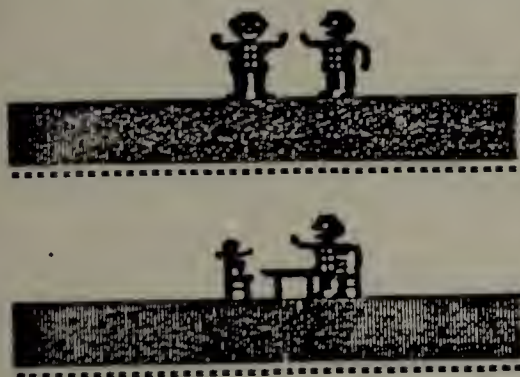
### Text 3. Story by Gabi (October 13th)

Children in the study also had to plan strategies to work and learn with Talking Text Writer, particularly when speech output was desired in Spanish. All these

activities constituted a big challenge for the majority of the students, and so not all of them learning how to use it at the same rate; children like Juan and Eduardo needed more than a few sessions to do well. The best indicator of a child's accomplishment in the second link was the development of a sense of control over his own learning. Once the interaction with the computer was established, and a degree of automaticity on the use of the programs was acquired, the child felt competent, and in control over his own learning. The complex cognitive skills used in Talking Text Writer, the mastery of its use and that of the speech output in English and in Spanish characterized the third link of this chain. It was at this point that the LEP children displayed literacy skills (in different degrees, and in different language(s)), a more creative use of the programs, and an overall genuine interest in learning how to read and write.

Example:

Juan was receiving speech and language services through special education due to some language and speech problems. It took a few sessions before Juan felt at ease in the computer learning environment. He liked the computer, but it was not until he was capable of interacting with it on his own, and using it for his own purposes, that Juan showed some progress in reading and writing skills in Spanish (Texts 4 and 5).



Juan /jugan/ (juega)  
 jugar (long pause)  
 comer  
 (encouragement) Cesar (pause)  
 estoy /juga/ (jugando con) Cesar  
 comer. Cesar y yo (pause) /Tidoks/ (Kellogs)

(Juan plays  
 play (long pause)  
 eat  
 (encouragement) Cesar (pause)  
 I am (playing with) Cesar.  
 eat. Cesar and I (pause) /Tidoks/ (Kellogs)).

Texts 4 and 5. Picture and oral stories created by Juan (November 3rd).

Juan's progress was evident in visual analysis, i.e. directionality, sense of proportion, recognition of the letters on the keyboard, and ability to follow letters and words on the computer screen. He also improved his oral pronunciation especially with the assistance of headphones with Talking Text Writer. The acquisition of these skills influenced his attitude towards learning, and enhanced his self-esteem. And it was at this point - once he had accomplished the requisites of the second link of the chain -, that Juan showed, for the first time, incipient literacy skills. In the above story, Juan represented what he and his brother Cesar (both depicted in page 1), do in the morning before going to school (they have breakfast, page 2), and then they take the bus to go to school (page 3 of the story). The story followed a sequence, and despite the poor quality of his oral narrative (Text 5), Juan showed some understanding of the function of the written code and attempted at using it for communication purposes. He even attempted to write with Talking Text Writer, "CESAR Y YO /TIDOKS/[Kellogs]" Cesar y yo comemos Kellogs; Cesar and I eat Kellogs (Text 6).



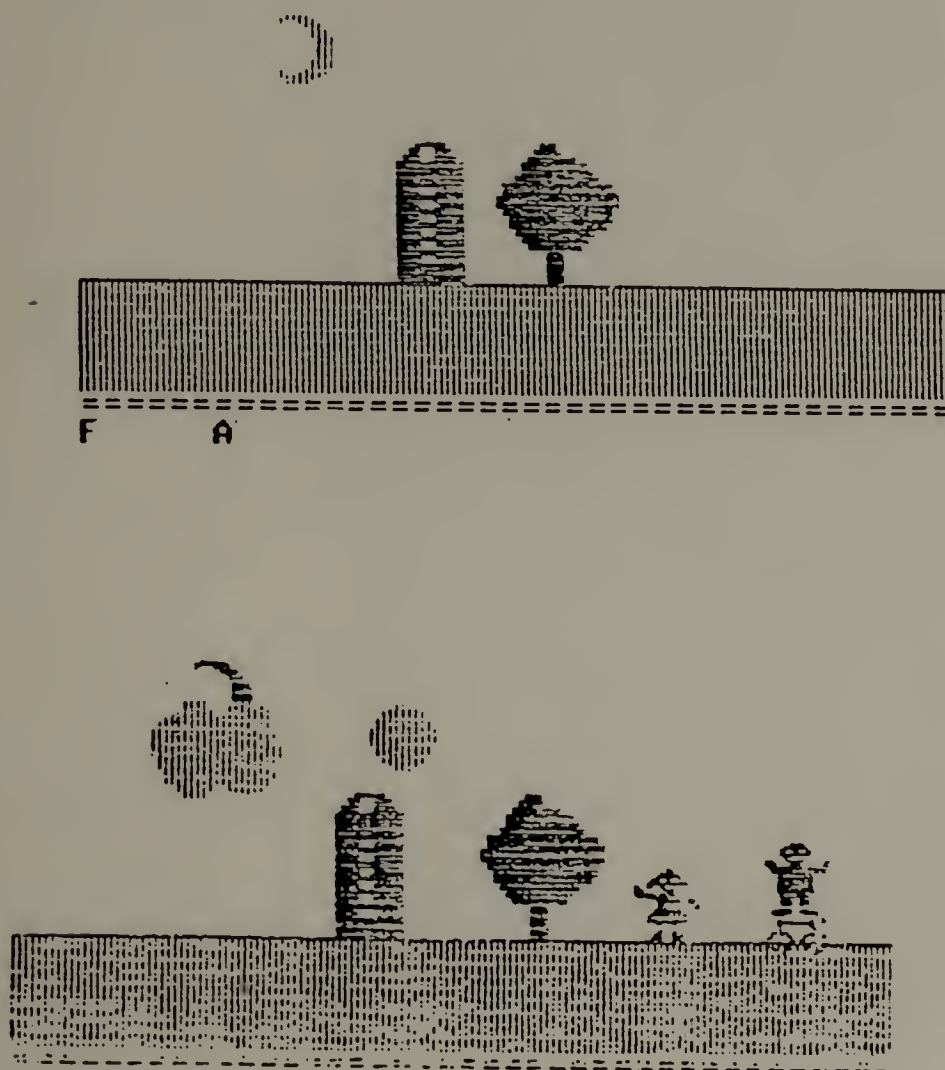
JUGARS  
 C            E    J            JUGAR  
 COMER  
  
 C            J            COME  
  
 ESTOY JUGAR            C  
  
 COME  
  
 C            Y YO    TIDORS

Text 6. Juan's First Writing Attempts at the Computer.

The Influence of Language Proficiency and Stories in the Development of Literacy. In this study, oral language (Spanish and/or English) was emphasized as a springboard to the activities at the computer. Prior to engaging in an activity with Kidwriter or Talking Text Writer, the children would share their experiences and ideas with this researcher, the teacher or their peers (especially their team member). As they brought their own uniqueness to the computer activities, and had the opportunity to experiment with them. They learned (each child at his own pace) to create, narrate and write stories. Also, and as they listened to their own stories in the tape recorder, and to their stories being read and reread by the computer (speech output) and by themselves, these LEP children began to master language in its written form. Emphasis was on meaning and comprehension. The barriers associated with phonics were tackled through the speech output. The influence of the stories was also evident in an increase oral proficiency, which in turn had an impact on the literacy process, as the following stories (Texts 7 to 18), created by Francisco and Connie illustrate.

Francisco was one of the most advanced children of the group in relation to his grade and chronological age. He was 7 years old and working at grade level (2nd grade). His dominant language was Spanish; he was learning how to read and write in

his language. Connie, also Spanish dominant and in grade 2, was 8 years old (11 months younger than Francisco), but doing poorly. In comparing the evolution of both children during the ten weeks of the study, the dependency of literacy upon oral proficiency, and the influence of stories in this process is rather evident.

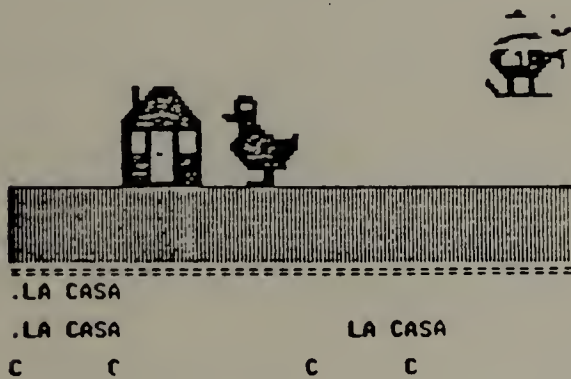
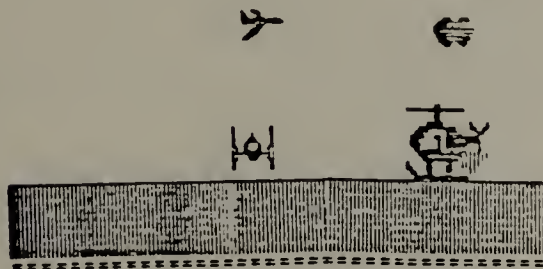
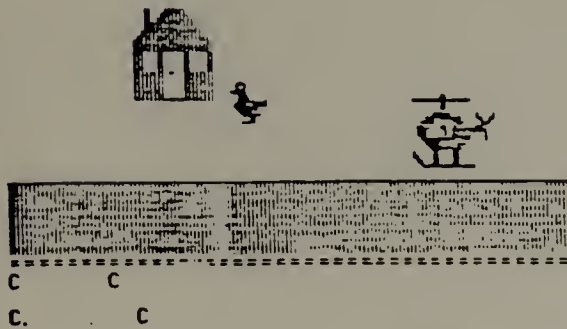


Text 7. Francisco first story with Kidwriter (October 6 and 8).

On October 6th, Francisco created the first page of the story which was narrated as follows:

La casa, el arbol, la luna (pause)  
 muy bonito (pause)  
 mi nombre (pause)  
 F.A.

(The house, the tree, the moon (pause)  
 very nice (pause)  
 my name (pause)  
 F.A.).



Text 8. Connie's first story with Kidwriter.

That same day Connie created her first story (Text 8), but she did not know what to say about it. She did not tell any oral story. The following week, both had completed their stories, they were more confident with the computer and more eager to narrate their story (Text 9).

Francisco:

Era de noche y la gente de la casa estaba durmidendo. Despues la luna se fue y salio el sol. Los nenes salieron a jugar. El nene jugabo con la bicicelta, y la nena estaba jugando con la bola. La mama salio a llamar a los nenes para irse al supermercado.  
(Titulo) Yo soy Francisco en el Mundo.

(It was dark and the people of the house were sleeping. Then, the moon left and the sun came. The children went out to play. The boy played with the bicycle, and the girl was playing with the ball. Mommy went outside to call the children to go to the supermarket.  
(Title) I am Happy in the World).

Connie:

El pichon se iba a meter a su casa y como lleo  
/eto/ (mumbles, pause) va, va, va /pa/  
/coptero/ (helicoptero)  
(pause, encouragement) el se fue  
(pause, encouragement) para que /coptero/  
(pause, encouragement) Despues lleo y se  
metio en su casa (pause) lo puso  
p'arriba (pause)  
volo p'arriba.

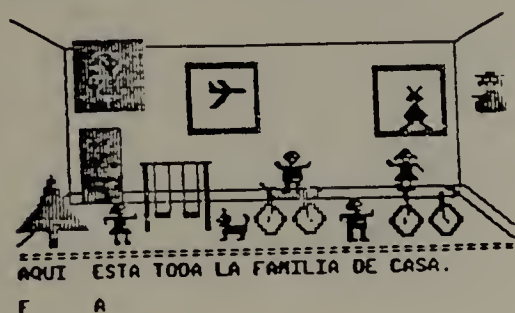
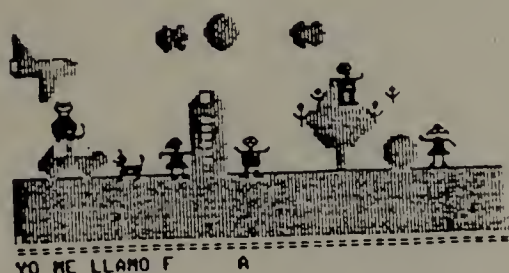
(The bird was going into the house, and since that the helicopter arrived, goes, goes, goes towards the helicopter.  
(pause encouragement) he left  
(pause encouragement) towards the helicopter  
(pause encouragement) Afterwards arrived and went into his house (pause) put it upwards  
(pause) flew upwards).

Text 9. Francisco's and Connie's oral stories (October 22nd).

When the qualitative and quantitative differences between the two stories, are measured in relation to the chain of cognitive accomplishments, there appears that while



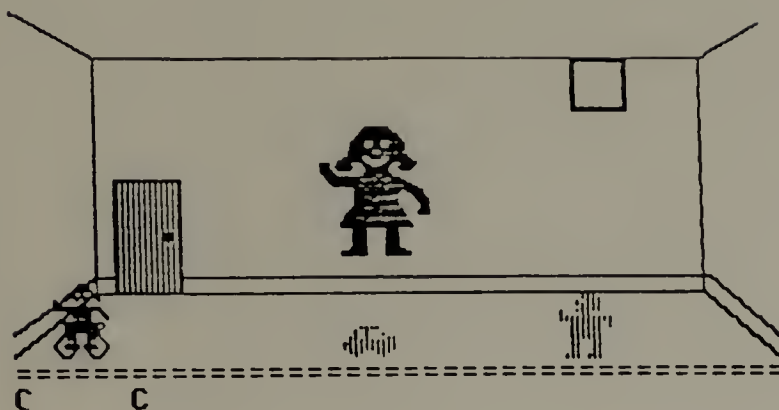
Francisco is already in the designing and planning stage, Connie has yet to achieve the requirements of the first link of the chain. Francisco's ability in story telling and story making have moved him faster along his chain. By the end of October, Francisco was working in activities that were part of the third link of cognitive accomplishments, whereas Connie was making her first attempts at story planning and sequencing (Text 10).



Texts 10. Story by Francisco (October 22nd).

