Computer assisted language activities: Are they all the same?

Lynn Denise David

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COMPUTER ASSISTED LANGUAGE LEARNING ACTIVITIES:
ARE THEY ALL THE SAME?

A Project
Presented to the
Faculty of
California State University,
San Bernardino

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts
in
Education:
Bilingual/Cross-cultural Option

by
Lynn Denise David

December 2000
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ARE THEY ALL THE SAME?

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Approved by:

Dr. Nena Tórrez, First Reader

Dr. Kenneth Johns, Second Reader
ABSTRACT

Various computer assisted language learning (CALL) researchers have suggested that computer programs have potential for stimulating conversation among pairs or groups of learners which could enhance the development of second language communicative competence. However, initial studies of the actual talk generated by the computer has shown the discourse to be limited in quantity and complexity. One possible explanation for these findings is the lack of open-endedness in the programs used. This study examines English language learners working in pairs on two different types of computer programs (1) to determine whether the quantity and quality of discourse varies with the type of software program, and (2) to investigate how collaborative CALL activities can be designed to promote oral academic language proficiency.

Subjects were selected from an intact first grade classroom. Spanish-speaking English language learners were paired with English-only students to form three dyads. Each dyad worked for 15 to 25 minutes on Picture Phonics, a drill and practice software program, and Kid Pix, an authoring program. The subjects' discourse was transcribed.
and divided into acts, which were then assigned to functional categories.

The talk was compared across programs with respect to the quantity and quality of talk. Discourse elicited by the two programs was surprisingly similar except in frequency of repeating, managing strategies for accomplishing tasks, and showing concern for language form. The findings of the study indicate that CALL has limited potential for developing oral communicative competence in elementary-aged students. However, the discourse generated during this investigation suggests that collaborative activities around the computer are not wasted social interactions as teachers strive to develop communicative competence as well as computer literacy for children living in a technological society.
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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>iii</td>
</tr>
<tr>
<td>ACKNOWLEDGMENTS</td>
<td>v</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>viii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>ix</td>
</tr>
<tr>
<td>CHAPTER ONE: INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Background to the Study</td>
<td>3</td>
</tr>
<tr>
<td>The Problem</td>
<td>7</td>
</tr>
<tr>
<td>Statement of the Problem</td>
<td>10</td>
</tr>
<tr>
<td>Research Question</td>
<td>10</td>
</tr>
<tr>
<td>Definition of Terms</td>
<td>11</td>
</tr>
<tr>
<td>Theoretical Framework</td>
<td>12</td>
</tr>
<tr>
<td>CHAPTER TWO: REVIEW OF RELATED LITERATURE</td>
<td>20</td>
</tr>
<tr>
<td>Early Studies</td>
<td>21</td>
</tr>
<tr>
<td>Recent Studies</td>
<td>24</td>
</tr>
<tr>
<td>Summary of Review</td>
<td>35</td>
</tr>
<tr>
<td>CHAPTER THREE: DESIGN AND METHODOLOGY</td>
<td>37</td>
</tr>
<tr>
<td>Design</td>
<td>37</td>
</tr>
<tr>
<td>Data Needed</td>
<td>37</td>
</tr>
<tr>
<td>Subjects</td>
<td>38</td>
</tr>
<tr>
<td>Methodology</td>
<td>39</td>
</tr>
<tr>
<td>Data Collection</td>
<td>41</td>
</tr>
<tr>
<td>Type of Analysis</td>
<td>42</td>
</tr>
<tr>
<td>Chapter/Section</td>
<td>Topic</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>CHAPTER FOUR:</td>
<td>Quantity of Talk</td>
</tr>
<tr>
<td></td>
<td>Quality of Talk</td>
</tr>
<tr>
<td></td>
<td>DATA ANALYSIS AND RESULTS</td>
</tr>
<tr>
<td></td>
<td>Quantity of Talk</td>
</tr>
<tr>
<td></td>
<td>Quality of Talk</td>
</tr>
<tr>
<td></td>
<td>Length of Turn</td>
</tr>
<tr>
<td></td>
<td>Types of Language Functions</td>
</tr>
<tr>
<td></td>
<td>Frequency of Negotiation</td>
</tr>
<tr>
<td>CHAPTER FIVE:</td>
<td>CONCLUSION</td>
</tr>
<tr>
<td>REFERENCES</td>
<td></td>
</tr>
</tbody>
</table>
LIST OF TABLES

Table 1. Average Number of Words Per Minute (wpm) of Talk ................. 47

Table 2. Average Length of Turn for All Dyads ............. 52

Table 3. Average Number of Acts Per Minute ............... 57
LIST OF FIGURES

Figure 1. Words Per Turn for All Dyads ................ 55
CHAPTER 1
INTRODUCTION

The purpose of this study is to determine the potential for using computers to promote the development of oral English language proficiency of elementary school-aged students of Spanish-speaking origin. The study will examine the role of computers and software in creating a language rich environment by evaluating the quantity and quality of discourse between partners as they collaborate to complete tasks on two different types of software programs. It is assumed that, if found effective, teachers could adopt collaborative computer assisted language learning (CALL) activities as an additional tool to promote English language learners' (ELL) appropriation of academic language.

The 1990 U.S. census indicates that the Hispanic population increased by 53% in the last decade. It is predicted that by the year 2000 the Hispanic school population will increase to an average of 35% nationwide (Oxford-Carpenter, et al., 1984). Some southwestern states have even higher concentrations of Hispanic students in their schools. While it is true that not all Hispanic students entering schools are limited English proficient, it would be safe to assume that such growth in the Hispanic
school population will significantly increase the number of ELLs enrolled in the nation’s schools.

Although teaching English skills to ELLs has always been a primary goal of teachers working with this group of students, the recent passage of Proposition 227 puts new pressure on California teachers to ensure that their students gain proficiency in English as rapidly as possible. The text of the new law specifies that students with limited English proficiency should be placed in structured English immersion classrooms “for a period not normally to exceed one year” (California Education Code, §11300). Teachers now have just 180 school days to help their ELL students acquire what would be described as “a good working knowledge of English” or “reasonable fluency in English” as measured by state-designated language proficiency tests (California Education Code, §11301a). The approved proficiency assessments generally limit assessment to oral English skills, although the Language Assessment Scales (LAS) also include a reading and writing component for students seven years of age or older. The State Board of Education, school administrators, and the supporters of the new law expect that in one year’s time teachers will be able to develop a level of English proficiency in their ELL students that will enable them to compete with native English-speakers in a mainstream classroom. In light of
this expectation, teachers must utilize all tools and teaching strategies which will help ELL students gain the communicative skills that are necessary to be as successful as their English-speaking peers.

Background to the Study

Over the years various perspectives about the best and most effective way to teach a second language have been presented. According to Backer (1995) the most popular perspectives are the behaviorist perspective, the innatist perspective, and the interactionist perspective.

Peregoy and Boyle (1997) note that behaviorist perspectives of language acquisition presented by researchers such as Skinner in the 1950s continue to influence second language instruction in many classrooms today. The audiolingual method, which first became popular in the 1960s, is based on the belief that language is learned through imitation, repetition, and reinforcement of grammatical structures. Based on the assumption that students learn to listen and speak before they learn to read and write, behaviorists ask students to echo increasingly difficult words and sentences in a drill and practice format. Lessons based on the audiolingual method may be presented by a teacher, an audiotape, or a computer program.
Chomsky, whose research revolutionized the field of linguistics, argued that behaviorist theories could not adequately explain the development of children’s grammar in their first language. Chomsky believed that language learning could only be accounted for by an innate biological language acquisition device (LAD) which allows children to invent the rules of grammar themselves by listening to and analyzing the language around them to determine the patterns that exist. Ultimately, children create and edit their grammar to the point that it matches the language around them.

The innatist theory suggests that the LAD allows second language learners to acquire a new language the same way a first language is learned. Innatists posit that second language learners go through predictable phases where certain grammar rules and structures are acquired by forming hypotheses which are tested through actual language usage.