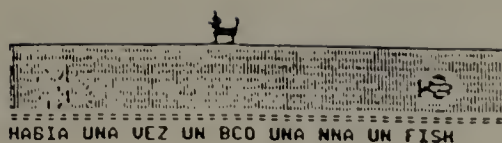
La bicicleta y /pue/ (despues habia  
 un /caro/ (carro), y (pause) /pue/ habia un papa  
 (long pause; encouragement)  
 y habia una nena  
 (long pause; encouragement)  
 rompieron el cuarto  
 (long pause; encouragement)  
 jugando rompieron la cama  
 (Title) La Cama

(The bicycle and then there was  
 a car, and then there was a daddy  
 (long pause; encouragement)  
 and there was a girl  
 (long pause; encouragement)  
 damaged the room  
 (long pause; encouragement)  
 playing the broke the bed  
 (Title) The Bed).



Text 11. Connie's story and oral narrative (October 22nd).

At the end of the ten-week study, Connie was capable of some free writing at the computer (Texts 12 and 13), and she found it very useful to have the computer read a text that the teacher had types and set ready (fixed pronunciation) for her to listen to .



Text 12 and 13. Two examples of Connie's progress at the computer.

She would have the computer read the same text several times, and then practice typing some of the familiar words and sentences (Texts 14 and 15).

Me despierta el sol.

Me despierta el sol.

Saludo a mi familia.

Me despierta el sol

!Buenos dias, mama!

me despierta el sol

Ella me besa.

me despierta el sol

!Buenos dias, papa!

Saludo a mi familia

Hoy voy a la escuela.

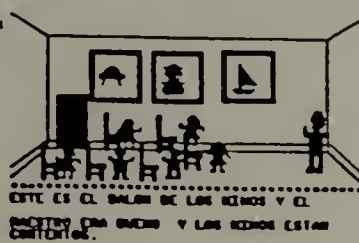
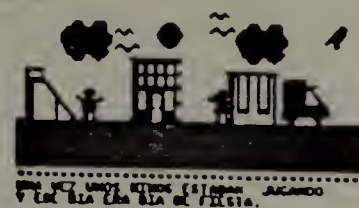
saludo a mi familia

Texts 14 and 15. A lesson typed on the computer and Connie's practice sample.

Francisco on the other hand, continued making progress at the computer (Text 16). He was capable of applying the skills and knowledge acquired in other contexts, e.g. his ability to story writing (Text 17).

The evolution of Connie and Francisco within the context of a computer learning environment was dependent upon the amount of resource knowledge that they had in a number of areas (Bussis et al. 1986); one of these areas being language proficiency. Therefore, and as these case studies illustrate, it appears that language proficiency is a critical factor in the development of literacy, and that story making, telling, reading and writing have a definite influence on this language proficiency. In turn, it appears that story skills are influenced by the child's language proficiency.

la tormenta de nieve  
 Una noche hubo una tormenta  
 y no dejaba dormir a la gente.  
 y cuando la tormenta pasó había  
 nieve en la calle y todos los niños  
 salieron a jugar con la nieve.  
 Habían niños tocando guitarra  
 pero una señora estaba enferma  
 y llamaron a la enfermera y la  
 enfermera se la llevó donde el  
 doctor. La señora se sintió mejor  
 y pudo estar feliz como la otra  
 gente.



Texts 16 and 17. Examples of Francisco's progress.



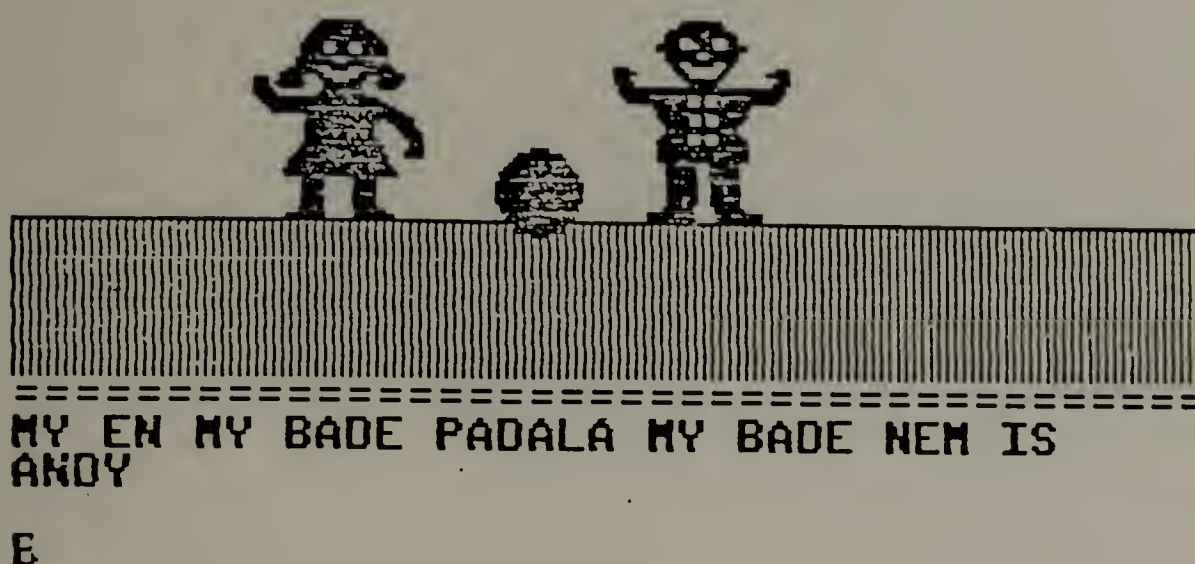
The Extent to which Crosslinguistic Effects of the L1 and L2 Influence Literacy.

Research on L2 literacy regards the process of reading, writing, speaking and listening as being interrelated and interdependent. Based on this understanding, the role of crosslinguistic influence is perceived as a strategy used by L2 learners as a resource in their process to develop the new language (Ringbom, 1986; Krashen, 1980; Hudelson, 1984; Cummins, 1980). Hudelson (1984) for example, suggests that LEP children should be encouraged to write in English before they master the oral language, and that emphasis should be in the child's efforts to express himself in writing, rather than the correctness of the text. The influence of the L1 is also evident in those cases where the first language is emphasized, and the introduction of reading and writing in English is delayed until the child demonstrates that she has solid literacy skill in this language (Cummins, 1981; Thonis, 1981; Brisk, 1981).

YO JUEGO EN UNA COMPUTADORA  
 TENIA UNA MAESTRA QUE ME ENSEÑABA A  
 JUGAR CON LA COMPUTADORA  
 Y YA YO SE JUGAR CON LA COMPUTADORA  
 Y AHORA SE JUGAR SOLO.

Barbara's progress in the computer learning environment illustrates this type of crosslinguistic effects. In Barbara, the use of Spanish and English appeared to be related to her developmental level in each of the two languages. Barbara was Spanish dominant, however, she spent most of her time outside the TBE class because of an IEP written on her. She was a standard monolingual special education room most of her time but she was learning how to read and write in Spanish in the bilingual classroom. In the computer environment, Barbara was encouraged to use her preferred language. Orally, her English proficiency was close to that of a natural

speaker, but academically she had difficulties with the language (Cummins, 1981). On October 18th, Barbara created a story with Kidwriter and she wrote the story in English (Text 18).



Text 18. Barbara's story in English (November 18th).

Some of the words used in the English text may represent Spanish influence. For example, MY instead of ME because of the influence of the Spanish word MI (me), EN for AND, because of EN being a connector in Spanish, and she probably was familiar with the word, even if the meanings were different. Barbara's utilization of BADE for brother, and NEM, name, suggests that her writing of some English words may be influenced by a continued reliance on Spanish phonology. On the other hand,

PADALA (play ball), reflect the influence of her developmental level of English PA (play).

ME LEVATA A LAS  
7.  
ME VESTI  
ME LAVA LA BOCA

Text 19. An answer to the question, What did you do this morning before coming to school? (October 30th).

AYER DESPUES DE LA ESCUELA

YO LLEGUE A MI CASA Y COMI Y

ME FUI PARA WORCESTER CON MI PAPA Y

CON MI MAMA Y CON MI HERMANO.

Y ME FUI PARA LA CITA DE MI PAPA.

Text 20. Free text written with some assistance from the TBE teacher (January 5th).

Barbara's literacy progress was not hampered by crosslinguistic effects. As her work illustrates (Texts 19 and 20) language experience stories with speech output, were an effective strategy to build upon Barbara's cognitive and linguistic abilities in Spanish, and overall attitude towards language and learning.

Research also mentions another type of interrelation between L1 and L2. It relates to the notion that meaning needs to accommodate not only to grammar but to the social context (Walsh, 1984, 1987; Hudelson, 1984; Cummins, 1984). This notion favors the use of language experience stories as reading material; the students may not have total control of the English language, but yet they are able to understand most of the material in English (Hudelson, 1984). In this study, the use of language experience stories in the child's preferred language gave the children an opportunity to learn through their own material and develop literacy from their own words. However, not all children displayed a preferred language; in Cummins' terminology they appeared to be "bicultural ambivalent". According to Cummins (1984), the main characteristics of bicultural ambivalence are hostility towards the majority language group and/or insecurity or even shame about the home language and culture. Although none of the children in the study appeared to be hostile towards the majority culture, a few of them, i.e. Andrew and Maria seemed rather insecure in their linguistic behavior.

Walsh (1987) addresses the impact of the sociocultural factors in the L1 on the acquisition of the L2 as an issue of meaning. In her view, the social and linguistic interaction of the individual with the environment provides for the construction of meaning, and therefore, meaning is closely dependent upon the reality of each individual. For the LEP child who is attending a school which reflects the values and realities of the majority language, meaning may be a problem. Walsh's (1984) study on the construction of meaning in a second language, in a group of fifty-four Puerto Rican children led her to conclude that:

For the Puerto Rican child, meaning is problematic. It represents both that which is a lived part of the child and that which is somewhat apart. The task of teachers is to build on this problematic meaning to permit students to reflect on their own lives and on the reality of life in the school (p. 126).



The conflictive coexistence of two divergent realities may result in underachievement (Cummins, 1984). Andrew's work at the computer, and with his teachers, seemed to indicate that the crosslinguistic influence of L1 and L2 was not only at a linguistic level, but that it was related, at least partly, to issues grounded in the construction of meaning.

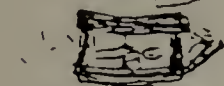
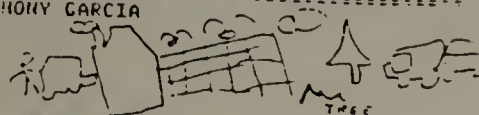
Andrew was attending a pre-first grade monolingual class, but received ESL instruction from the bilingual program. Although apparently fluent in English (he had been classified Lau D), Andrew's performance was below grade level. According to the teacher, there was not doubt about his cognitive abilities, but he was doing rather poorly. Andrew's family situation was conflictive, and his interest in learning rather uneven. Andrew's oral story (Text 20 and 21) is disjointed, he uses words in English and in Spanish, and does not contain a logical sequencing of ideas. The graphics accompanying the picture story appear to corroborate the impressions given by his oral story. Overall, his performance suggests that Andrew's underachievement may be associated with a poor attitude towards school, towards himself and influenced perhaps, by a divergent reality.

The Impact of the Speech Output in the Development of Literacy. The conclusions of a study conducted by Rosegrant with 36 first, second and third graders to investigate the utility of Talking Text Writer indicate that "the children in the study used the unique speech capability of the Talking Text Writer to help themselves in their beginning efforts to acquire literacy" (p. 85). The findings of the study with LEP children corroborate those of Rosegrant . The incorporation of speech output into the experimental computer learning environment contributed very significantly to the progress of these children during the limited study period. Both bilingual and

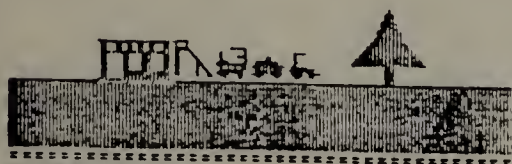
monolingual classroom teachers noted a sudden advancement in the academic progress of these children, which they could not otherwise explain.



ANTHONY GARCIA



ANTHONY GARCIA



ANTHONY GARCIA

T  
T R A I N T R E E

THIS TRAIN IS GOING UP IN THE HOUSE

SUBIENDO

THE CHILDREN RIDE IN THE CAR IS

COMING

SMILE OUT THE BIRDS ARE FLYING

THE TRAIN IS THAT DRIVING THE BOY

PLAY

WHOLE BUILDING.

THE BOY LA NENA E ROCK PUNER Y EL

NENE SE LLAMA SPIKLER

T R A I N T R A I N T R A I N T R A I N T R A I N

Text 21. Two samples of Andrew's work. The oral story was typed into the computer respecting his phonological and grammatical miscues.

Computerized speech was a powerful learning tool to build up comprehension skills. The possibility of listening to the computer and a child's own story was incredibly motivating to the children. They enjoyed replaying the piece over and over which they were able to read (even those children who were considered to be illiterate or pre-literate). This motivation developed an increase interest in learning the use of the written code, and 'discover' its functions through experimentation. The intrinsic motivation of these children to work at the computer, and to listen to their stories and free texts had an immediate impact on reading comprehension. Reading was soon

associated to their language experience which they had previously narrated, and which had typed on the computer.

The LEP children of this study established an interactive and meaningful relationship with the computer. This relationship is similar to Papert's (1980) notion of a "child as a programmer", in the sense that the child took control over the computer, rather than being aided by it. In sharing Papert's concepts, the possibility of the use of voice synthesis facilitated the understanding that written language is a system and not an accumulation of facts. The LEP children learned that words had to be written in a certain fashion and in a certain position on the screen. The awareness of the notion of language as a hierarchical system did not become evident when using Kidwriter (the program also offered word processing capabilities), because Kidwriter did not have speech output; children were able to type a word or sentence in any way they wanted.

The Valentine letters written spontaneously by the children reflect the intrinsic motivation to do a good job with the computer, the child's sense of competence, and their success in exploring the written code (Text 22).

The use of speech output was also effective in helping the children distinguish between the Spanish from the English language. Even if the objective of this study was meaning and not grammar, it was evident that the use of the speech made an impact on specific literacy skills, such as, spacing, the recognition of upper and lower case letters, the recollection of partial spelling words, and the development of a sense of audience.

QUERIDA ROSA

TE MANDO ROSA UNA CARTA PORQUE TU NO

ESTA ADUI.

ADIOS ROSA

C

QUERIDA ROSA

YO ESTOY BIEN Y USTED COMO ESTA

YO CREO QUE USTED ESTA BIEN.

ESTAMOS EN VALENTINE LOS NINOS TIENEN

QUE DARLE LAS CARTAS A LOS NINOS A MI

ME GUSTA VALENTINE.

LE DESEO UN BUEN VALENTINE.

R

Text 22. Sample of the spontaneous Valentine letters prepared by the children.

The program capability to have a text printed in 20 and 40 columns in addition to the standard 80 column screen, was another excellent incentive. Children were much more excited and motivated when a text (a simple statement, or a few isolated words) was printed in large print; it gave them a sense of completeness that they could not have had if their short statement appeared in the middle or in a corner of a large and empty piece of paper (Text 23).

YO QUIERO A MI  
MAMA POR QUE ELLA  
ES BUENA Y MI PAPA  
Y JOSE ES BUENO Y  
MISI C                    Y SE  
FUERON A LA CASA  
JUGARON A FUERA  
CON LA NIEVE.

Text 23. Sample of Cesar's work in a 20-column screen.



The combination of the use of the child's own language and cultural ways of knowing when creating a story with Kidwriter, and later when listening to it through Talking Text Writer, was extremely useful in promoting self-confidence, a sense of control over the child's own learning, and in learning and/or improving spelling and other aspects of the written code, such as spacing. This application of the computerized speech was particularly helpful for the pre-literate child, such as Wendy (see below). That same kind of child would become rather frustrated when trying to write a free text with speech output. Eduardo, for example preferred to write with Kidwriter because the machine 'can't read my words' (/YT ES BLR/ white and blue), he said one day with great disappointment (Text 24). Eduardo preferred to write with Kidwriter, since he, Eduardo himself, was 'reading' the text, and he 'could read it' (Text 25).

FISH FISH FISH

FISH

YT ES BLR

EDDIE

TIDE



=====

D Y HY HOME  
THEY ARE GOING HOME

D Y HOME

E

Text 24. Eduardo's work with Talking Text Writer (November 5th).

Text 25. Eduardo's work without speech output (his sentence was re-written by this researcher).

On the other hand the pre-literate children of the study were not encouraged to experiment with sounds and letter combination because of the technical limitations imposed by the program which is designed to accommodate to the English sounds. Despite the possibility offered by this program to fix a pronunciation, and the success in fixing it to make the computer read in Spanish, there were some limitations. The most relevant information for our purpose being the difficulty in having the machine read each letter in Spanish without having to hear it in English first. That could only be accomplished by turning the sound off, and have the machine read word by word, a sentence or paragraph.

Pre-literate children were unable of fixing the pronunciation by themselves, and therefore free text was only possible when this researcher or the teacher provided assistance. Speech output, however, was an excellent resource to develop an awareness for completeness of ideas, and for structural problems. It was also effective in learning how to read with comprehension.

The editorial approach proposed by Rosegrant (1986) proved successful with beginning writers. This editorial approach combines speech output with the word processor, and is geared to "the development of 'critical ear' for 'hearing' written discourse (p. 9). The examples used in this discussion illustrate rather extensively the use of this approach and its effects on the learning process of the children of this study. The addition of speech output made possible the use of whole language within a computer environment, and the progress made by the majority of the children (far above their teacher's expectations) suggest that auditory feedback is a critical factor in the development of literacy skills.

## PART II - CHILD STUDIES

The purpose of this section is to illustrate the major findings of the study reported in Part 1. The portrayals of the four children that follow are based directly on the data gathered through naturalistic observations and analysis of work samples. All concrete data are identified as to the day and month in which the activity took place. The major "themes" of each individual child reflect patterns of behavior which are neither mutually exclusive categories nor are they exclusive behavior patterns of these children, e.g. all children displayed a positive attitude towards the use of computers. Each case study concludes with a summary; the last case study is followed by the major conclusions discussed in this chapter.

### Benito

Benito is a nine-year old bilingual boy, well proportioned, slender but not thin. He is fairly tall for his age, soft spoken and of measured manners. In the IPT (IDEA test), he scored as equally proficient in the two languages (Lau C). He is enrolled in the TBE program where he spends most of his time. He is integrated for homeroom purposes, Music, Art, Library and Physical Education.

Report from the total record. Observations of Benito's actions, interactions, and stories indicates a serious and responsive attitude toward learning and a certain degree of shyness combined with insecurity, particularly when using the English language. In further examining these observations, four major themes appear to emerge. They have been organized and documented under the following headings:

1. Learning as a steady process.
2. The significance of a coach, and the team approach.



3. The speech output difference, and

4. The evidence of how literacy in L1 was applied to L2, and how the two languages were kept separate in several ways.

1. Learning as a steady process. Benito like all the other children involved in this study, had not used a computer until this study. However, he learned the basic commands very quickly and efficiently. Kidwriter was attractive to him especially at the beginning. He used a great variety of objects, often modified in size and/or color to fit the context of each particular story. He seemed easily able to express himself in Spanish. His oral stories, based on the picture stories created with Kidwriter, showed use of varied vocabulary, ability to narrate the story in sequence, complex syntax and no significant oral code-switching (Text 26).

#### LA NOCHE DE LOS ZOMBIS

El estaba en su apartamento viendo a la luna. Seconvirtion en un hombre verde. De pronto aparecioun avion y bajo una nave (pause) espacial con los zombis. Se le llevaron y la mama (pause) y la familia se estaban buscando. Llamaron a la policiay buscaron por todos los sitios y no leencontraron. El mando una senal que el hermano vio; el llamo a la mama, mandaron un cohete, y al otro dia aparecio en el patio.

The Night of the Zombis. He was in his apartment contemplating the moon. Suddenly a plane appeared and a spaceship came with the zombis. They took him and mom (pause) and the family were looking for him. They called the police and look for him everywhere. He sent a signal that his brother saw; he called mom, sent a rocket, and the following day he appeared in the yard.

Text 26. Benito's oral stories sample (November 10th).

A more advanced step in his progress was the translation of old stories into English. This activity helped Benito in several ways. First, it increased his feelings of competence; he regarded the activity as a challenge, but not as an impossible task (it was his own story, and he had worked on it with Kidwriter, Talking Text Writer, and had listened to his own narration in the tape recorder). Secondly, it made him aware of



the possibilities of the computer, and his control over them, and over his own learning. For example, while translating the above story (Text 26) into English (Text 27), Benito made some specific comments about the mechanics of editing and deleting being the same regardless of the language, which indicated some degree of skill transfer, as well as an awareness of the existence of differences and similarities between the two languages. Finally, he came up with a strategy that permitted him to write the story in English keeping the main thrust of the Spanish version despite his limited English vocabulary.

The man in green. The sombis took him into the spase and put him into glass and put him into a box a big box. They put him one snake on his face. He yel the man and green the mother hear it and the man came back home.

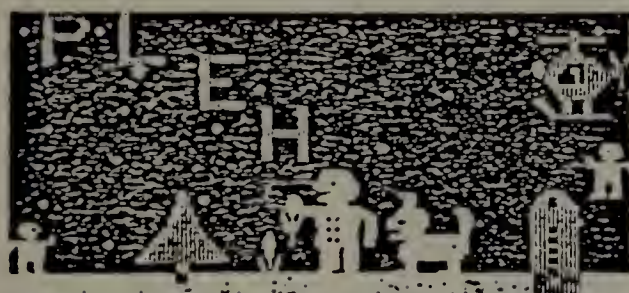
Text 27. English version of an old story (October 30th).

More specifically, an analysis of the above version in English indicates that: 1) Benito used simpler vocabulary e.g. put for montarse (to get on), big box for nave espacial (spaceship), 2) he used simple sentences, sometimes connected by and e.g. The man in green, He yel the man and green the mother hear it and the man came back home, whereas in Spanish, he used a relative pronoun in a defining relative clause, e.g. pointing at the picture he said (Este es) el nino que se monto en la nave espacial. ((This is) the boy who got onto the spaceship).

During November and December, Benito continued making progress. He mastered the use of the function and command keys of Kidwriter and most of the keys of Talking Text Writer, including fixing the pronunciation in Spanish. The amount of

time that Benito was capable of working at the computer also increased over time. The fifteen minutes initially assigned to each student was not enough for Benito. Benito could work without distractions for periods of 20 and even 25 minutes, and there were times when his partner Rafael would give up his time so that Benito could finish his work, and viceversa. Another interesting aspects of Benito's performance, which related - maybe more indirectly - to his school progress inasmuch as it related to this overall emotional development, was the content of his stories and free writing.

Benito's prudent and cautious manner favored the concrete and the literal, and yet some of his stories made reference to his whimsy. Thus, the theme of the spaceships, and snakes surfaced several times (Text 28), and almost simultaneously to other works which illustrate his mature expression and representation of images and ideas (Text 29).



THE MAN WAS GETIN A FLOWER AND THE DOG  
BIT HIM AND HE YELT HELP

B'



THE MAN THINK THAT THE DOG WAS A SNAKE  
THE LITTLE-MAN SAID DONT TAKE FLOWERS  
HE DIDN'T LESINO.

B

WENT I WAS A BABY I PLAY WETH MY  
MOTHER AND MYFATHER.  
I GO TO SCHOOL I LERN MY WORK  
I GOEN TO THE ARMY  
ILIKE TO GO TO THE ARMY BECAUSE I  
WANT TO BE IN THE RESERVE. AND IN WAR

THEY ARE OMOST HERE SET TITO LETS GET  
OF NOW LEST GET SON TOYS TO PLAY  
O.K. SAID AL .  
LIST

Texts 28 and 29. Work samples that illustrate Benito's main story themes.

2. The significance of a coach, and the team approach. A number of observations collected in this researcher's notebook refer to the subtle signs of Benito's timidity. When he wrote a letter to his father (Text 30), who was in Puerto Rico, Benito was extremely concentrated on his thoughts, his eyes moving back and forth from the screen to the keyboard, while composing, fixing and editing the words based on the speech output. Benito did not ask for assistance, and he did not make any comments (Rafael was not present at the time); rather, his apparently cautious manner suggested that he was trying to protect his privacy inasmuch as he could.

PAPI ESPERO QUE ESTE BIEN ESTOI  
BIEN. ESPERO QUE TU ME MANDES UNA  
CARTA TAMBIEN TE ESTOY ESCRIBIENDO EN  
UNA COMPUTADORA. BENDICION PAPI

B M .

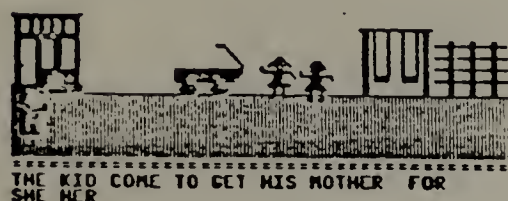
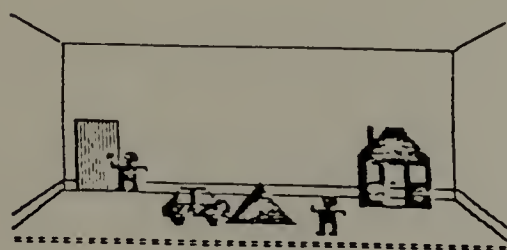
Text 30. Benito's letter to his father.

Benito's way of working at the computer, his quickness in understanding the concepts and the quality of some of his work were not always reflected in his oral stories. When asked to tell a story, Benito's response was not enthusiastic. He appeared threatened by the tape recorder, and also by the presence of the researcher. His timidity would lead him to a long pause, and incomplete thoughts. In this situation, his attention span was much shorter, and his degree of distractability much higher. In contrast, however, Benito would take a very active role as a coach. He would offer solicited but also unsolicited advice to Rafael, who usually welcomed it. They also became involved in long and interesting discussions around the story or text:



at hand. As a coach, Benito could be talkative, confident and much more venturesome than when working on his own, or with the researcher.

In the following story (Text 31), Benito and Rafael work together.



Text 31. A joint story with Rafael (November 12th).

There was good collaboration. Rafael did the first page, and Benito continued with the second and the third ones. Rafael typed the text on the last page. Their teamwork was very effective in problem solving. In the second page they wanted to draw a ramp for the car, but there was no such icon in the list of object available from Kidwriter. After a lengthy discussion around the different possibilities and the reason for such a ramp in the picture, they decided to go through the booklet together. Then they 'discovered' the possibilities of using a triangle; indeed the triangle served its purpose. The Benito/Rafael team was exemplary also in the respect that they had for



each other's talents and interests. In this particular story Rafael, with assistance from Benito, wrote the last page"

Rafael (R): THE KID

Benito (B): COME TO GET HIS MOTHOR

R. corrects B's spelling: MOTHER, and then finished the line.

(Rafael): There was a kid. He was going in the house. The kid was in the car.

Then Benito is asked to tell the story his way, and he does it in Spanish.

(Benito): El amigo del nene que estaba debajo del carro, adentro, fue a buscar a la mama, y estaba hablando con las amigas y ella estaba cojiendo /pa/ la casa de ella (pause)/ y vio . . . , y vio . . . , y el nene di jo mama un nene me cogio un carrito . . . . y el /logo/ hizo una rampa y despues rompio la casita chiquitita mia.

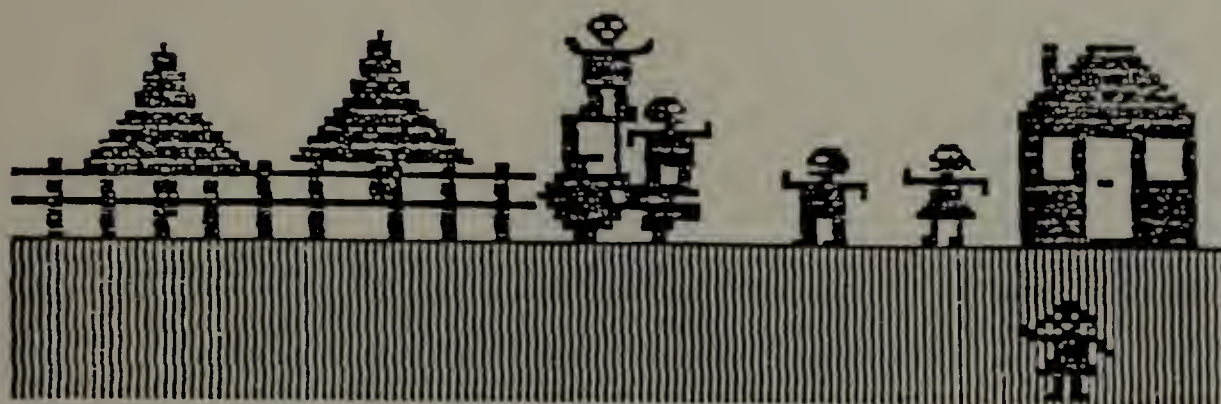
(The boy's friend who was under the car, left to get his mother, and she was talking to her friends, and she was getting ready to go to her house, (pause) and saw . . . , and saw . . . , and the boy said mom a boy took one of my small cars . . . and he then made a ramp, and then took my little house to pieces).