Many second language programs changed dramatically in the 1980s as the innatist perspective of Stephen Krashen gained popularity among classroom teachers (Lessow-Hurley, 1996). Krashen developed a set of five hypotheses which suggest that (a) language is acquired rather than learned, (b) acquisition takes time, (c) language is acquired in a predictable order, (d) language is best acquired when input
is slightly above the learner's current level, and (e) the learning environment must be low-anxiety to minimize affective barriers (Peregoy & Boyle, 1997). In a summarization of the five hypotheses Krashen (1981, p. 62) asserts, "People acquire second languages when they obtain comprehensible input and when their affective filters are low enough to allow the input in [to the language acquisition device]." According to Krashen, listening to and understanding spoken language is the crucial element in second language acquisition because it allows learners to construct grammar rules.

Like the innatist perspective, the interactionist perspective acknowledges the importance of comprehensible input. However, the interactionist perspective recognizes the critical role more experienced language users play in language acquisition by modifying their speech to assist learners in communication. Halliday (1975) believes that social interactions provide opportunities for "learning how to mean." As language learners experience the variety of functions and forms of language through authentic discourse, they internalize the way society uses language to represent meaning. Goodman and Goodman (1990) summarize Halliday's theory of language development by stating, "the very form that language takes derives from the fact that it is used socially and that, through its use, language users,
including children, create and learn the language conventions or social rules of language to make communication easy and effective. Viewed from this perspective, the belief that language forms and grammar structures must be taught as a prerequisite to their use is erroneous.

Studying second language acquisition, Long and Porter (1985) note that it is the communicative give-and-take which occurs during natural conversations between native-speakers and language learners that is the crucial element in the language acquisition process. Meaning is constantly negotiated as language learners ask for repetitions or respond in a way that indicates that they do not understand. In response the conversational partner modifies his or her cues and speech in order to be understood. The interactionist perspective acknowledges the role of the learner and the social environment in the language acquisition process.

Before the technology boom of the 1980s audio-visual language labs were a major component of many second language programs for students of varying ages. Backer (1995) notes that these labs were based on the behaviorist assumption that language learning could be broken down into discrete units which could be mastered through drill and practice. Technological advances and increased knowledge
about computer programming sparked interest in creating computer programs to teach language competencies. The earliest attempts to employ computers in language labs occurred at large universities in the late 1950s where, utilizing the behaviorist perspective, computer programs provided electronic drills of grammar structures. Phillips (1986) and Rivers (1981) observed that several decades later much of the CALL materials available are still based on behaviorist psychology, and drill and practice methodologies. Motivated by data that suggest achievement gains can be attained in the areas of reading and math when computer-assisted instruction (CAI) is employed, various educators and researchers in second language acquisition (SLA) have focused their attention on CALL to determine whether computers can increase the language proficiencies of second language learners.

The Problem

According to the U.S. Government’s Office of Technological Assessment (OTA), the percentage of American schools with one or more computers for instructional purposes grew from 18% to 95% between 1981 and 1987. There are now between 1.2 and 1.7 million computers in American public schools (“Power On!,” 1988). As a result of the widespread availability of modern personal computers in schools, and the multimedia capabilities of CD-ROMs,
teachers and researchers have continued to experiment with computers for teaching second language competencies to students (Chapelle, 1997). Johnson (1985) notes that providing English language learners with access to computers is an important issue "not only because certain uses of computers may be found to enhance certain kinds of cognitive, social, and language development, but also because the need and opportunities to use them as tools at higher levels of education, in the work place, and in the home are continually increasing" (p. 6).

Enthusiasm for using CAI with English language learners is largely based on the numerous studies (Kulik, Bangert, & Williams, 1983; Kulik, Kulik, & Cohen, 1980; Otto, 1981; Underwood, 1984) which have been conducted to assess the effects of computer assisted instruction on the attitudes and academic achievement gains of native English speakers. The limited quantity of data (Chapelle & Jamieson, 1983; Kleinmann, 1987) documenting the effectiveness of computers to create gains in reading and writing proficiencies when CAI activities were included in the high school or adult second language instructional program is also used as a rationalization for the practice of using CALL to teach second language competencies. Dunkel (1990) notes that the number of studies examining the effect of CALL for English language learners,
especially elementary-aged students, is meager at best which is problematic because of the increasing prevalence of personal computers in schools which are used for instructional purposes.

In comparative syntheses of CAI and CALL research Chapelle (1997), Dunkel (1991), and Pederson (1987) propose a move away from technocentric investigations of CAI which have a tendency to give a centrality to a technical object such as a computer. They challenge researchers to conduct studies which will provide a better understanding of the psycholinguistic process involved in working with CAI or CALL, and the way in which the medium can be used to enhance knowledge construction and second language acquisition. Determining the potential for using computers to increase the oral language proficiency of ELLs is an important issue for several reasons. First, unless student performance and skills improve, some may perceive that the money invested in microcomputer hardware and software for use by ELLs has been wasted. Second, and most importantly, an increased understanding of the role software plays as a mediational tool for generating discourse between students will help teachers to organize computer activities which maximize language learning opportunities through meaningful dialogues.
Statement of the Problem

At this time teachers do not know if computer assisted language learning activities are an effective tool for the development of oral English language proficiency in elementary school-aged students of Spanish-speaking origin. Furthermore, it is not clear which types of software programs are most beneficial for engendering conversation between pairs of students working on the computer.

Research Question

There can be no doubt that even the youngest students in school are capable of using computers with surprising skill, and that they find the experience quite enjoyable. However, as a result of the limited quantity of research which addresses the use of CAI and CALL with young ELLs, it is difficult to know if it can be an effective tool for promoting oral English language proficiency. This research project will focus on the following research questions:

1) Does the quantity and quality of discourse between pairs of students vary with the type of software program?

2) How can collaborative computer assisted language learning (CALL) activities be designed to promote the development of oral academic language proficiency?
Definition of Terms

English language learner (ELL): The categorization for students whose home language is not English, and who enter the formal education process with a continuum of English proficiency from very little English ability to a high level of English ability. The California Department of Education (1989) defines English language learners as "students for whom there is a report of a primary language other than English on the state-approved 'Home Language Survey' and who, on the basis of the state-approved oral language (grades K-12) assessment procedures and including literacy (3-12 only), have been determined to lack the clearly defined English language skills of listening comprehension, speaking, reading, and writing necessary to succeed in the school's regular instructional programs."

Computer assisted instruction (CAI): The use of computer hardware and software to help students learn academic skills related to any area of instruction.

Computer assisted language learning (CALL): The use of computer hardware and software used as tutors and tools to help students learn a second language. Various types of multimedia software developed for language development, authoring tools, e-mail, and the Internet may be used as CALL materials.
English oral proficiency: The ability to communicate in English by listening and speaking. For the purposes of this study, a student can be said to have limited English proficiency if he or she receives a scaled score on the Pre-LAS below level 4 during initial student identification testing, does not have a score of 4 or 5 in all subscales of the SOLOM, and/or cannot perform academic tasks in English in a mainstream classroom at the same level as his or her fluent English peers.

Theoretical Framework

This research project will be based on a combination of theoretical approaches which view interaction as being a factor in both learning and teaching. Specifically, Sociocultural theories of learning and Krashen’s innatist perspective of language development will be used to analyze the potential of computer software in developing oral English language proficiency.

Sociocultural perspectives of learning are rooted in Vygotsky’s belief that children are not merely recipients or objects of the educational process, but are active agents who elaborate and create meaning through social interactions. Vygotsky claimed that "every function in the child’s cultural development appears twice, on two levels: first on the social and later on the psychological level—first between people as an interpsychological category and
then inside the child as an intrapsychological category” (1978, p. 128). The process through which knowledge is transferred from the shared, social level to the individual, intrapersonal level is known as “internalization.” Litowitz (1993, p. 185) identifies three distinguishing characteristics to the process of internalization: “(1) cultural knowledge is transferred not from one person (adult) to another (child) but from two persons (the dyad) to one (the child); (2) the transmission is accomplished through semiotic means; and (3) the nonknower demonstrates equality in the dyad by becoming equally responsible for solving problems and accomplishing tasks.” Social institutions such as schools systematically structure the interactions that occur between people, or between people and cultural artifacts. Therefore, according to the Sociocultural perspective, an investigation of the process of internalization must include an examination of the social context in which the interaction occurs.

The interaction that leads to internalization occurs within the zone of proximal development (ZPD). The ZPD can be defined as “the difference between what the child can do on her own and that which she can do in collaboration with a more knowledgeable other” (Vygotsky, 1978 in Litowitz, 1993, p. 185). Speech, as a tool of mediation within the
ZPD has been acknowledged as a primary mechanism of developmental change. Vygotsky believed that speech as internalized social mediation changes more than content because it creates new processes and new forms of thinking. In his writings about social, egocentric, and inner speech, Vygotsky proposed that speech is the mechanism by which the nonknower becomes the knower. Specifically, as a child internalizes the speech of the more competent partner who structures the task, the child becomes the one who speaks in that manner. As a member of a dyad or group in the classroom setting, children participate in discourse that is qualitatively different from everyday discourse because it represents an organized system of knowledge. Through participation in academic activities that are mediated by language, knowledge is constructed about culturally defined ways of "schooled" speaking, thinking, and acting. In order to understand how discourse contributes to children's construction of academic knowledge, it is important to study the discourse that occurs in classrooms.

Research related to CAI and CALL has historically focused on the outcome or "effectiveness" of such practices to achieve academic gains, rather than on the process of knowledge construction. The disappointing results achieved in studies which focused on the results of a single user interacting with a computer inspired researchers (Chapelle,
1997; Dunkel, 1991) to acknowledge the need for a new research paradigm. Several researchers (Salaberry, 1999; Warschauer, 1998) propose that CALL research be conducted from the Sociocultural perspective.

The Sociocultural perspective provides a framework through which to investigate the social as well as the cognitive impact of using computers and software for second language teaching/learning. It is essential to consider how computer-mediated language and literacy practices are shaped by the broader institutional and social factors because the effects of computers depend on the social and educational context in which they are embedded. Warschauer (1998) likens the interrelationship between computer technology and language learning to the social effect of the invention of the printing press on Europe. He says, “I would suggest that 50 years after the computer was invented we do not have old language learning plus the computer, but we have a different language learning” (p.760). This is an important point because literacy in a technological society includes knowing how to communicate with computers as well as with traditional means such as speaking, reading, and writing. Certain types of CALL activities have the potential to develop the interrelated goals of second language learning and computer literacy.
One of Vygotsky's (1978) leading principles— that every function in a child's cultural development appears twice: first on the social level and then on the individual level—provides a framework for understanding how CALL activities might be used to promote ELLs' development of oral language proficiency. Rather than structuring activities in which the computer software is used as a tool of transmission, the computer software can be used to create a ZPD for ELLs where knowledge about language is constructed through collaborative activities. Collaborative CALL activities can create a social context in which ELLs participate meaningfully in a community of learning, and receive a range of assistance which allows them to participate at a level that they are not currently capable of without mediation. As ELLs appropriate knowledge about culturally defined language and literacy practices, they will assume more responsibility for participation in CALL tasks. The object of CALL activities in SLA contexts is, quite obviously, the development of second language competencies which allow full participation in academic situations.

The ability to participate equally in academic endeavors depends on students' ability to select and use appropriate semiotic devices such as speech registers. Halliday (1975, p. 65 in Forman & McPhail, 1993) defined
register as "a set of meanings that is appropriate to a particular function of language together with the words and structures which express these meanings." CALL activities can provide educators with an appropriate context in which learners must use academic registers in a meaningful fashion in order to accomplish mutual academic goals. The internalization of academic speech registers by language learners requires multiple opportunities for practice with a more knowledgeable target language partner. Cooperatively structured computer activities have the potential to provide a viable context for stimulating quality, academic discourse between students.

While this project relies most heavily on the Sociocultural perspective, it will acknowledge the importance of Krashen's innatist perspective, and will examine the ways in which computer software can contribute to creating an environment in which second language acquisition can take place. In contrast to early attempts at using computer software to teach language skills as a series of grammar rules and thematic vocabulary in a predetermined time frame, this study accepts that language is acquired over time when students are provided with comprehensible input. Krashen (1981) calls comprehensible input that which contains a message in a meaningful context.
Providing second language (L2) learners with comprehensible input that is slightly beyond their current level of proficiency is a key element of Krashen’s Input Hypothesis. Comprehensible second language input which leads to language acquisition is characterized as language which the L2 acquirer already knows, (i), plus a range of new language, (i+1), which is made comprehensible in a formal schooling context by the use of certain planned strategies. Computer software is seen as a valuable strategy in creating the context in which meaningful dialogues between students can take place.

Krashen’s Affective Filter Hypothesis addresses three affective or socio-emotional variables related to L2 acquisition: (a) anxiety, (b) motivation, and (c) self-confidence. The affective filter determines how effective the comprehensible input will be. A situation which minimizes anxiety, and maximizes student motivation and self-confidence will allow learners to fully utilize input to acquire the second language. Dunkel (1991) notes “the Florida Department of Education report (1980) and the series of studies conducted by Kulik and colleagues (Kulik, Bangert & William, 1983; Kulik & Kulik, 1986, 1987) all suggest that students hold positive attitudes toward using computers.” Opportunities to work with computers and
software will give ELLs opportunities to acquire language in high-motivation, low-anxiety situations.

The reality of living in a technological society with an increasing ELL school population has magnified the need for CALL research. Descriptive studies conducted from perspectives which acknowledge the social nature of language learning will help educators understand how CALL activities influence knowledge construction by ELLs. The findings of such studies can be utilized to evaluate one of the increasingly common socio-educational language learning contexts that ELLs experience.
CHAPTER 2
REVIEW OF RELATED LITERATURE

Inspired by data that suggest achievement gains can be obtained in the areas of reading and math when computer assisted instruction (CAI) is included as part of the instructional program, educators and researchers interested in second language acquisition began to experiment with CAI for the purpose of increasing language proficiencies. For several decades researchers have been asking whether or not CAI, and more specifically computer assisted language learning (CALL), is an effective teaching tool for English language learners (ELLs) of various ages. The question has most often been addressed by comparing pretest and posttest scores of two groups of students: those who received at least a portion of their instruction via technology, and those who did not. In the last decade some researchers abandoned a technocentric focus to CALL studies. Instead, they began to ask what cognitive/affective factors influence CALL effectiveness, and what impact materials selection plays on second language acquisition. Through a review of early and recent literature it will become evident that the studies have not provided conclusive results about the effectiveness of CALL for second language learners of any age level. Unfortunately, at this time teachers do not know if CALL activities are an effective
tool for developing oral English language proficiency in elementary-aged ELLs of Spanish-speaking origin.

Early Studies

Some of the earliest studies to specifically address the value of computers for teaching skills to elementary-aged ELLs evaluated achievement gains made by students in reading. Following a meta-analytic review of 28 studies which assessed results from reading achievement examinations, Kulik, Kulik, and Bangert-Drowns (1985) concluded that students from CAI classes had better scores in tests covering course content than students who received instruction through conventional methods. Furthermore, they concluded that CAI has the strongest achievement effects at the elementary level.

Saracho (1982) reported that the elementary-aged ELLs who participated in the CAI program had greater achievement gains in reading, language, and math on the Comprehensive Tests of Basic Skills (CTBS) at the end of one year than the ELLs who participated in only the regular classroom program. Saracho's study involved 256 third- through sixth-grade Spanish-speaking migrant children. The 128 students in the control group used various drill and practice CAI programs which focused on basic skills as a supplement to their classroom instruction for a total of 60 hours during the academic year. Saracho concluded that CAI
is an effective tool for elementary-aged ELLs when used as a supplement to the regular classroom program, but noted that the results obtained may be due to the additional practice rather than the inclusion of CAI in the instructional program.