Text 32. Joint text of picture story.

3. The speech output difference. Numerous authors have emphasized the important relationship between listening and reading; the reader is also a listener, and thus the two skills are not completely separated from one another (Foss and Hakes, 1978; Rosegrant, 1986). Based on this assumption, the incorporation of speech output into the experimental computer learning environment becomes almost a priority. In addition to that, if the computer has the capability of speaking in more than one language, the potential of this environment is theoretically unlimited. Benito tested and confirmed the tremendous potential of such an environment. Benito's overall developmental process was good; he improved his literacy in Spanish as well as in English. However, there are significant differences between the work done with (Text 33) and without (Text 34) speech output.

EL HOMBRE ESTAVA COJIENDO UNAS FLORES  
 PARA LA MAMA UN NINO DIJO NO NOLAS  
 COJAS OSI TE PASA UN TREN POR ENSIMA.

Text 33. Story sample using speech output.



=====

LLE GO MAHI LLE GO MAHI VASHOS AVERLA.  
 NOS TRAJO ALGO SI SI MIRA IO QUE ME  
 TROJO UN CARITO HIAHI UN PELUCHE  
 PAPA YAVOI BOI HAORA  
 VAMOSHADENTRO.

Text 34. Story sample without speech output.

The two texts were written with three days of difference between them; Benito wrote the story with Kidwriter on November 30th, and the text with Talking Text Writer on December 3rd. The quality of the writing between the two papers is significant. The contribution of the computerized speech is evident in: 1) Spacing (8.3% errors with speech output vs. 25% errors without it), 2) spelling; the text written using speech output containing only one misspelled word *o* (Oh!) in *osi*, whereas the story written without the auditory feedback contains eight spelling errors which, based on Edelsky (1986), can be further classified as follows:

a. Spelling inventions:

VASMOS (vamos/go),

IO (yo/I),

TROJO (trajo, brought),

CARITO (carrito/small car),

HIAMI\* (y a mi/and to me),

YAVOI (ya voy/i am coming),

BOI (voy/come),

HAORA (Ahora, now), and

VAMOSHADENTRO\* (vamos a dentro/let's go in)

b. Non-spelling conventions:

LLE GO (llego/arrived)

AVERLA (a verla/to see her)

\*: can also be classified as non-conventional spelling errors.

While the resulting product is important, what maybe more important was Benito's process when composing and editing with Kidwriter. Benito pressed control (c)-4 and c-5 (reading of a line and reading of a text) very often. He usually would have the machine read the entire text first, then a line and he would finally identify the word that had to checked. Once edited, he would continue where he had left off before. Benito was encouraged not to use the speech mode while typing when using Spanish. The reason being that because the pronunciation of most of the words had to be fixed, it was much more efficient to write with the volume at the minimum, and check the spelling after the words had been fixed (it was normally done on the spot, right after Benito or whoever, had completed typing a sentence). Towards the end of December, Benito learned how to fix the pronunciation himself, and he would continue



with the same strategy with Spanish. When using English he would hear the text as he typed it. Editing was also done after each word.

4. Evidence of how literacy in L1 was applied to L2, and how the two languages were kept separate in several ways. Based on Thonis (1981) theory of transferability of skills, Benito's abilities in English appeared to be clearly influenced by his reading and writing skills in Spanish. From the long list of potential L1 skills transferable to L2 (Table 2), Benito showed strong skills in habits and attitudes, i.e. attention, listening skills, concentration, persistence and task completion, and those same skills were evident in his work in English. A similar parallelism was found in regards to an understanding of reading as a process. Benito knows how to establish the speech-print relationships in Spanish and English, he was also capable of carrying out comprehensible reading in Spanish, and he applied that to reading in English. Benito also showed strong skills in the visual and spatial skill areas, and therefore he did not present any problems in these areas in English. On the other hand, Benito demonstrated some weakness in the self-esteem, i.e. being literate, feeling capable, and achieving, and this may explain in part, his timidity and need for encouragement, especially when working in English. The holistic approach used in this study, incorporated the use of Benito's own experiences as a learning source and the use of computerized speech enhanced Benito's self-esteem. Benito's progress was faster in Spanish than in English (his world knowledge was more extensive in Spanish), but he also made remarkable progress in English, which again supports the theory of transfer of strong skills.

Benito did not produce any written code-switching. His Spanish texts and stories do not include any English words, and viceversa. Benito, however, knew how



to apply his knowledge of Spanish to develop literacy skill sin English. Benito often used similar segmentation types in both first and second language writing (only texts written with the same program were compared). For example, Benito had the tendency to attach one-syllable word to the next one, and he did that when using either Spanish or English e.g. MYFATHER, ILIKE, AVERLA (a verla/to see her), NOLAS (no las cojas/do not take them). In a similar fashion, Benito's spelling errors were phonetic in nature; the difference between the two languages being that spelling errors in Spanish were rare e.g. IO (yo/I), and carito (carrito/small car), whereas phonetic spelling errors in English were rather frequent (they were influenced by his developmental level in English), e.g. yel (yelled), gettin (getting), lesind (listen), set (said), son (some), omost (almost), weth (with), and goen (going).

Summary. An even gradual pace marked his progress in the development of literacy skills in Spanish and in English. The use of whole language within the experimental computer environment was very helpful in strengthening his reading and writing abilities in Spanish and in building up stronger literacy skills in English. An important component in Benito's progress was the influence of his coach, Rafael. Rafael and Benito formed a particularly good team. They helped each other with criticism while maintaining care and respect for each's preferences and independency. One day this researcher encouraged them to work on a story together, but they preferred not to do it; Benito said "No, because Rafael may want to draw things that I don't want to". Rafael engaged in story making while Benito played an active role as a coach, but he never pressed a single key of the keyboard (they had prepared other stories in collaborations; see below). Benito and Rafael also complemented each other well; Benito had better skills in Spanish than Rafael, who was better in English, and they both acknowledged

it. Therefore, when Benito was working in an English text, he would seek Rafael's advice and approval more often than if he was working in a text in Spanish.

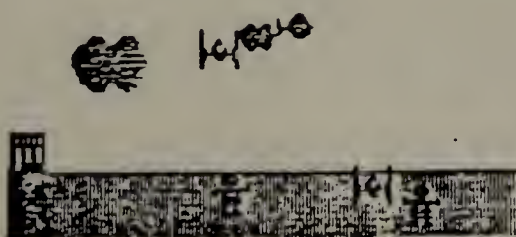
Benito mastered all the command and function keys of Kidwriter very quickly, including saving a page, and starting a new one, which required a number of steps: 1) press the 'Shift' key and the '\*' while holding the 'Shift' key down, 2) read the new menu and press 'Y' key to save the picture story, 3) type the name of the story following the screen instructions, 4) read the new menu that appears on the screen, and 5) select from the new menu the instructions to start a new page. Benito's first story already indicates a good understanding of the functioning of the program; he changed the story background, used color as well as modified icons, and the word processing capabilities of the program to write the story; he even explored lower case letter (Text 34). In fact, Benito outgrew Kidwriter towards the end of the tenth week, and he was introduced to other programs, e.g. Problem Solving Skills to be used in combination with Talking Text Writer.



El hombre verde.



DE PRONTO APARECIO UNA NAUVE ESPASIAL  
ICE CEVO AL HOMBRE



El NINO Que se MONTA EN la nave  
es PASIAL.

unos sobis vajaron DE LA NAUVE

Text 35. Benito's first story with Kidwriter (October 8th).

The speech output helped Benito in many different ways. It was effective in assisting him to differentiate sounds in English, e.g. /b/ and /p/ in buthin for put him, to improve spacing and spelling. Most of all, however, the speech output was effective in developing in Benito the internal discourse, that Rosegrant (1986) characterizes as the most critical element to become a good writer. By January, Benito was able to carefully plan a story, read the text aloud subvocally, had a sense of audience - his writing attitude when writing a letter to his father or when writing a story was rather different -, and capable of editing a Spanish as well as an English text. One of his latest handwritten stories (Text 35) illustrates how Benito transferred all the above skills to a story created off the computer.

Habia una vez un arbol que  
crecia cada vez mas alto

Y un dia un niño vino a  
el arbol mas alto y se trepo  
en el arbol

que ponía huevos de oro

Y el niño la cogió pero el  
gigante estaba despierto

Vamos corra! vamos a cortar  
el arbol

La mamá era pobre pero

el gigante lo miraba y mira  
ba pero se le perdió de vista  
el gigante

El niño a su casa y vio un  
gigante con vacas muertas  
para comerse las  
El tiene una gallina

el niño tenía una gallina  
que ponía huevos de oro

Text 36. Story by Benito (January 6th).



## Wendy

Wendy is a thin and smiley seven year-old girl whose dominant language is Spanish (Lau B). Wendy is in grade 1, and attends a monolingual first grade class as her homeroom, but spends more of her day in the bilingual class. Wendy has two other sisters, Connie, and eight year-old girl, who also participated in this research project, and younger sister who stays at home. Wendy's report card for the first marking period indicated that she was doing well in areas such as work habits, and social development. her academic profile was overall "satisfactory", although she is working of at a lower level than most of her classmates. She was not graded for written language, and had an "improving" in math skills.

Report from the total record. Overall, the record of Wendy yields impressions of good disposition, progress and increased socialization (more talkative, improved oral proficiency). These impressions have been categorized as follows:

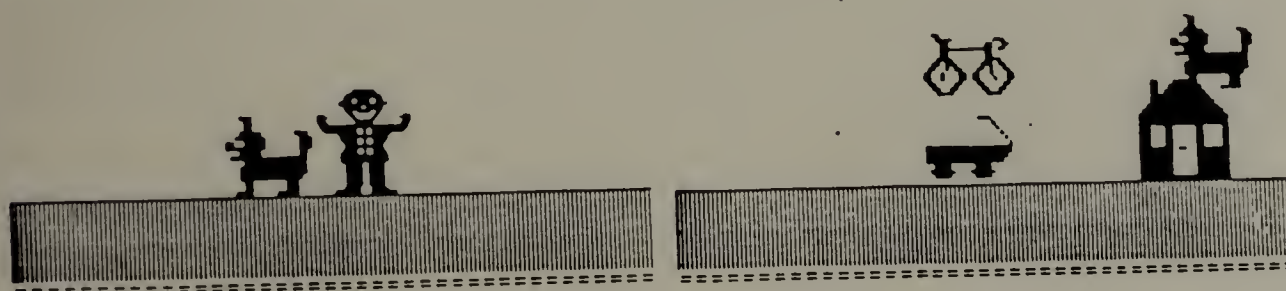
1. Receptiveness to modifiability.
2. Development of metalinguistic awareness.
3. The onset of literacy.
4. The impact of whole language.

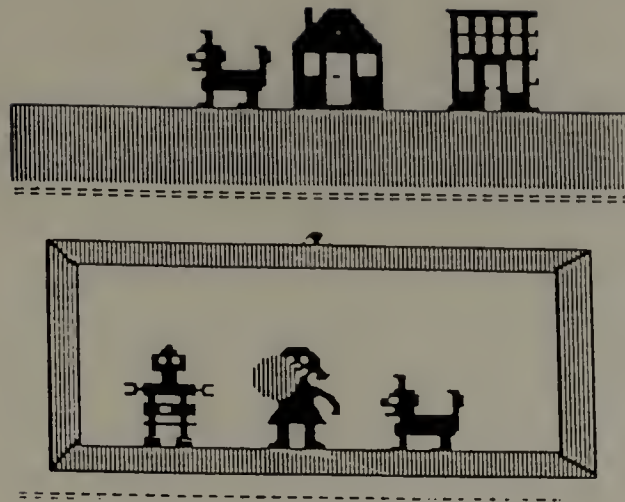
1. Receptiveness to modifiability. The adult/learner interaction was of critical importance to Wendy's achievement of progress in reading and writing. Wendy's learning potential was evident but so it was her lack of maturity or, in Feuerstein's terminology, lack of mediated learning experiences. The adoption of teaching in the nature of mediated learning experiences (MLE) was effective in eliciting optimal performance in Wendy. She responded to this researcher and to her teacher with enthusiasm, she "wanted" to learn, and this reciprocity between the two guided every



session. An important aspect in ML is transcendence, that is the identification of goals beyond the immediate situation. Transcendence was a targeted objective with Wendy. It took some time before she showed this type of ability. She normally worked using the elements at hand, in very contextualized situation, and only towards the second semester, did Wendy show some evidence of this type of skill, i.e. her ability to carry out independence reading using speech output and to apply acquired knowledge to a textbook lesson. Along with transcendence, the mediation of meaning was also carefully targeted. Every task and every accomplishments were fully explained, Wendy frequently would say "Que iba hacer?" (What was I about doing?). Since she had a tendency to forget the point of the task. The mediation on meaning, e.g. an explanation of why there were specific command keys in Kidwriter would focus her attention, help her restrain the purpose of the task at hand, and progressively build up a certain degree of knowledge and accumulation of information that she was capable of using in different contexts.

The regulation of behavior focused on two main points: 1) space and temporal orientation and 2) sequencing. Wendy mastered neither space nor temporal relationships, as her first stories demonstrate (Text 37 and 38).





Text 37. Wendy's work sample (October 6th).

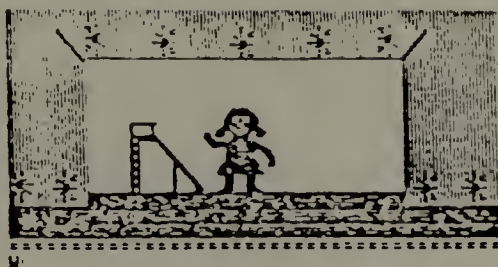
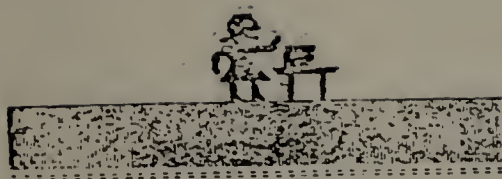
Wendy's oral narration of the above story show her lack of temporal notion as well as inability to operate logically:

"Una vez habia una casa,  
dos perros, y una  
mujer. Y la mujer se  
comio la manzana"

"There was a house,  
two dogs, and a  
women. And the women  
at the apple."