In the introduction of his article, Kleinmann (1987) claimed that, "almost no work has been published on the effect of CAI on the reading achievement of ESL learners, and the research that does exist is either incomplete or flawed" (p.268). To document his position, Kleinmann specifically discounted Saracho's finding because of the possibility that the achievement gains could have been attributed to the additional 60 hours of practice rather than the CAI.

Kleinmann's motivation for the study was to determine the impact of CAI on English reading instruction for 76 college-aged ELLs, while avoiding the research errors he claimed others had made. The participants in the study were divided into three treatment group classes, and three control group classes. Each instructor taught one treatment group and one control group. All 76 participants received two hours per week of reading instruction in a lecture format. The treatment groups spent one hour each week in the reading lab working on CAI reading materials. The control groups also spent an hour each week in the
reading lab, but received individualized instruction from the instructor and an aide. Kleinmann converted pretest and posttest raw scores to scaled scores on the Descriptive Tests of Language Skills (DTLS) Reading Comprehension Test in order to compare results on different forms of the test. Kleinmann refutes the findings of other researchers with his conclusion that instructional programs which include CAI do not appear to be more effective than similarly structured instructional programs which lack a CAI component.

Various researchers have attempted to consider the effect of other factors on the effectiveness of CAI and CALL. Chapelle and Jamieson (1986) assert that CALL effectiveness cannot be judged without entering other variables, such as cognitive/affective characteristics, into the equation. Using a sample of 48 Arabic- and Spanish-speaking college students, Chapelle and Jamieson examined the role of field independence/dependence, ambiguity tolerance, motivational intensity, English class anxiety, attitude toward CALL, time spent using CALL, and English proficiency on the use and effectiveness of CALL for the purpose of English language acquisition.

Using Pearson product-moment correlations and multiple regression analysis, Chapelle and Jamieson concluded that field dependence/independence was the sole predictor of the
time spent on CALL. Students who were not field
independent, those who approached problems in a global way,
showed a marked preference for computer learning. They
further concluded that the amount of time spent on CALL was
not a significant predictor of ESL gains, and that the most
successful learners were those whose method of instruction
most closely matched their affective and cognitive styles.
Although the results of this study are based on adult
learners, the importance of matching methods of instruction
to students' affective and cognitive learning styles cannot
be overlooked when considering the use of CALL with young
ELLs.

Recent Studies

Soska (1994) asserts that many students find schools
to be dull in comparison to the multisensory world they are
exposed to outside the school because many teachers rely on
the same instructional methods and strategies that were
employed in the 1920s. Although Soska admits that the
effectiveness of CAI is influenced by many factors, he is
convinced that technological advances made in the last
decade will encourage and enable ELLs to take a more active
and responsible part in their learning. He notes, in
particular, the value of CD-ROMs which contextualize
dictionaries, encyclopedias, and interactive books by
presenting them in a multimedia format. Soska is
especially enthusiastic about the listening and speaking opportunities presented by CD-ROMs with digital audio which allow students to listen to a word or phrase, then record and play back their speech. He contends that ELLs can benefit from this feature because they can experiment with listening skills and pronunciation in a non-threatening environment. In spite of his enthusiasm, Soska is a realist who perceives CALL as a tool that encourages active learning, rather than a panacea for meeting ELLs needs.

Dunkel (1991) synthesizes and discusses the research base on CALL in order to provide a view of how researchers have examined the issue of CALL effectiveness, which she defines as improved second language acquisition. Dunkel observes that some researchers (Congressional Office of Technology Assessment, 1987; Johnson, 1985) have used Orlansky's (1983) study, which documented a 30% savings in time needed for military personnel to learn course content when CAI was used, as a rationale for studying the effectiveness of CALL for ELLs in terms of time. Dunkel notes that other researchers (Crosby, 1983; Edwards, Norton, Taylor, Weis, & Dusseldorp, 1975; Okey, 1985) have focused on the effect of using CALL as a supplement to, as opposed to a replacement for, teacher directed lessons. She observes that study of this particular issue has decreased over time because results have led to the rejection of the
idea that CALL can serve as the sole method of instruction for students of any age. Following her evaluation of literature related to the time-saving element of CALL, Dunkel concludes that tutorial and drill and practice CALL materials may be useful, timesaving tools for teaching grammar, but teacher-led classroom activities are still preferable for engendering communication.

Evans (1996) recorded the discourse of a linguistically diverse group of college-aged ELLs as they worked on one CALL and one non-CALL task, then analyzed and evaluated the nature of the discourse that was generated. Both tasks generated a similar amount of repetitions, 13% for the non-CALL task and 12% for the CALL task. The number of turns speakers took was also equal for the two tasks. However, Evans found that the length of turns was greater in the non-CALL task (5.9 words per turn) than in the CALL task (4 words per turn). Her data suggest that CALL is not an effective tool for promoting communicative competence. However, she still endorses the use of computers for language learning based on students' enthusiasm for CALL.

In a similar study, Abraham and Liou (1991) analyzed the discourse generated by three different types of computer programs as pairs of ESL students worked on the computer. They sought to better understand the
disappointing results of prior studies (Higgins & Johns, 1994; Sanders & Kenner, 1983; Underwood, 1984; Wyatt, 1984) which sought to investigate the potential of computer assisted instruction (CAI) for enhancing second language communicative competence. Abraham and Liou theorized that the impoverished language used by subjects was related to lesson characteristics. Abraham and Liou sought (a) to determine whether the quantity and quality of talk varied with the type of program, (b) to compare the talk generated in the investigation with that found in Piper’s (1986) computer-talk study, and (c) to compare the computer-talk in the study with non-computer-generated, small group talk reported by other researchers.

The six subjects in the study were adult English as a second language (ESL) students enrolled in the intermediate to advanced level of the Intensive English and Orientation Program at Iowa State University. English proficiency levels were determined by TOEFL scores. The volunteers were from diverse language and cultural backgrounds, and were paired as follows: a Brazilian female and an Egyptian male; a Japanese female and a Mandarin-speaking Chinese female; and a Malaysian male and a Japanese female.

Abraham and Liou selected the programs used in the investigation based on the results of a pilot study which sought to identify three computer programs which differed
in content and approach, yet elicited considerable discussion. The three programs selected for use in the main study were: (1) Articles (Lam, 1983), a drill and practice lesson with immediate feedback; (2) Eliza (Cherry, 1982), a version of "free" communication in which the computer carries on dialogue with the user for as long as the user wishes to continue; and (3) Lemonade Stand (1979), a problem-solving simulation in which the computer asks the user to make decisions about operating a lemonade stand.

Various indicators of quantity and quality were examined in analyzing recorded and transcribed data. The average number of words per minute spoken by pairs was used as the indicator for quantity of talk. The indicators of quality of talk included: (1) turn length; (2) types of language functions used; (3) average length of utterance representing a single function, and (4) frequency of negotiation. In order to analyze the types of language functions used, Abraham and Liou modified a scheme proposed by Long, Adams, McLean, and Castaños (1976) in which coded discourse "acts" are assigned to one of eight categories. When evaluating the data, longer turn lengths and greater frequency in the negotiation of meaning were presumed to have greater value from the standpoint of augmenting communicative practice. Furthermore, a greater number of "high-level" language functions, such as
managing/negotiation, decision making, and evaluation, were viewed as more conducive to the development of communicative competence.

Abraham and Liou found fewer differences than expected in the comparison of talk elicited by the three computer programs. Analysis of words per minute, turns per minute, words per turn, and words per act indicated relatively small differences between the programs. However, differences were apparent in several language function categories: "repeating," "managing mechanical aspects of tasks," "responding," and "showing concern for language form."