Text 38. "Mi historia" Wendy. (October 8th).

Closely related to the mediation of these behaviors, I emphasized the mediation of goal setting and goal achieving, especially through story making and narration. As her control over the computer increased, i.e. command and control keys, Wendy's stories improved (Text 38).



Text 39. Story created with Kidwriter. Wendy, November 5th.

Oral Narration:

"Wendy estaba bebiendose un cafe.  
/Entonse/ yo fui /pa/ la/baeto/  
hasta que venia la guagua.  
Y me fui /pa/la escuela y encontre  
un enaid/"

(Wendy was drinking coffee.  
Then I went to the bus stop  
until the bus came.  
And I went to the school and found  
a slide).

In this story, Wendy has used two modified icons, i.e. 'square' and 'bus' that she reduced in size to adjust their proportions. She used two different icons to represent herself, i.e. girl in profile (while drinking coffee), and a second in a frontal position (while waiting for the bus and at school). Other indicators of Wendy's progress are her degree of abstraction: she used a modified square to represent a cup of coffee, the temporal sequencing of the story, i.e. the use of 'then', 'until', 'and', as well as its logical conclusion. Despite its conclusion, the narration is not complete

because of the statement, "y rencontre un/chaid/" (I found a slide) that Wendy adds at the end.

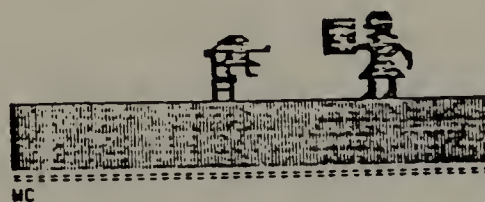
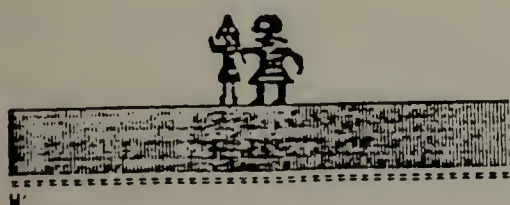
Working at the computer was challenging to Wendy, a challenge that she accepted with enthusiasm. It is because of her readiness to be challenged that the computer environment worked well with her. The speech output was of significant challenge to her. Wendy felt more comfortable typing without speech output; she would get confused with the English sounds and she also would feel discouraged when the computer was unable to "read" what she had typed. Therefore, Wendy often wrote after creating a story with Kidwriter, but she had to be encouraged to write with Talking Text Writer. Her continuing improvement was encouraged through the mediation of change, that is, through a constant feedback offered by this researcher of her teacher. I would emphasize her successes by giving her an insight into her own progress, and by offering her examples with applications of the knowledge just acquired, e.g. I would acknowledge Wendy's sequencing of her story, and retell the story to her. Then, she would be asked a number of questions about how much she liked coffee, the names of some of the children who took the school bus with her, and what happened with the slide.

2. Development of metalinguistic awareness. Wendy's initial performance appeared to indicate that she did not see the relationship between words. In Bialystok's terms, it seemed that Wendy's analyzed language knowledge was rather low, that she had yet to develop enough knowledge of the language system to be able to analyze it objectively, and to establish relationships between the forms and the meanings. From a Piagetian perspective Wendy was working at a pre-operational level. Although there was some type of cognitive maturation during the ten weeks of the project, Wendy's progress



suggested that variables other than maturation might have been responsible for it. Bryan and Trabasso (1971) found the four year-old children were capable of successfully performing an interference task if such a task had been explained to them so that they understood the relational information among the different parts. Following Bryan and Trabasso's rationale and that of Bialystok's, Wendy's success with Kidwriter and later with the word processor and speech output, suggest that the computer environment was an effective means to explain the relational information between forms of language, e.g. spacing and meaning, and that it provides Wendy with specific language experiences which were relevant to growth along the analyzed knowledge dimension (Text 40).

The computer learning environment also helped to increase automaticity of functions, which is the second cognitive dimension underlying the development of literacy (Bialystok, 1985). Kidwriter first and later on Kidwriter and Talking Text Writer appeared to be effective in facilitating the development of cognitive control. More specifically, the more she mastered the use of the control and command program



Text 40. Wendy's progress along the analyzed knowledge dimension.

keys the easier it was for Wendy to modify icons, create a context for a story, search the appropriate objects, introduce space between words, etc. By January 8th, Wendy was capable of creating a story and composing a text without speech output (Text 41). She was also able to retrieve specific information from a text and use it to compose or to read. For example, Wendy would practice a given text at the computer with Talking Text Writer. She then would choose some words and type sentences with them (Text 42).

3. The onset of literacy. Based on Rosegrant literacy progress charts (see Appendix 4), the beginning of literacy in Spanish was characterized by progress in visual motor and auditory analysis. More specifically, in the visual motor modality Wendy showed progress in:

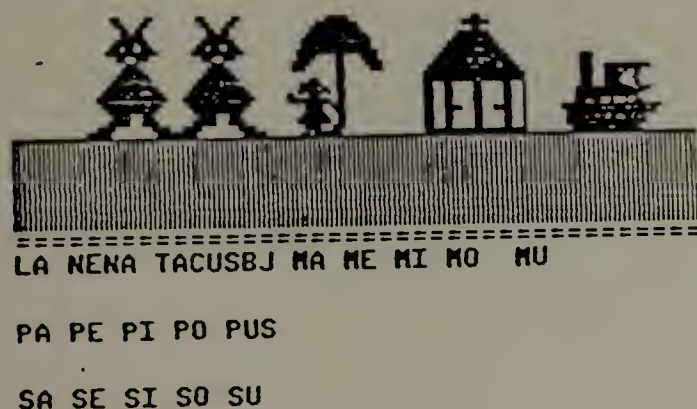
- . using the arrow keys to indicate direction, i.e. left to right, top to bottom.
- . sequencing of letters in a word and words in a sentence.
- . introducing spaces between words (significant improvement).
- . matching letters on the keyboard and letters on the screen, as well as in matching letters and word on the screen and letters and words in the textbook.
- . recognizing, not without some degree of difficulty, the letters on the keyboard.



Texts 41 and 42. Work samples that illustrate Wendy's progress.

The first few weeks of the study, Wendy used to check every singly key on the keyboard before finding the one that she needed. Similarly, she found difficulties but made significant progress after the ten weeks of the study, in following letters and words on the screen as the machine read a text.

In motor analysis Wendy mastered the use of function keys, and some of the command keys, including the delete key. She was capable of typing desired letters although she had yet to master the sound - symbol correspondence of all of them (Text 43).



Text 43. A sample of Wendy's syllabic hypothesis.

Summary. At the end of the first session, Wendy's opinion of the computer was: "Me gusto porque era bien nice" (I liked it because it was very nice). This statement somehow reflects Wendy's two main performance features, an immature approach to literacy tasks, and excellent disposition to work at the computer and to learn. Initially, Wendy did not master pre-readiness skills, i.e. directionally, copying of words, space orientation, sense of proportionality, lack of knowledge of letter/sound relationships (Text 37).

Towards the end of the text-week project, she had made significant progress; she was confident enough to express herself in writing (Text 44), followed a dictation (Text 45), and was capable of using Talking Text Writer independently to prepare her reading lesson.

In order to facilitate this independent activity, the TBE teacher types Wendy's reading lessons into the computer, and had Wendy go over it using the speech output. Wendy liked the task; she had the machine repeat the text by paragraphs or sentences up

OLA MAMA OLA PAPA  
OLA TIA OLA  
ABUELO OLA WALA

w w w

w

Esa osa  
osa pe pa  
osito a ma a papa y a mama  
osito

Text 44. Sample of free writing.

Text 45. Sample of a dictation (December 15).



to 10 times (if not more) but she seemed to enjoy the repetitions, and to read along with the machine. Wendy was able to transport these relationship to a different medium, and thus, she was not able to read from the textbook as well as do dictation based on the same vocabulary (Texts 46 and 47).

El lomo y la loma	
el pelo y el palo.	LOMA LOLA LILI
	OSO A OSA SU OSITO
El lado y el lodo,	ESA LOMA MAMA
el mulo y la mula.	LOLA Y LILI A LOMA
	OSA Y OSO LOLA A
La pala y la pila,	FAPA Y MAMA LOLA
el dedo y el dado.	

Text 46. Page from Wendy's reading book.

Text 47. Vocabulary from text typed into the computer.

### Maria

Maria is the type of child that makes her presence felt in whatever group she might be. Her manner of speaking is lively, expressive, and fast, so that there are times that it is difficult to understand what she says. There are occasions when code switching also gets in the way. Maria is also very impulsive, active and often interjects her peers and disrupts the classroom.

Maria is now nine years old, and is enrolled in the TBE program only for ESL purposes. Her oral English skills based on the IDEA test classified her as Lau C (equal proficiency in the two languages), but she showed a preference for Spanish during her activities at the computer. In the Wide Range Achievement Test-Revised (WRAT-R) administered in English on September, Maria obtained a grade equivalent of pre-first in

reading, and a grade equivalent of 1 in spelling and arithmetic. Last year Maria was referred for special education services, and subsequently placed in a resource room where she spends most of her time. She is integrated for ESL, Music, Gym, Library, Health and Art. Her preference for Spanish, and her effective needs seem to indicate that a bilingual resource room would have been a more appropriate placement for Maria (at present these services are not available at the school).

Report from the total record. The discussion of Maria's record is organized according to the following headings:

1. The distractibility factor.
2. Linguistic abilities in Spanish and English.
3. The accommodation of the computer learning environment to Maria's learning style.
4. The achievement of a sense of control over her own learning.

1. The distractibility factor. Maria's I.E.P. reads:

She is an eager student but tends to rush through her work, consequently, the quality could be improved. Maria is easily distracted. Her teacher reports that she 'bothers' other students in the classroom. All personnel should use firm guidelines and encourage proper behavior and attention to task for maximum academic performance. She needs to be encouraged to leave superfluous materials at home as she tends to concentrate on all the things she brings to school rather than her academic materials.

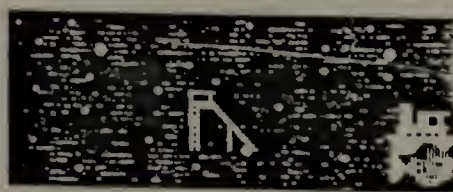
Maria often displayed this type of behavior when working at the computer, especially during the first few weeks. Like all the other children, Maria was assigned to work at the computer with a peer, Barbara. Barbara and Maria, however, were not able to work together. There was no peer interaction other than continued challenges and mutual interjections. Maria demanded most of the attention and she had great

difficulty in playing the role of "coach" while Barbara was using the computer individually, even if that meant spending half of time of actual contact with the computer. The opportunity of not having to compete for time at the computer had a positive impact on Maria. She was always in a good mood, talkative and enthusiastic about using it.

In observing Maria's relationships between task and performance, there seemed to be sufficient evidence to suggest that she did not feel a need for focusing on the factors involved in a task and that results in perceptual inadequacies, and eventual failures. For example, the day that Maria was introduced to Kidwriter, she could not wait to create a story. Therefore, she began a story before she had a chance to listen carefully to all the instructions; obviously she could not proceed with the story which she inadvertently erased (pressed the wrong key). Impulsivity and unsystematic exploratory behavior accompanied sweeping perception. Impulsivity and unsystematic behaviors were reflected in her tendency to use either a salient element, or the first element that she would encounter. For example, Maria would not narrate a story but describe the evident elements of a given picture (Text 48). Similarly, she rarely checked the booklet with all the icons available from Kidwriter; she would just use whatever object she would run into when pressing the command key.

I did stairs  
 I did a (inintelligible),  
 and I a fish (pause)  
 then I wrote my name.  
 The fish went to get his friend  
 to go to his house the,  
 and boat came and the boat  
 went far far away.

(long pause, encouragement)  
 They had a part (long pause)  
 outside (pause, hesitant)  
 (Title:) The fish are friends



R  
F

Text 48. Oral and picture story created by Maria (October 14th).

Maria's perceptual conflicts occurred in different situations, but they happened rather frequently when writing her first and/or last name. Maria could write both, but she often would forget some of the letters, and not to be aware of it. The correction of these difficulties involved the introduction of reflective thinking which, according to Feuerstein (1980) is an effective approach because it creates a distance between input and output. Keyboarding and speech output, in particular, were effective in facilitating this type of reflective thinking. First, typing forced Maria to have to check the letters on the keyboard, and this search helped her to slow down and work in a more relaxed mode. Secondly, in order for the machine to read back a letter or word typed into the computer, it is necessary to press the keys down one at a time; the need for some kind of rhythm again promoted a sense of control over her own behavior.



In order to mediate the development of planning and reflective behavior, Maria practiced with a computer dot-to-dot game in which the objective was the discovery of a hidden object. This game was helpful because it required the determination of the starting point, as well as the sequence of the drawing (identified by the letters of the alphabet). Inasmuch as the objects were simple and rather predictable, this preliminary activity was considered useful since it created in Maria the need for precision and accuracy to achieve success in the game. Maria also learned to apply this approach to word processing and story making. Moreover, through this activity and similar ones, Maria understood that to establish communication with the computer she had to follow certain rules, and that she had to comply with them if she wanted to do work at the computer. This initial success with a dot-to-dot game, was interpreted as a good indicate of Maria's potential.

Talking Text Writer was particularly helpful because of the speech output. At the beginning, however, Maria would ignore the machine and continue typing when the machine would read a misspelled word or make a incomprehensible sound. The introduction of a simple activity, i.e. the typing of the alphabet with a space between letters was enough to reinforce the need for self-regulated behavior.

Maria made significant improvements during the time of the study. As the following illustrates, there is a significant improvement between a text typed at the beginning of November (Text 49), and another typed the first week of December (Text 50).