Articles, the drill and practice program, had the highest number of low-level acts of "repeating," which the researchers attributed to the need to read the stimulus response questions and repeat information for the typist. Eliza also had a high number of acts of "repeating" because subjects read and reread the screen displays, and repeated responses for the benefit of the typist. Although Eliza is a free-response program, it was the least effective in eliciting acts of "responding." Abraham and Liou attributed this finding to the fact that the program leaves the choice of topic and direction of conversation entirely to the users, who often had difficulty in deciding what to say in spite of the support provided by the researcher.
Lemonade Stand had the highest number of acts in "managing," was lowest in "concern for language form," and, most importantly, had the fewest number of acts of "repeating." Abraham and Liou noted that subjects quickly took the information they needed from the screen, and moved on to higher-level functions, such as discussing strategies for proceeding with the task. Although the talk generated by Lemonade Stand was related to the topic of running a lemonade stand, the researchers concluded that the program provided the best practice for fostering communicative competence.

The results of the study demonstrate that the characteristics of the computer software affect the topics of discussion and the language functions used. Abraham and Liou concluded that carefully selected CAI/CALL materials can be used to elicit reasonably complex discourse between pairs.

González-Edfelt (1990) proposes that the limitations of CAI and CALL documented by other researchers (Male, Johnson, Johnson, & Anderson, 1986) are a function of the structure of the activity setting, rather than the activity itself. González-Edfelt cites various studies (Dickson & Vereen, 1983; Hawkins, Sheingold, Gearhart & Berger, 1982; Okey & Majer, 1976) which indicate that limitations such as social isolation, and lack of oral explanation and
elaboration of information disappear if computers are used within a cooperative learning setting.

In an effort to provide evidence of the way in which computer activities promote oral discourse, González-Edfelt conducted a study which focused on the discourse produced by various pairings of fifth-grade non-English proficient (NEP), limited-English proficient (LEP), fluent-English proficient (FEP), and monolingual-English (ME) students as they worked collaboratively on The Oregon Trail, a problem-solving software application. In a quantitative analysis of the text indicators, or oral language, produced by the dyads, González-Edfelt identified a general dyadic pattern of behavior that demonstrated the greatest number of text indicators occur when NEP students are paired with FEP students. A significant number of text indicators were also produced when NEP students were paired with ME or LEP students. She attributes the pattern to the fact that the NEP students are the ones that need the most assistance to complete tasks in English.

A qualitative analysis of the results revealed that the students engaged in a great deal of collaborative behavior in order to complete the task. The more proficient member of the dyad adopted the role of the tutor, producing comprehension checks, explanations, and translations, while the less proficient member of the dyad
adopted the role of tutee by requesting help and explanations about the meaning of the text on the screen. González-Edfelt concluded that appropriately structured CALL activities have the potential to create a social context which allows ELLs to participate meaningfully in classroom discourse, and construct knowledge about academic language.

Recently, as a result of technological advances and the widespread use of electronic communication, such as networked computers and online services, interest has grown in the way computer-mediated communication (CMC) can be utilized for SLA. Various studies have demonstrated positive quantitative and qualitative results when collaborative ZPDs were constructed through CMC.

Chapelle (1998) proposes that the nature of certain types of CALL activities provide researchers with built-in data-collecting capabilities which can document learners’ interactions as they engage in learning activities. She states that “negotiation of meaning needs to be seen not only in the face-to-face spoken conversations, but also in written communication that occurs over networked computers” (p. 754). To support her argument Chapelle provides the following excerpt of an online discussion to illustrate how adult ESL students negotiated to create a shared meaning for two unknown words:
<table>
<thead>
<tr>
<th>Move</th>
<th>Participant</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Instructor</td>
<td>What do you think about sustaining life artificially?</td>
</tr>
<tr>
<td>2</td>
<td>S1</td>
<td>What is sustaining artificially? Anyone answer me?</td>
</tr>
<tr>
<td>3</td>
<td>S2</td>
<td>What's that?</td>
</tr>
<tr>
<td>4</td>
<td>S3</td>
<td>Artificially support someone’s life.</td>
</tr>
<tr>
<td>5</td>
<td>S4</td>
<td>Don’t you understand artificially?</td>
</tr>
<tr>
<td>6</td>
<td>S3</td>
<td>For example using machines.</td>
</tr>
</tbody>
</table>


The networked computers provided a collaborative ZPD in which student 3 was able to mediate and create knowledge about the words “sustain” and “artificially” so that students 1, 2, and 4 could participate meaningfully in the discussion. Chapelle concludes that one of the greatest prospects for CALL is using networked computers and online discussions to organize social contexts in which computers create opportunities for language learners to be apprenticed by more experienced speakers so that they become proficient users of academic discourse.
Sproul and Kiesler (1991, in Warschauer, 1997) found that electronic discussion groups comprised of people of different status show approximately twice as much equality of participation as face-to-face discussions. Several studies (Kern, 1995; Kelm, 1992, in Warschauer, 1997) conducted with learners of French and Portuguese found that although some students refused to participate in person, every student participated online. Warschauer (1996, in Warschauer, 1997) also observed that CMC creates twice as much equity in the participation of adult ESL students in small group discussions because silent students participated online. Increased participation in discussions, regardless of personality type or status, is one of the most frequent and most significant findings in CMC research analyzed from the Sociocultural perspective.

Perhaps of more importance than the quantity of talk produced by CMC, is the quality of the talk. Warschauer (1996, in Warschauer, 1997) found that the language students used during online discourse was lexically and syntactically more complex than face-to-face talk. Chun (1994, in Warschauer, 1997) found that electronically mediated discourse covered a wider range of communicative and discourse functions than normal classroom discussions. Based on the results of her study, Chun (1994, p.27) claimed that "electronic discourse appears to be a good
bridge between writing and speaking skills, with the strengths of each domain apparently helping the other." While CMC may not have been the form of speech that Vygotsky envisioned when he proposed that speech is the primary mechanism for developmental change, the role of online discourse in SLA cannot be ignored in the context of technologically advanced societies.

Summary of Review

As we approach a new millennium the reality of living in a technological society has expanded the need for CALL research beyond prior expectations. Descriptive studies which document the nature of the interaction that learners engage in within various CALL contexts will help educators to organize activities which maximize language learning opportunities. The vast majority of CALL research to date has been conducted with adult second language learners, and has been interpreted according to behaviorist or interactionist perspectives. While many of the studies document the promise of CALL activities for SLA in adults, the results cannot be validly generalized to children. The relative absence of studies conducted with elementary-aged language learners is an important issue because educators do not know if CALL can be an effective tool for promoting oral English language proficiency. Kern (1994) believes that questions about the effectiveness of CALL must be
framed in terms of particular goals. CALL is not proposed as a panacea for language acquisition, nor as a replacement for regularly structured classroom activities. Rather, interest in CALL is based on the potential of CALL activities to create a novel context for the social use of academic language. For this reason, it is proposed that research be conducted with elementary-aged students of Spanish-speaking origin to determine whether the quantity and quality of discourse varies with the type of software program used.

Teachers may not have control over the curriculum or materials that they are expected to use. However, they do have some control over the way they organize activities around the curriculum and materials. It is assumed that a quantitative and qualitative analysis of the data collected while elementary-aged ELLs use different types of software will be useful in helping educators understand how software influences knowledge construction when computers are used as mediating tools in collaborative learning activities. This study attempts to provide information that will assist teachers in organizing collaborative CALL activities to promote English language learners’ acquisition of oral academic language proficiency.
CHAPTER 3
DESIGN AND METHODOLOGY

Design

The design of the research project is based on a study conducted by Abraham and Liou (1991). The researchers documented and analyzed the oral interaction generated by three computer programs as three pairs of adult English learners completed computer assisted language learning (CALL) tasks. The study sought to determine whether different types of computer software programs generate differences in the quantity and quality of talk between students.

Like Abraham and Liou’s study, this research project attempts to determine whether different types of computer software programs elicit quantitative and qualitative differences in the oral interaction between students. This research project was conducted using three pairs of first grade students who completed tasks on two different types of computer software programs. The two types of software programs included a drill and practice program and an authoring program.

Data Needed

Recordings of the discourse generated by each of the three student dyads as they worked on the two computer programs were collected. Each of the recordings documented
approximately 20 minutes of student interaction. Each recording was transcribed and coded according to the system of discourse analysis used in Abraham and Loiu's (1991) study. The data was analyzed to determine if differences exist in the quantity and quality of talk generated by a drill and practice program and an authoring program.

Subjects

The study was conducted utilizing an intact group of students enrolled in the same first-grade classroom at an elementary school in a high desert community in California. Three ELLs of Spanish speaking origin were paired with native English speakers to create three ELL-EO dyads. All participants were six years old at the onset of the study.

The classroom selected for the study had only three EO students enrolled; two boys, Derek and Ryan, and one girl, Aimee. Academically, Derek was an above average student, Ryan was a below average student, and Aimee was an average student. Socially, Derek and Aimee were outgoing, while Ryan was more reserved in classroom situations. All three students had average or above average vocabulary and oral expression skills in comparison to other six year old EO children.

The ELL students' classification was determined the previous year through the use of the Pre-LAS test (version A, English). The three ELLs chosen to participate in the
study were selected from those ELLs whose current English proficiency level was judged to be 3 (Early Intermediate) as measured by the results of a Pre-LAS test (version B, English) conducted by the researcher. The three level 3 ELLs selected to participate in the study, Javier, Sandra, and Judith, were matched to their EO partner based on academic and social factors. Academically, Javier and Judith were average students, while Sandra worked above grade level in most subjects. Socially, Judith was an extremely extroverted student, while Sandra and Javier were average students in classroom situations. Based on these considerations, Javier and Derek, Sandra and Ryan, and Judith and Aimee were paired to create the three ELL/EO dyads.

Methodology

In order to ensure that subjects in the study felt confident using computer hardware and software, all students received 75 minutes of computer instruction per week; 45 minutes once a week in the school’s computer lab, and 15 minutes twice a week in the classroom. Computer instruction began at the beginning of the school year, in July. One month before the data was collected, all students received direct instruction from the teacher to learn how to use the two software programs selected for the study. Students were provided weekly opportunities for
independent practice with the programs. All students in
the class, whether they were participants in the study or
not, had access to the software programs utilized for data
collection in order to reduce implementation threats to
validity. All data was collected in the classroom to reduce
location threats to validity.

The computer programs used in the study were selected
on the basis of an informal investigation conducted by the
researcher during the 1998-1999 school year with first
grade ELLs. Various factors were taken into account when
selecting the software programs for the main study: (1)
the age-appropriateness of the program, (2) the degree of
correlation between the software program objectives and the
regular classroom objectives, (3) students' preferences
when allowed to self-select software programs, and (4) the
amount of discussion elicited. From the various programs
piloted, two were selected for use in the main study:

1. Picture Phonics (Micrograms, 1995), a drill and
practice program in which students type the letter(s) which
correspond to the picture and orally stated prompt. Each
item has a single correct answer which is rewarded by a
star on the screen. Any deviation from the correct keyed
response receives increasingly explicit feedback messages
which begin with an oral repetition of the prompt, and
progress to an oral repetition with the computer flashing
the required letters in their positions. Students can listen to the oral prompt as many times as they want to by clicking on the picture. The program offers 11 levels of difficulty, from beginning consonant sounds to spelling complete words which combine short and long vowels with consonants, blends, or digraphs. Each level has four lessons.

2. Kid Pix (The Learning Company, 1999), an authoring program designed for 3-12 year old children. Students create projects by “drawing,” “painting,” and “stamping” with the mouse, adding text, and recording their voices. Use of the program can continue for an indefinite period of time, and allows for completely open-ended projects.

Data Collection

Each ELL-EO dyad spent approximately 20 minutes working on Picture Phonics, and 20 minutes working on Kid Pix. Due to the fact that there was only one computer available in the classroom, one student pair worked through one program each day until all six sessions were completed. Subjects’ talk was audiotaped and videotaped while the pairs collaborated on the programs. The teacher/researcher was present to answer procedural questions and to stimulate talk if interaction between the students ceased for more than 30 seconds.
Type of Analysis

Each of the six recordings documented approximately 20 minutes of student interaction. Each recording was transcribed and coded according to the system of discourse analysis used in Abraham and Loiu’s (1991) study. In analyzing the data, various indicators of the quantity and quality of the talk generated by the two software programs were examined.

Quantity of Talk

The indicator of quantity of talk was the average number of words per minute spoken by pairs of subjects as they worked through each program.

Quality of Talk

Three indicators of quality of talk were used to analyze the data: (1) turn length, (2) types of language functions used, (3) frequency of negotiation.

Turn length was measured indirectly by the average number of turns per minute (as indicated by a change of speaker), and directly by the average number of words per turn. Abraham and Liou (1991) state that the average number of words per turn is a more meaningful measure of turn length than the number of turns per minute in computer activities where there may be periods of silence while one student is typing. In an activity which has an objective
of increasing communicative practice, longer turns are regarded to be of greater value.

To analyze the types of language functions used, the talk was broken up into "acts" (sometimes several per turn), each of which was coded using the method utilized by Abraham and Liou (1991). Acts were grouped into eight categories, and the number of acts per minute in each category were compared across the two programs. The eight categories include:

(1) Repeating. Reading from the screen; repeating the partner's, the computer's, or one's own utterance.

(2) Managing mechanical aspects of tasks. Management of the computer.

(3) Managing mechanics of discussion. Focusing discussion; extending previous contributions; rephrasing; requesting time to think.

(4) Managing strategies for accomplishing tasks. Suggesting strategies or answers; making decisions; telling partner to make decisions; evaluating previous courses of actions; expressing purpose and cause/effect relationships; drawing logical conclusions; stating generalizations.

(5) Inquiring (to establish facts needed to perform tasks). Asking for information, clarification, confirmation, or agreement; asking for the partner's opinion; asking
whether the partner understands; expressing confusion or lack of understanding.

(6) Responding (to establish facts needed to perform tasks). Providing information; clarifying; confirming; agreeing; disagreeing; expressing understanding or awareness of situation; questioning truth of partner’s assertion; making an observation about or showing lack of belief in computer responses.

(7) Showing concern for language form. Asking or providing information about target language; spelling words for typist; correcting spelling, punctuation morphology, or grammar; analyzing grammatical structures.

(8) Showing emotion and feeling for others. Complaining; apologizing; reassuring; joking; showing excitement.

Acts in categories (2) through (8) involve the higher level functions of negotiation, decision making, and evaluation, and were therefore presumed to be of greater value than category (1), repeating, which represents a mechanical use of language.

Various researchers suggest that negotiation of meaning is particularly important to developing communicative competence. Chaudron (1988), Krashen (1985), and Long and Porter (1985) propose that negotiation of meaning enables learners to make “input” comprehensible. Swain (1985) argues that negotiation promotes language
acquisition because it increases learners’ "comprehensible output." The categories of "inquiring" and "concern for language form" in the current study conform to the operational definition of negotiation developed by other researchers (Abraham & Loiu, 1991; Doughty & Pica, 1986; Duff, 1986; Gass & Baronis, 1985; Porter, 1986). The frequency of negotiation was compared across the two programs by averaging the acts per minute per pair that occur in the categories of "inquiring" and "concern for language form." The total number of acts produced in the two categories by each pair as they completed each task was divided by the number of minutes needed to complete the task in order to calculate the average number of acts per minute.

Using these measures of analysis, it was possible to determine whether differences exist in the quantity and quality of talk elicited by different types of computer programs.
CHAPTER 4
DATA ANALYSIS AND RESULTS

The various indicators of quantity and quality of talk used by Abraham and Liou (1991) were used to examine the talk generated by the two different types of computer programs.