EABY MOVER MOTHER PLAE PAPO  
 I LIKE SCOOOL  
 I WEL B R TECHR TEACHER  
 I WEL B RTECHR TEACHER

ABCDEFGHIIP  
 A B C D E F G H I J K L M N O P Q R S  
 T U V W X Y Z

M F CHOPPO IS 12. HE IS MY BROTHER.  
 F HE IS N PUERTO RICO. I WANT  
 HIM N MY SCOOOL.

Text 49. Text typed on November 2nd.

Text 50. Text typed on December 3rd.

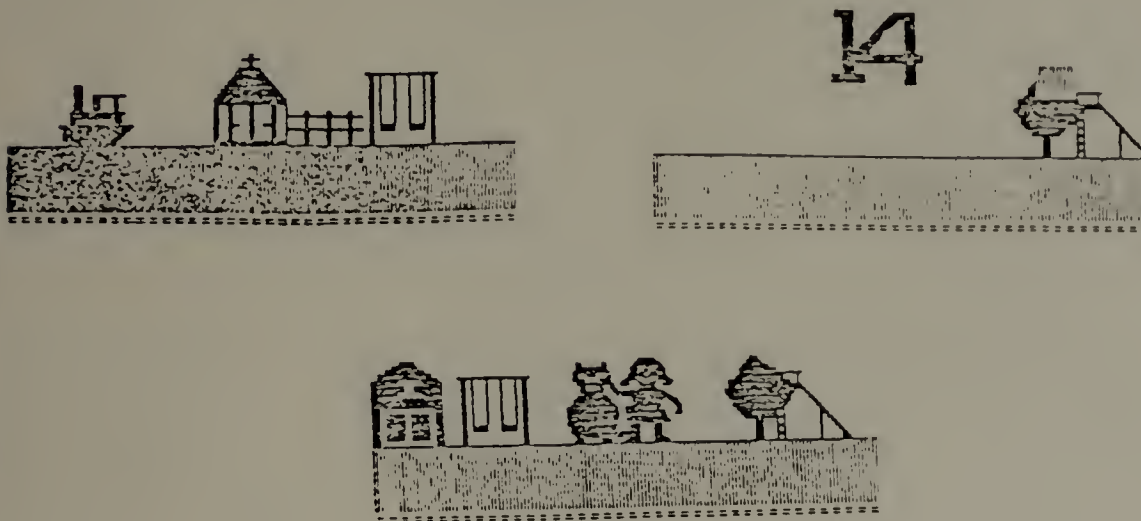
2. Linguistic abilities in Spanish and English. In Maria, the classification as Lau C does not qualify her as a bilingual individual. In reality, Maria's approach appeared to have an equally low proficiency in both languages. According to Parker's (1988) performance matrix. Maria functions at an advanced beginner level in the areas of oral proficiency. She masters the functional use of the language forms, and uses them to express her interests and needs. On the other hand, her cognitive academic language proficiency (CALP) appears to be at a beginner's level. Her reading skills at the beginning of the year were equivalent to pre-first grade. From the observations made during the present study, Maria enjoyed using Spanish when given the choice, and her oral abilities seem to suggest higher proficiency in this language. Maria, however, did not choose to explore the written code in Spanish; all her written work was done in English (probably because of her placement in a monolingual resource room).

From a bilingual viewpoint, the case of Maria seem to be one of subtracted bilingualism. Maria was introduced to second language instruction, including literacy skills, before she mastered her first language (she is still in ESL). Her choice for Spanish when narrating her stories could be interpreted as an indicator of her preference for this language, regardless of the exclusive use of English for academic purposes. Apparently, Maria's first language skills began to be replaced by the second language, before she reached the desired threshold of language proficiency that characterizes the beginning of the development of additive bilingualism, from which some cognitive benefits drive.

### 3. The accommodation of the computer learning environment to Maria's learning style.

A remarkable feature in Maria was her global approach to reading. When reading or writing, Maria had a tendency to rely on the form of the word much more than its components. She would memorize words visually, and globally, with little or no attention to details. This lack of attention to small elements and details went beyond reading; it was her attitude towards learning in general. This latter point, can somehow be illustrated by Maria's eagerness and enthusiasm to work at the computer. She would be so interest that she would be really chatty about what to do, and how to do it, that her fingers would be all over the keyboard, looking without seeing, and searching with little success. She would press one key instead of another, and change the topic of her story every time she would run into a different icon. Maria was satisfied with her 'product', because she was interested in 'a product' but not a particular or perfect product. In other words, the story was an 'incidental' result more than an 'intentional', 'planned' story of text (Text 51). The story in Text 51, has neither a main idea or sequence. Even if Maria's intention was to create a story, the pictures as well as the oral story do not reflect such an attempt. The text of the story (below) was typed into

the computer and Maria had the opportunity to listen to it. She was visibly happy to hear the computer 'read' her own story, but in trying to read it herself, Maria would skip words and make frequent miscues, such as substitutions.



Oral version of the above story:

Hize una (unintelligible), una iglesia, una 'fence' y unos 'swings'. (Pause, and pointing at the number) 'fourteen'  
 Hize in (pause) 'building', unos 'swings', un perro, una nena y un (unintelligible) con la escalera, (pause) estan jugando con los nenes y la /deso/.

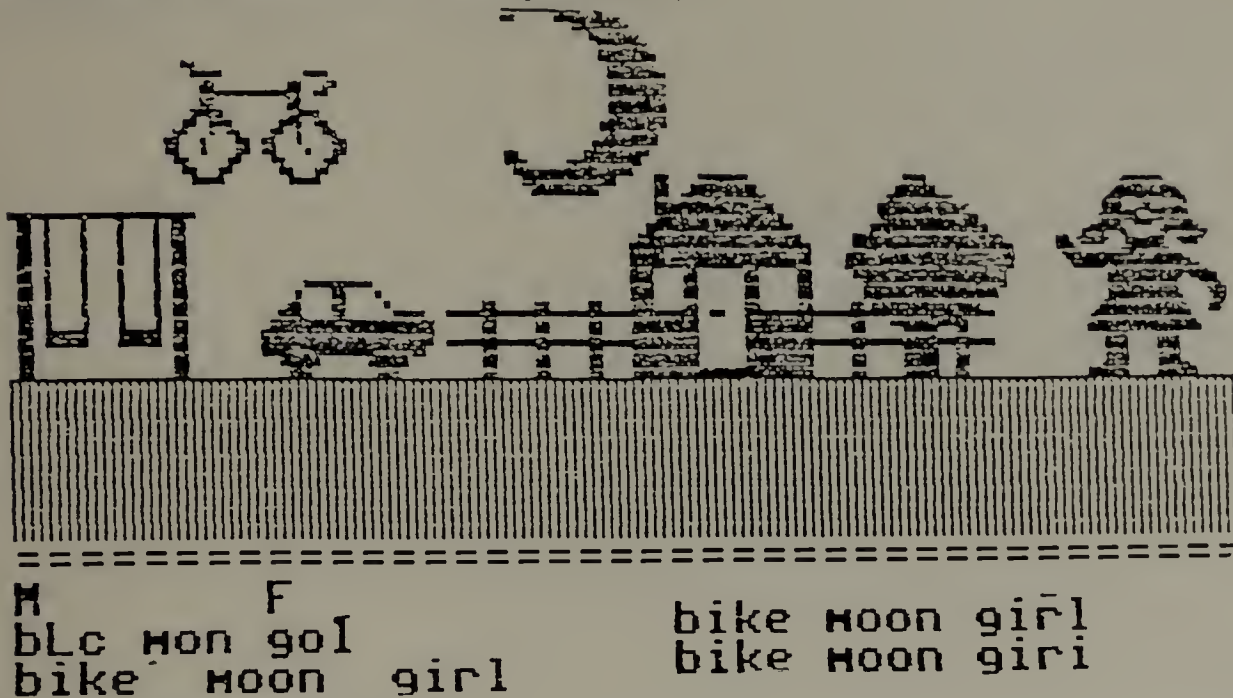
(I made a unintelligible, a church, a fence and swings. (Pause, and pointing at the number) fourteen. I made a (pause) building, swings, a dog, a girl and a (unintelligible) with the ladder, (pause) they are playing with the children and this thing).

Text 51. Maria's story with narrative (November 3rd).

The integration of whole language with speech output seemed to be an effective approach for Maria. With time, as she progressed in mastering Kidwriter and Talking Text Writer, her tendency to omit and/or invent words gave way to a more systematic



approach to the task. By focusing on meaning and comprehension, Maria made significant progress towards literacy (Text 52)



Text 52. Story by Maria.

4. The achievement of a sense of control over her own learning. Rosegrant's (1984) claim that "for children who have trouble controlling their bodies or focusing their minds to begin with, this approach (the focus on rules of grammar) may be the greatest hurdle to their ever achieving literacy" (p. 50), certainly applied to Maria. And the opposite also held true. The computer learning environment fostered feelings of success and pride in accomplishments. The whole language approach encouraged the expression of her experiences and interests, and an opportunity to learn in contextualized situations that were meaningful to her. Consequently, Maria's attention span increased significantly, to the extent that she could engage in intensive and prolonged reading and writing activities for over 20-25 minutes (at the beginning she would spend a total of 15 minutes, but she would not be capable of maintaining an intensive focused attention for that long). The option for her to participate and/or to respond in either Spanish or English, was probably another important contributing

factor to Maria's sense of control over her own learning (Maria was asked to use only English in both her resource room and ESL class; however, she usually narrated her stories in Spanish).

Another indicator of Maria's sense of competence and desire to learn was her requests for dictation of unfamiliar words. For example, when she was writing about her brother (Text 50), she attempted to write brother but she wrote "BOV" instead. She had the computer read the word back to her, and she acknowledged the error. Rather than to skip the word and move on to the next, Maria asked the researcher whether she could dictate the word to her. Maria was capable of recognizing every sound, finding the corresponding symbol on the keyboard, and typing it correctly. Her success not only showed the onset to analyzing language but an interest for collaborative work with the teacher, and potentially with other students.

Summary. Maria responded very positively to the computer learning environment. The essential inference to be drawn from Maria's total record is that she appeared to have tremendous potential to do well at school but her emotional and effective needs interfered with the learning process. Her willingness to learn and her cognitive capacities enabled Maria to make significant progress during the ten-weeks of the study. The continued use of the computer (she has now access to the computer in the resource room), accompanied by positive reinforcement seem critical in ensuring Maria's emotional stability and academic success.

### Cesar

Cesar is an eight year old Puerto Rican student. He is enrolled in the TBE program, although his oral proficiency in English classified him as a Lau D student in

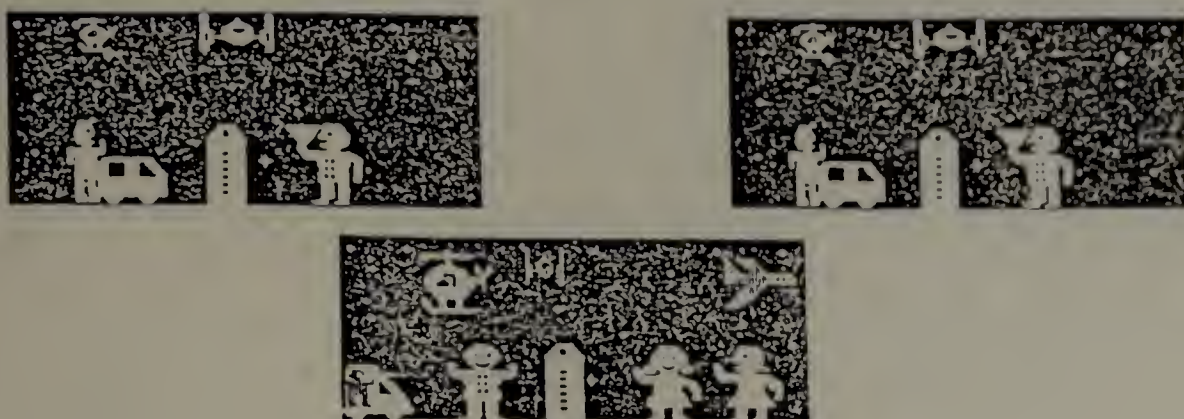
the IPT test (given in September). Despite this apparent ability in English, Cesar had yet to be introduced to reading and writing in English primarily because his oral expression appeared somewhat limited. He was receiving speech services geared at improving his pronunciation and fluency. Cesar had had experience however, with reading in his first language. He scored at second grade level in the Brigance Spanish reading test in September. He did not have any reading or writing abilities in English. Cesar' report card of February indicated that he was already reading at grade level (3rd).

Report from the Total Record. The discussion of Cesar' progress is organized according to three major areas which appeared to emerge from Cesar's interaction with whole language in the computer learning environment. The areas are as follows:

1. Positive attitude towards the computer.
2. Impact of speech output, and
3. Transfer of skills to handwritten work.

1. Positive attitude towards the computer. Cesar approached the computer with enthusiasm and interest. He worked diligently at his stories at the computer and soon he and Francisco formed an excellent working team. Cesar's picture stories were creative but they lacked consistency. He would stress the detail and thus lose the main idea. As a result, both his written and oral versions were incomplete. For example, an early story utilized an upside down triangle as a bottle of wine. However, he did not use the word processor except to type his name (Text 53).





Text 53. Sample of Cesar's early picture stories.

His oral story in Spanish (Text 54) reflected a significant degree of impulsivity, and unplanned behavior which may explain in part, his poor oral expression.

Habia habia una ves do nene /quetava/ jugando a pitola y una pego (pause) el albor, el numero y la letra (pause) /depue/ se apearon a coger (pause) pusieron un espejo una ventana, el deso (pause) una sombrilla (pause) la silla, el gato . . . y jugaron la bola (pause) puse (pause) la mesa la do silla. el columpio. el /deso dai/ (pause) bicicleta, /fores/, /pescao/ y un /deso/ de albol y un snowman y y y (pause) uuuuuuu! y se fueron.

(There was a time two boys playing with pistols, and one hit (pause) the tree, the number and the letter (pause). They they got off to pick up (pause) they put a mirro, a window (pause) this, an umbrella (pause), the chair, the cat (pause) and played with the ball (pause) put (pause) put the table and the two chairs, a swing, this here (pause), bicycle, flores, fish and something, tree a snowman and and and (pause) uuuuuuu! they left).

Text 54. Oral story: "El juego de la pitola y de la bola" (the game of the pistol and the ball (October 13th)).

Despite having a hardcopy of the picture story in front of him, Cesar did not narrate a story, rather, he limited it to an incomplete description of the most salient features on every page. Based on Feuerstein's (1980) notion of the relationships between task and performance form (see Appendix 3), Cesar displayed unplanned, impulsive and unsystematic behavior both at the input and output phase of the mental



act. As a result of this impulsivity, Cesar frequently, elaborated his response upon bits of information, i.e. story details, which would then hinder the quality of them, i.e. incomplete stories. The holistic use of the computer, its speech capabilities in Spanish as well as in English, together with the benefits of team work had a decisive influence on Cesar's self-esteem. By the end of the study, Cesar's behavior at the computer had become relaxed and persistent. He was proud of his computer abilities, particularly his ability to Spanish pronunciation, and he was confident about his academic work, such as the completion of reading assignments without using the computer.

2. The impact of speech output. Cesar' early behavior patterns; his unplanned approach to the task and predominance of incidental learning might have hindered the development of the ability to carry out the internal discourse that, as Rosegrant (1984) claims, is essential to "hear" whether a text sounds appropriate, and to modify it accordingly. If Kidwriter was critical at the onset to motivate Cesar to learn, to strengthen his pre-readiness skills and to introduce him to word processing, Talking Text Writer was instrumental in facilitating the learning "jump" that Cesar did towards the end of October. Cesar's attitude in class improved significantly as well as his attitude toward learning. Computerized speech played an important role in enhancing Cesar composing skills. Cesar's enthusiasm towards the computer encouraged him to use the written code. At the beginning, the only objective was to express himself in writing. At this stage of his development the speech output was used to hear the text as he typed it, to reread a text to, and hear his ideas in a line or a short paragraph. Almost simultaneously to composing, Cesar began developing some editing skills. The speech output was helpful in reading a text aloud for structural problems, i.e. spacing between words, and to read a text to hear the sequence and completeness of the ideas (Text 55).

CUANDO GO ERA CHIGUITO MAMA ME  
 JEBABA AL LAGO Y MI ABUELO TENIA UN  
 BOTE.

YO JUEGO FULBOL MUCHO Y TANBIEN SOKER

YO ME LLAMO C. M . MI  
 ERMANO SE LLAMA J M

Text 55. Text using Talking Text Writer (November 6th).

Cesar was learning how to read and write in Spanish only. Therefore, when writing at the computer, the role of the adult/research was critical, since the pronunciation had to be fixed for most of the words. Cesar and I "taught" Spanish to the computer. Cesar soon developed good discriminatory skills and he was capable of discriminating between the sound of a Spanish word read in English, a pseudo-Spanish sound, and an acceptable sound for a Spanish word. By late December, Cesar had learned how to fix a pronunciation by himself and enjoyed doing so. However, the sound of the letters at the pressing of a key was disruptive to him, since he was working Spanish. To avoid confusion, Cesar adopted the strategy of turning to a minimum the volume of the speech synthesizer. While typing (this was easier than to follow the few steps required by the program, he would increase the volume once the first draft was written. At this point Cesar would use the auditory feedback to identify the difficulties in the text and solve them.

Around the beginning of December, Cesar was introduced to English reading. The speech output here was particularly effective in modeling the pronunciation of some blends and sounds that Cesar could not read. With the assistance of the teacher, he would identify from the English reading book those words that he had difficulty

reading. Cesar would type them in large print, 20-column file (Text 56), listen to the computer several times and then read the entire lesson to himself.

1. This bus is going where we want to go.  
We will get on the bus not get on the bus

2. I want to see where the truck is going.  
Will you come with me to see to go on the truck

3. We can't go here with the trucks.  
We will have to stop here get a fish

4. You can hide in this can.  
He will see you in the can get out you here

HERE

WE

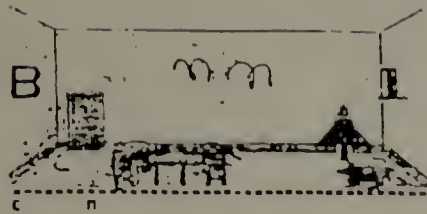
WE'LL

I CAN HELP

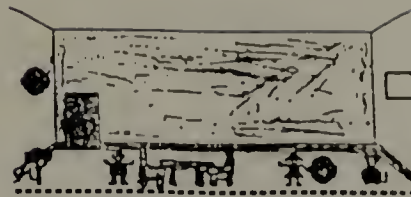
I LL  
CANNOT  
HE  
WHERE  
HERE  
WE  
WE LL

Text 56. Sample of Cesar's work

3. Transfer of skills to handwritten work. There is evidence of transfer of skills in the work produced by Cesar during the study. First, there is evidence of the common underlying reading comprehension potential, the quick progress of Cesar' in reading (in Spanish as well as in English) in such brief time period (10-12 weeks). Second, there is evidence of skill transfer at the writing level. Cesar, who according to the bilingual teacher had never written a single piece by himself, produced his first handwritten work on October 22nd (Text 57).



abi una vez dos nenes jugando  
 con una pitola y se murio  
 de jugando y min un animo  
 en la casa.



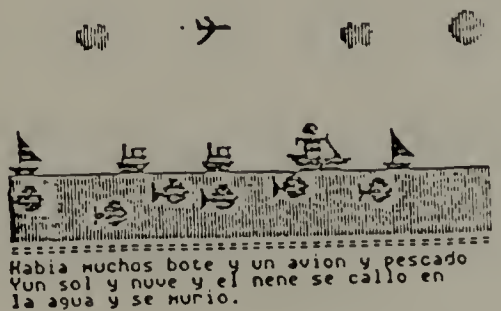
Los nenes es Tabalji. Jullud con  
 la bola y se pasava la bola  
 y abia un gato y un es. p. 10  
 y abia un benta.

Text 57. Cesar's first handwritten work (October 22nd).

By January, his typed as well as his handwritten work were clearer, expressed complete ideas, the problem of spacing has been reduced to a minimum, and spelling errors have decreased significantly (Texts 58, 59, 60, 61 and 62).

EL HOMBRE  
 BEVIENDO RON Y  
 ROTRO Y HOMBRE  
 ESTABA ROBANDO UN  
 CARRO Y EL CARRO  
 LO PILLO.  
 CARLOS MACHUCA

EL HELICOPTERO  
 LA NAVE ESPACIAL  
 EL HOMBRE SERE  
 TIENE SED  
 EL CAMION  
 LA CASA  
 ES DE NOCHE



Habia muchos bote y un avion y pescado  
 Y un sol y nube y el nene se callo en  
 la agua y se murio.



Texts 58 and 59. Work samples produced after 6/7 weeks (Mid-November).



La mamá de nieve  
 Lindia hizo una forma  
 de nieve

Fueron fuera los niños  
 a jugar con la nieve

Las niñas y los niños  
 nieve

Mamá llamó a los niños y  
 Niños y fueron a jugar

YO JUEGO EN UNA COMPUTADORA

TENIA UNA MAESTRA QUE ME ENSEÑABA A

JUGAR CON LA COMPUTADORA

Y YA YO SE JUGAR CON LA COMPUTADORA

Y AHORA SE JUGAR SOLO.

ME AND MY FRIEND

PLAY FOOTBALL AND

WE GO IN SCHOOL

AND WE GO TO OUR

HOUSE

Texts 60, 61 and 62. Work samples produced right after completing the 10-week study (January).

Summary. Cesar's extraordinary progress since he began using the computer illustrates to what extent a computer learning environment with speech output can impact on a child's emerging literacy skills. Cesar approached the computer with enthusiasm from the beginning, and soon mastered the functional and command keys of Kidwriter. His first stories were technically interesting, i.e. used a variety of icons, modified icons, and objects in a very suggestive manner.

Talking Text Writer was introduced at a point when Cesar had already mastered Kidwriter, and thus he was ready for a new challenge. His increased focused attention and behavioral control, allowed him to work at the computer for longer periods of time and to produce complete stories. Cesar who, according to the TBE teacher had not

written anything in class, suddenly appeared extremely interested in developing literacy skills (Text 58).

More importantly, however, were Cesar changes in attitude and behavior. By January, he was cheerful, responsible and capable of doing independent work. He was no longer receiving speech services (one may suspect that his poor oral expression was related to a poor self-image). He used the computer when he thought that the computer would help him, or when he pleased to do an assignment with it. The teacher respected his independence and continued guiding him to ensure successful challenges.

One of the latest observations of Cesar's were conducted on January 25, the day that this researcher videotaped some of the children. The TBE teacher asked Cesar to work on his English lesson at the computer. Cesar was supposed to type those words that he had some difficulty reading, have the computer read them back to him as many times as he wanted until he could read them. The same vocabulary was in the worksheet that he had been assigned to do. Cesar diligently went to the computer, before he turned it on, and asked me several questions about the recording that I was about to do. He said that first he wanted to read the book himself. After about 15 minutes, he put the book down and did the worksheet, and once it was done, he looked at me with a big smile and said "I could do it; . . . I'll read it again". He read again the story for 10-12 minutes, closed his books and went to the teacher. "I did all the work" (he said very satisfied. "Did the computer help you?", asked his teacher, "Oh yes," replied Cesar. The reality is that he never even turned on the computer. He did not use it; he knew that he could do it all by himself.

## Conclusions

The general findings of the present study suggest that the use of computers can be an empowering learning tool for LEP students, particularly if their use is based on current second language acquisition theories. The integration of whole language and word processing with speech output clearly show the significance of the link of computer technology to research on second language literacy development.

The computer learning environment used in this study is child-centered, and encourages the development of higher order cognitive skills, e.g. logical reasoning which is necessary for reading and writing. As this study demonstrates, the identification of the child rather than the computer as the locus of control is of critical importance. It has become apparent that the child's feeling of competence and interest in literacy is closely related to her awareness of having control over the computer. Computerized speech has been instrumental in establishing this relationship with the computer, because it has given pre-literate children the unique opportunity of 'reading' and 'writing' with the computer, when they could not do it by themselves. Computerized speech has also been instrumental in encouraging literacy behaviors in the beginner reader/writer. The children in this study showed an increased focused participation, and improvement in their development of the internal discourse and sense of "audience".

I argued that the integration of speech output and whole language could promote the child's natural reading process. I thought that the language experience stories would make reading and writing much more meaningful and that eventually these stories would be the basis for the child's own learning. While the present study shows that stories - the making, telling, reading and writing of stories-, do facilitate the

learning process, it has also demonstrated that to be effective, stories should be used in a variety of ways depending upon the age, language proficiency, learning style and degree of literacy skills. For example, this integrative approach helped Maria control her impulsivity to the extent that she developed a genuine interest for reading and writing that, according to her teacher, she had never displayed before. In Cesar, the use of stories made reading comprehensible to him. As soon as he became aware that reading is based on comprehension and that he had to formulate his ideas in his mind first before writing them, he overcame his fear and began reading and writing. His work shows how the 'discovery' of his own abilities played a critical role in his development of literacy skills.

Finally, the study shows the special role of the adult in the child's overall process. The role of the adult was critical in achieving an optimal performance of the child at every stage of his development. The adaptation of the role of a mediator, and not that of a teacher, in the traditional sense, ensured this optimal performance and the ability of the child to use the knowledge that he gained at the computer in other contexts, i.e. ability to read and write outside the computer environment.



## CHAPTER VI

### PEDAGOGICAL IMPLICATIONS AND RECOMMENDATIONS

Having discussed the significance of whole language and the use of computerized speech, and shown its importance in the literacy process of LEP students, this chapter considers the pedagogical implications of the study. The implications of the theories reviewed and findings of the study are then followed by specific recommendations for administrators and educators of linguistic minority students.

The population of limited English proficiency (LEP) students is the fastest growing segment of school-age population in the United States. According to the report prepared by the Office of Technology Assessment of the U.S. Congress (1987), "during the period of 1978 to 1982, while the overall population of the students ages 5-14 declined by 6.2 percent, the limited English proficient population grew by 10.3 percent" (Ibid: 75). Despite substantial investments made at the Federal, State and Local levels, the education of these students is still an issue. According to statistics (Technology Report, 1987) three out of four American students graduate from high school, however, the dropout rates among LEP students is much higher (48% for Native Americans, followed by 45% for Hispanic students).

This paper has argued against a belief among many educators and policy-makers that the acquisition of English skills, and not literacy, should be the educational goal for these students. It has been the purpose of this study to demonstrate that by tapping the child's cognitive and linguistic strengths, it is possible to develop a positive attitude towards learning and facilitate the LEP child's development of literacy skills. The pedagogical approach discussed in this study appears to hold promise to enhance

the intrinsic motivation of the students towards learning and consequently for improving their achievement in school.

One immediate implication of the study is the obligation of educators and school administrators to replace the widely spread use of deficits models, i.e. remedial and compensatory programs, for an open model that fosters the linguistic, emotional and cognitive growth of the LEP child. Such a model utilizes the LEP children's linguistic strengths in their first language and their cultural knowledge as educational resources. The use of language experience stories as the primary source of learning in the present study illustrates the effectiveness of such a model.

A second important implication is the perception of the computer as a tool that the child can utilize to enhance his learning, rather than the perception of the computer as a teaching aid. This distinction has implications at both the teacher and the student levels. At the teacher's level, it implies the active involvement of the teacher in the child's learning process. That is, the teacher plans and formulates individual goals and objectives. He/she also facilitates the integrative use of whole language and computerized speech while enhancing the children's sense of success.

At the children's level, the computer is perceived as an empowering tool. Children become aware of their control over the computer, their abilities to 'teach' Spanish to the computer, and the computer 'struggle to learn' (at times fixing the pronunciation of a word may take more than two trials). The child's perception as the expert builds up an intrinsic motivation to learn, and an increased interest in reading and in writing on the computer and at the desk. As a result of this empowerment, the teacher-child relationship changes. The children in the study grew to the point that their relationship with the teacher was one of dialogue and mutual respect. An implication of

this finding is the claim that a reciprocal interaction approach rather than the traditional transmission teaching model is most appropriate when working with linguistic minority children, in particular, with Puerto Rican children with limited English skills. .

Another implication to be drawn from the study is the contribution of computerized speech. The uniqueness of speech output makes possible the use of whole language within the computer environment. Two major conclusions emerge from the results. The first involves the influence of auditory feedback in the child's development of literacy and the interrelationships that exist between oral, listening, reading and writing skills. The primacy of these interrelations is reflected in the LEP children's way of using their stories. They created the stories with the computer (projection and realization of their own ideas and experiences), then they narrated the stories, played them on the taperecorder, saw them transformed in text on the screen, listened to the computer read their stories, and finally they were encouraged to experiment and learn from them. While the process of story making, story telling, story reading and story writing requires a diversity of skills the common underlying theme and the intrinsic motivation that this common theme created in the children, facilitated the acquisition of all these different skills that constitute what has been defined as literacy.