Quantity of Talk

The average number of words or utterances per minute (wpm) spoken by the three dyads was used as the indicator for quantity of talk. In this study Kid Pix elicited approximately 25% more talk than Picture Phonics. Kid Pix generated an average of 56.3 words per minute while Picture Phonics generated an average of 43.7 words per minute. Although Kid Pix elicited the greatest quantity of talk overall in this study, examining the data obtained for each dyad is important because the data revealed a much more dramatic difference in the quantity of talk for one dyad and contradictory results for another pair. Table 1 demonstrates that the data collected for Sandra and Ryan is similar to the overall results. It is noteworthy that Kid Pix encouraged almost four times more talk between Javier and Derek than Picture Phonics. In contrast, Kid Pix was actually slightly less effective than Picture Phonics for eliciting talk between Judith and Aimee.
Table 1. Average Number of Words Per Minute (wpm) of Talk

<table>
<thead>
<tr>
<th>Dyad</th>
<th>Picture Phonics</th>
<th>Kid Pix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Judith and Aimee</td>
<td>69.0</td>
<td>63.9</td>
</tr>
<tr>
<td>Javier and Derek</td>
<td>12.5</td>
<td>45.6</td>
</tr>
<tr>
<td>Sandra and Ryan</td>
<td>47.9</td>
<td>59.9</td>
</tr>
</tbody>
</table>

Further analysis of the data reveal that the amount of talk produced by the English language learner (ELL) compared to the English only (EO) student while using Picture Phonics varied greatly between dyads. Picture Phonics demonstrated a slight advantage over Kid Pix for encouraging talk between Judith, the ELL, and Aimee, the EO. More importantly, the amount of talk elicited by Picture Phonics was relatively balanced for this dyad. This was probably due to the fact that both girls have self-confident, assertive personalities, and they took turns spelling and typing words in response to computer prompts as evidenced in the following segment of the transcript.

C: Tube.
A: /u/
J: /u/.
A: U.
J: U. (Pushes U, laughs.)
A: (Laughs.)
J: Remember that you playing right there.
A: I put it on him.
C: Sailboat.
A: He's hiding though. (Laughs.)
J: (Laughs.)
A: Okay. Now I get to push the letters, and you get to put 'em in places.
J: Okay. I put it here.

The Picture Phonics data collected for Javier and Derek reveal that they produced significantly less talk than the other pairs. In addition, evaluation of the transcript reveals that Derek, the EO, spoke almost three times more than Javier, the ELL. As noted previously, the combination of personalities may have affected the balance of talk. Derek is an outgoing student who often contributes to class discussions, while Javier is an average student socially. While using the drill and practice program Derek served as the primary decision-maker and respondent while Javier entered the answers into the computer. The following excerpt illustrates the manner in which the two boys typically worked together.

C: Cheese.
D: I know. C-H-E.
J: (Pushes C-H-E.)
D: I think S or Z. S or Z?
J: E?
D: (Nods.)
J: (Clicks on E.)
D: Maybe it’s a Z or something? (Points at Z.)
J: (Hesitates, moving pointer from Z to S several times.)
D: Maybe Z or S. (Points at letters.) You can try S.
J: (Clicks on S.)
D: E.
J: (Clicks on Z.)
C: (Makes error beep.)
D: No, here. (Points to E.)
J: (Clicks on E.)

The Picture Phonics data for Sandra and Ryan reveal a third pattern, which contrasts with the results obtained for Javier and Derek. While the quantity of talk produced by the pair closely reflects the overall results, Sandra, the ELL, produced nearly one-third more talk than her EO partner. A review of the transcript reveals that Sandra, as the more academically competent and more outgoing personality in the dyad, took responsibility for spelling most of the words and often confirmed Ryan’s suggestions by spelling along with him. Their style of working on Picture Phonics can be seen in the following portion of the transcript.
C: Cake.
R: /c/-/a/-/k/.
S: /c/-/a/-/k/. I know. This one. No, no, no, no, no.
   This one.
R: That’s what I said.
C: Slide.
R: /s/-/l/-/i/-/d/.
S: /sl/-/i/-/d/. This one. I think.

Analysis of Sandra and Ryan’s discourse while using Kid Pix reveals a division of talk between the two students that is similar to the data obtained for Picture Phonics. Sandra was again responsible for the majority of the talk; producing approximately 60% of the discourse. The following segment of discourse demonstrates the way in which Sandra used her status as the partner with more confidence and more competence to lead their interactions while using Kid Pix.

S: If you want you could do the starfish big. Cuz I know. I already know to do the starfish.
R: Here.
S: Pencil, pencil, pencil. (Clicks on pencil.) Do it like big. (Points at screen.)
R: (Draws starfish.) Uhh! (Frustrated.)
S: I will do it. If you want? (Erases.)
R: Just mess it up.
S: You will try and do it. But it cannot get messed up.

R: I’ll fill it in.

The data for the other two dyads reveal that the EO students produced a greater quantity of talk than the ELL students while using Kid Pix. Judith and Javier, the ELLs, produced approximately 35% of the discourse while their partners, Aimee and Derek, were responsible for the remaining 65% of the dialogue. This is not a particularly surprising result because Aimee and Derek were both judged to be outgoing socially. Furthermore, Kid Pix is a completely self-directed authoring program which allows students free choice in selecting topics and carrying out tasks. By definition, EO students have greater fluency and communicative competence than their limited English proficient (LEP) peers, so they are likely to use more words during negotiations of meaning or task management.

Quality of Talk

Length of Turn

Turn length was measured indirectly by the average number of turns per minute (as indicated by a change of speaker), and directly by the average number of words per turn.

The average number of turns per minute spoken by the three dyads are illustrated in Table 2. The overall results
from this study indicate that Kid Pix elicited one turn per minute more than Picture Phonics. It is important to note, however, that the changes in speaker that occurred with Picture Phonics were stimulated by the computer's word prompts rather than one student's need to communicate with his or her partner. During the majority of the Picture Phonics task one student spelled the words for the typist, and the typist repeated the speller's utterances while entering letters.

Table 2. Average Length of Turn for All Dyads

<table>
<thead>
<tr>
<th>Program</th>
<th>Turns per minute</th>
<th>Words per turn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Picture Phonics</td>
<td>12.24</td>
<td>3.56</td>
</tr>
<tr>
<td>Kid Pix</td>
<td>13.26</td>
<td>5.11</td>
</tr>
</tbody>
</table>

The number of words per turn gives a more meaningful account of turn length when considering the potential of computer assisted language learning (CALL) activities to promote communicative competence. In this study Kid Pix elicited an average of 44 percent more words per turn than Picture Phonics. With Picture Phonics no turn contained more than 23 words, and 80 percent of the turns contained 1 to 5 words. Many turns consisted of only a single utterance as evidenced by the following exchange between Judith and Aimee.

C: Cup
J: Is a C or a K?
A: A C.
J: /u/.
A: /u/. (Clicks on U.)
J: /p/.
A: /p/. (Clicks on P.)

Not only did Picture Phonics elicit a high percentage of extremely brief turns for all the dyads, but the drill and practice format of the program also allowed Javier and Derek to frequently lapse into long periods of silence. The following portion of the transcript illustrates how the two boys often interacted with the computer rather than each other.

C: Wheel.
J: (Clicks on answer.)
C: Queen.
J: (Clicks on answer.)
C: Jug.
D: /j/-/u/.
J: (Clicks on answer.)
C: Zebra.
J: (Clicks on answer.)
C: Bat.
J: (Clicks on answer.)
C: Snail.
J: (Clicks on answer.)
C: Cheese.
J: (Clicks on answer.)
C: Train.
J: (Clicks on answer.)

While the 5.11 words per turn generated by Kid Pix falls short of the 8.5 to 17.3 words per minute documented in non-computer task studies with adults (Duff, 1986; Tong-Fredricks, 1984), some of the differences between Picture Phonics and Kid Pix are notable. For example, although 64 percent of the turns with Kid Pix contained only 1 to 5 words, 21 percent of the turns contained 6-10 words. Furthermore, 5 percent of the turns had 15 or more words, and 5 turns had a length of 30 to 38 words. The following excerpt demonstrates that although some turns were only one word in length, others were significantly longer and consisted of more than a repetition of the other subject's utterance.