Secondly, and despite the technical limitations imposed by the program adopted for this study, (mainly the fact that it was designed to be used with English only), the use of speech output offers tremendous potential. The speech output helped the beginner writer in acquiring the ability to carry out the internal discourse that is critical for a good writer. In the pre-literate LEP child, the speech output facilitated the development of behaviors and skills that are associated with learning to read and write,



e.g. increased focused participation, hypothesis testing, space and temporal orientation. Finally, the use of speech output helped both type of children in building their self-esteem, a feeling of competence and a sense of control over their own learning.

The progress made by the LEP children participating in the study, qualified as extraordinary by their teachers, raises an important implication for the bilingual/ESL educator. The use of the computer in the bilingual and/or ESL class should no longer be considered a potential instructional avenue, rather it should be adopted immediately. Also, teachers of LEP students should regard the use of computers in their classroom as a powerful resource to be used with the student, rather than to keep a student 'occupied', or to reinforce some specific skills through drill- and -practice programs. Drill and practice programs have their function, but it is a very limited one. Teachers of LEP children should refocus their pedagogical approach to reading and writing and incorporate word processing with speech output in their curriculum.

Another classroom implication that derives from this study is the power of language experience stories in the development of oral proficiency and in the development of literacy skills. The LEP children in this study created stories at the computer, - stories grounded in their own reality- which were used as the primary material for the other activities, i.e. narration of stories, writing and reading at the computer. Children therefore, both created and responded to meaningful language and meaningful context. Those LEP children with more advanced skills in English, found the use of language experience stories very helpful in reinforcing and promoting their English skills. They were able to translate their own stories and work with them on the computer. When working on a story from their textbook, these children were capable



of identifying those vocabulary words that they had difficulties reading and practice by typing them at the computer and having the computer read them back.

The function of the printer in the computer learning environment also has immediate applications. The transferring of a picture or a text from the computer screen to a piece of paper has a very special, almost magical effect on children (and on adults to a certain extent). It represents the realization of your dream and your ideas. Finally, you see the story that you had in your mind, you can touch it, and you can take it with you and share it with your teachers, friends and family. For the teacher of LEP children, access to the use of computers should mean access to computer and printers. Computer games and drill and practice activities are far less effective because they do not have this third dimension, that of the hardcopy, which is only possible when using a printer.

Despite the relevance of these findings, continued research is deemed necessary in order to make generalizations to other LEP groups. Further research on the design of the design of a bilingual word processor with speech output, classroom management and the use of whole language and computerized speech with older illiterate students is also considered of particular interest.

### **Recommendations**

If we attempt to "graft" the computer onto the present institutions without major changes in teaching methods, teacher training and expectations, and administrative structure, then the power of these machines to help will be dissipated (Smith, 1982; in Robbat, p. 35, 1986).

In order to affect change in the way that computers are currently being used to educate LEP children, it is recommended that:

1. Quantitative research projects be undertaken on particular aspects of the impact of speech output and whole language in the second language literacy learning process.
2. Training or re-training of educators and school administrators be undertaken on issues related to second language methodologies, and in particular on the use of whole language as an effective instructional strategy for this population.
3. Training or re-training of educators school administrators be undertaken on issues related to equal access to education, and the potential of computer use in promoting the natural development of literacy in the LEP child.
4. Training or re-training of educators and school administrators be undertaken on a rationale for the use of computers in education, and in particular in the TBE and ESL classroom. This rationale would help ensure an understanding that the focus of computer use should be the student rather than on the machine, with the best setting being a computer learning environment (that is an integral learning approach).
5. Administrators as well as teachers, must also become familiar with the large number of software programs available and capable of distinguishing those which enhance the child's overall growth. For LEP students, and given today's market, the best choices are word processor and graphic programs, even if they have not been designed for this type of population. Word processing programs, such as Kidwriter and Talking Text Writer offer unlimited possibilities for the LEP child. Unfortunately, many software programs intended for LEP children are basically drill- and practice type

programs of a remediation nature. Authoring programs are also excellent resources if used to again promote learning based on the child's linguistic and cognitive knowledge.

6. Bilingual and ESL teachers should be able to use technology effectively and creatively. Therefore, there is a need to be informed of new advancements, such as the use of computerized speech. The results of the study strongly suggest the incorporation of computerized speech onto a computer learning environment for LEP students. Computerized speech is not recommended as a language model, but as a powerful learning tool.

7. The use of computers have a place in any curriculum, and so all teachers should consider the adoption of the technology. However, it seems that computers are making a special impact on language development, that is in the field of writing (if used without speech). In promoting the use of word processor programs, special emphasis should be placed on the effectiveness of long-distance networking capabilities. Networking systems, such as the Shore to Shore program (Technology Report, 1987, are effective means to enhance communication beyond the child's classroom, and promote cultural esteem and understanding. Bilingual, ESL and monolingual teachers of LEP students must become familiar with the networking systems currently in place and link their students to them.

## APPENDICES



APPENDIX A  
COURSEWARE EVALUATION FORMS

## COURSEWARE EVALUATION FORM

**Program:** KIDWRITER

**Manufactures:** Spinakker Software Co., 1984

**Cost:** \$45 (approximately)

**Availability:** Commodore 64, Commodore 128, Apple IIe, Apple IIc

**Printer Options:** Black and write only, Apple Scribe, Imagewriter, Imagewriter II,  
Epson and IBM

**Program Description:** Provides an original format for story writing and illustration. It lets children choose from 99 different characters and objects, and a variety of picture settings thus encouraging them to create their own stories. Children are also encouraged to write their stories using the program's word processing capabilities.

**Appropriate grade/age levels:** Elementary; ages 6-10.

**Technical Quality:**

- The program runs effectively; it is reliable.
- Sufficient information is given to operate the program.
- Program can be exited at any time.
- Frame display is effective.
- Program collects and stores data.
- Students can utilize the program easily.
- Programs can be an effective tool for teachers.

**Content Quality:**

- Content has clear instructional objectives.
- Content challenges learner.
- Content is free of stereotypes.

- Content designed to fit learner needs.
- Content matches objectives.

**Instructional Quality:**

- Attracts learner's attention.
- Learner is informed of program objective(s)
- Content is supported by examples.
- Special effects are embedded in content, i.e. color, size.
- Graphics enhance content.
- High degree of learner participation.

## COURSEWARE EVALUATION FORM

**Program:** TALKING TEXT WRITER

**Manufacturer:** Scholastic, 1986

**Cost:** \$100 (approximately)

**Availability:** Apple IIe with 128K or Apple IIIGS and Echo+ Speech Synthesizer or IIc with Cricket Speech Synthesizer

**Printer Options:** The program's Custom Option can configure Talking Text Writer to almost any printer.

**Program Description:** Talking Text Writer combines word processing with synthesized speech to help children learn to read and write. The program allows students to type any text and hear it spoken back to them. Using a developmental approach to learning that places an emphasis on motivating the students and providing support to early readers and writers, the Talking Text Writer fosters a sense of competence in the student and a feeling that he or she is in control of the learning process.

**Appropriate grade/age levels:** K-early elementary; ages 5-10.

**Technical Quality:**

- Program runs effectively; it is reliable.
- Sufficient information is given to operate the program.
- Program can be exited at any time.
- Instructions can be reviewed at any time.
- Frame display is effective.
- Program collects and stores data.
- Comprehensive support materials available.
- Students can utilize the program easily.



- Program can an effective tool for teachers.

### Content Quality:

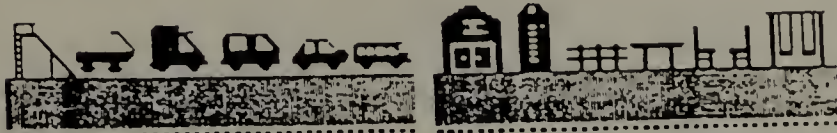
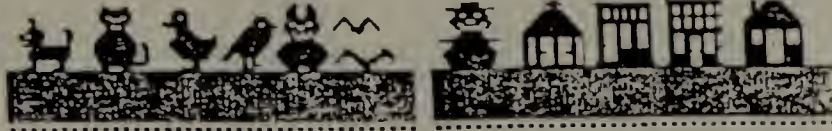
- Content has clear instructional objectives.
- Content challenges learner
- Content is free of stereotypes.
- Content designed to fit learner's needs.
- Content matches objectives.

### Instructional Quality:

- Attract's learner's attention.
- Places an emphasis on motivating the students.
- High degree of learner participation.
- Student can type any text and hear it spoken back to him.
- The program incorporates a dictionary capability, and the Fix Pronunciation function that allows to change the way the program pronounces any word.

**APPENDIX B**  
**KIDWRITER'S PROGRAM OBJECTS**

KIDWRITER PROGRAM OBJECTS



UVWXYZ



123456

CDEFGH

789

IJKLMN

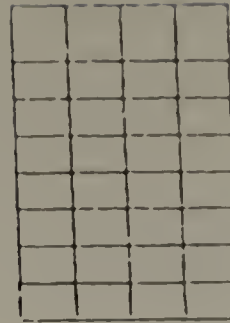
OPQRST

APPENDIX C  
OBSERVATION FORM





24. Trial and error responses.
25. L/I verbal or other tools for communicating adequately elaborated responses.
26. L/I need for precision and accuracy in the communication of one's responses.
27. Deficiency of visual transport.
28. Impulsive, random, unplanned behavior.



APPENDIX D  
DATA ANALYSIS FORM

INTEGRATING COMPUTERIZED SPEECH AND WHOLE LANGUAGE  
DATA ANALYSIS

Name:  
Age:  
Grade:  
Lau Category:

1. COMPUTER LEARNING ENVIRONMENT

A) The Cognitive Effects of Computer Learning Environments (Mandinach & Linn, 1986).

2. WHOLE LANGUAGE

A) Use of Word Processor (Newman, 1987-88).

B) Levels in Writing Development (Ferreiro & Teberoski, 1979).

C) Stages in Reading Development (Chall, 1988).

D) Development of English Skills; Language Experience Stories (Hudelson, 1984).

E) Incidental vs. Intentional Learning (Snow, 1987).



F) Contextualized/Decontextualized Use of Language (Snow, 1987).

G BICS/CALP, and Development of Literacy (Cummins, 1981; Thonis, 1981).

H) Potential for L1 Reading Skill Transfer to L2 (Thonis, 1981).

I) Criteria for Transitional Period (Thonis, 1981).

J) Language Development Path/Variables in the Development of L2 (Brisk, 1981).

K) The Application of L1 Literacy in the Acquisition of Literacy in L2 (Edelsky, 1986).

L) Oral stories. Characteristics: (1) Main idea, (2) details, (3) Logical sequence, (4) Logical Outcome, (5) title as it relates to story content, (6) # words in English and in Spanish, (7) child's predisposition.

Stories Summary:

M) Picture Stories with Kidwriter: (1) # of icons as they relate to overall story and time invested, (2) # of different icons, again as they relate to overall story and time invested, (3) three of modified icons as they relate to overall story and time invested, (4) Main idea, (5) details, (6) logical sequence, (7) logical outcome, (8) title as it relates to story content; (9) child's use of word processing capabilities, specially as they relate to the use of Talking Text Writer .

N) Attitude and Interest

O) Social Interaction

### 3. SPEECH OUTPUT

A) Modalities for Learning: General sequence: (1) tactile/the keyboard; (2) tactile with auditory/speech YA; (3) tactile, auditory, visual/printed page, short duration; (4) tactile, auditory, visual/monitor screen; and finally (5) tactile, auditory, visual/monitor screen, printed page. The more progress in literacy they achieved, the more important the two visual modes became. (Rosegrant, 1984).

B) Adult Interaction Measure: (1) Scaffolds, (2) Acknowledges, (3) Facilitates, (4) Informs and (5) Extends. Interfering Adult Behaviors: (1) Intrudes, (2) Withholds, (3) Evaluates and (4) Control. (Rosegrant, 1984).

C) Literacy Progress: Modalities of Child Behaviors for Progress Analysis (Rosegrant, 1984).

## Visual Analysis

### Direction

Left to right

Top to bottom

### Sequence

Follows letters in a word

Follows words in a sentence

Follows sentences in a paragraph

### Spacing

Spaces between words

### Matching

Matches letter on card to letter on keyboard

### Recognition

Finds letter on keyboard

Follows flashing words on screen

Follows letters and words on screen as typed

### Motor analysis

Types desired letters

Uses function keys (CTRL) with command keys

Positions cursor accurately

Deletes desired text (uses delete key)

## Auditory analysis

Recognizes letters and sounds

Experiments with letter combinations

Spells aloud familiar words

## Attitudes

Sense of competence as a reader/writer

Reaction to error

Interests in written language

Motivation to write

Motivation to read

## D) Child Behaviors for Progress Analysis: Literacy (Rosegrant, 1984).

## · Letters

Name of letters

Alphabetical order

Letter-sound relationship

Upper & lower case letters

## Words

Spelling

Sight vocabulary

Phonics or phonetics

## Spelling

Initial sounds

Long and short vowel

Recalls partial spelling of word

Uses minimal pairs in analysis

Phonetic spelling

Endings of words

Clusters and morphemes



Vocabulary	Phonic analysis/decoding
	Sight recall
	Comparisons
Print Conventions	Punctuation
	Spacing
	Directions
	Syntactical order
	Capitals
Composing	Story
	Audience
	Conventions and forms
	Expressive self
	Explores other functions of print
	Planning
	Revising
Reading	Keeps place on line
	Keeps place on page
	Reads with synthesizer
	Reads aloud

E) The Use of Speech Output (Rosegrant, 1986)

#### 4. THE ROLE OF THE TEACHER

A) Mediated Learning: Student/Researcher interaction, (Jensen, 1987): (1) Intentionality, (2) Transcendence, (3) Meaning, (4) Regulation of behavior, (5) Mediation of a Feeling of Competence, (6) Sharing, (7) Individulation/Psychological Differentiation, (8) Goal Seeking, Goal Setting and Goal Achievement, (9) Challenge and (10) Change.

B) Relationship between task and performance, (Jensen, 1987) (1) Input phase, (2) Elaboration phase and (3) output phase.

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