J: Now what? Another (color.)
A: Where’s that one picture?
J: And then another. We’re drawing legs. Legs!
A: You’re drawin’ it wrong. You’re drawing it so wrong. You’re supposed to draw a circle and then put the legs. You could make it a little bit bigger if you put it right there.
J: Legs. Man, we have a lotta legs huh?
A: They go like around and around.
J: They have different color legs.
A: Actually, they have rainbow legs.
J: (Laughs.) How 'bout this one Aimee?
A: I'm gonna draw eyes on it.
J: Cool.

The following graph further illustrates the differences in turn length that are generated by a drill and practice program and an open-ended authoring program. Figure 1. Words Per Turn for All Dyads

Words Per Turn for All Dyads

![Graph showing words per turn for all dyads with Picture Phonics and Kid Pix programs compared.](image-url)
Both programs elicit a somewhat disappointing turn length. However, quantitative and qualitative differences in turn length suggest that programs with open-ended objectives may be somewhat better than drill and practice programs for fostering communicative competence through longer turns.

Types of Language Functions

The data were coded following transcription of the videotape recordings. The audiotape recordings were consulted when talk was difficult to understand. The speech acts were described by assigning them to the following categories:

1. Repeating.
2. Managing mechanical aspects of the task.
3. Managing mechanics of the discussion.
5. Inquiring (to establish facts needed to perform tasks).
6. Responding (to establish facts needed to perform tasks).
7. Showing concern for language form.
8. Showing emotion and feeling for others.

Table 3 provides a summary of the average number of acts per minute by category as compared across the two types of programs.
Table 3. Average Number of Acts Per Minute

<table>
<thead>
<tr>
<th>Category</th>
<th>Picture Phonics</th>
<th>Kid Pix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeating</td>
<td>1.97</td>
<td>1.07</td>
</tr>
<tr>
<td>Managing mechanical aspects of task</td>
<td>1.87</td>
<td>1.63</td>
</tr>
<tr>
<td>Managing mechanics of discussion</td>
<td>0.84</td>
<td>1.37</td>
</tr>
<tr>
<td>Managing strategies for accomplishing tasks</td>
<td>2.01</td>
<td>3.88</td>
</tr>
<tr>
<td>Inquiring</td>
<td>1.32</td>
<td>1.85</td>
</tr>
<tr>
<td>Responding</td>
<td>2.01</td>
<td>2.84</td>
</tr>
<tr>
<td>Showing concern for language form</td>
<td>6.85</td>
<td>2.25</td>
</tr>
<tr>
<td>Showing emotion and feeling for others</td>
<td>0.92</td>
<td>0.64</td>
</tr>
</tbody>
</table>

A fairly significant difference between the programs can be seen in "repeating." Picture Phonics prompted almost twice as many "repeating" acts per minute as Kid Pix. Most of the acts occurred when the typist repeated the sound or the letter that the other subjects suggested as in the following exchange:

C: Flute
The data demonstrate an insignificant difference in the number of "managing mechanical aspects of task" acts per minute. *Picture Phonics* elicited slightly more acts per minute in this category than *Kid Pix*. This is most likely explained by the fact that the students often negotiated who would make the entries and who would spell the words. Additionally, some of the tasks in *Picture Phonics* require students to make entries with the mouse, some tasks require the use of the keyboard, and some tasks give students the option of using either piece of hardware which generated some discussion about how to complete a task. In contrast, except for typing text, all tasks in *Kid Pix* are completed with the mouse so that students spend less time managing mechanical aspects of the tasks.

A significant difference in the number of acts classified as "managing strategies for accomplishing tasks" exists between the two programs. The need to make decisions, suggest strategies, and evaluate previous actions while using *Kid Pix* produced almost twice as many acts in this category as with *Picture Phonics*. The following dialogue demonstrates some of the strategies Sandra and Ryan used to complete the assigned *Kid Pix* task.
S: Ahm, we’re going to do a starfish. Like this.
   (Referring to a bag with sand, shells, and a
   starfish she has brought to school.)
R: All right.
S: And, ahm, a shell. And we could do like, ahm, one
   of those like they’re look like octopus. Like
   almost like octopus, but not like octopus. So let’s
   work.
R: Okay. (Draws and fills sand.)
S: Now a pink shell.
R: You just fill in the line with that little thing.
   Now it’s your turn to color a picture.
S: Now a shell that is pink. This one? (Referring to
   color.)
R: Ooh, ooh, ooh! That over there. (Points to the
   color he wants.)
S: Okay, that one. Now you do the shell.
R: Hey, I’m doin’ everything. You wanta try to use
   that. (Points to paintbrush.) No, cuz it’l just
   make dots.
S: Oh. Okay, now let’s color the shell. (Fills shell.)
R: Uhh, we coulda made lines. (Makes line motions with
   finger on shell.)

The greatest difference between the two programs is
seen in the number of acts per minute that occur in the
category of "showing concern for language form." Picture Phonics generated nearly three times as many acts in this category as did Kid Pix. This finding is easily explained by the fact that Picture Phonics is a drill and practice program designed specifically to provide students with the opportunity to apply phonics rules in the context of "fill-in-the-blank" computer activities. The students' concern for language form was limited almost completely to discussion about the correct spelling of word prompts supplied by the computer. The following dialogue is representative of most of the "concern for language form" acts elicited by Picture Phonics.

C: Zebra
A: /z/. (Clicks Z.)
J: E
A: (laughs, and clicks E.)
J: /br/, /br/. 
A: (Clicks B-R.)
J: /u/, a U.
A: /u/. (Clicks U.)
(Computer makes error beep.)
J: Zebra-ruuuu/.
A: /u/, /u/.
J: No?
A: It's a E.
(Computer flashes A as a clue.)

J: A.

A: A.

Kid Pix generated far fewer acts per minute in the category of "concern for language form." Kid Pix did, however, elicit some variety in the types of responses that fell into this category. As in Picture Phonics, some responses focused on the correct spelling of words. However, as seen in the following sample of dialogue, the students were attempting to spell self-generated text rather than computer-generated prompts.

J: The jellyfish- /i/, /i/  
A: The jellyfish.  
J: /i/, /i/, jellyfish.  
A: /l/, /l/.  
J: /l/, /l/.  
A: Jelly, jelly, jelly  
J: Jelly.  
A: No. (Erases.) Space.  
J: No. Stop. No jellyfish.  
A: And then write fish.  
J: The jellyfish is. Where's /i/?  
A: No, it's not right there. Is, is. /st/-/i/, sticky. The jellyfish is sticky.  
J: /i/, /i/.
A: /k/, /k/.
J: /k/ /k/ sticky.
A: Okay
J: /e/, /e/, sticky.
A: Okay.

Some of the talk about "concern for language form" also focused on correct writing mechanics. In the following discussion the EO student was mediating the ELL student’s writing so that she included a capital letter at the beginning of a sentence.

A: Now think. Think. Tell me what you’re gonna write.
J: The- This jellyfish is sticky.
A: Wait. Looket, you push- push this.
J: No.
A: Push that. (Referring to the shift key.)
J: No, Aimee. (Pushes shift.)
A: Uppercase. Now you can do it.
J: This.
A: A sentence always begins with an uppercase letter.

Another example of "concern for language form" demonstrates that the ELL student had not only internalized phonetic rules of writing, but also some rules of punctuation. In the following section of the transcript Javier negotiated with Derek to include a period at the end of a sentence.
Although the data suggests that Picture Phonics encourages significantly more "concern for language form," it is important to keep in mind the objective of CALL activities. It is true that the students are thinking about language form while they are discussing how to spell a word provided by a computer. However, it seems impossible to imagine that programs which force learners to focus on a predetermined task could be as beneficial to developing communicative competence as those which allow students to determine their own course of action.
The data reveal that Kid Pix elicits a slightly greater number of acts per minute in the categories of "inquiring" and "responding." As noted before, the scripted nature of drill and practice programs does not encourage the type of student-centered dialogue that promotes "inquiring" and "responding." The following excerpt from the Kid Pix transcript demonstrates the potential that authoring programs have for engendering inquiry and response in student discourse.

J: The starfish (reading) is sticky?
A: No, back. (Referring to erasing an error.) The starfish. (Reading off screen.)
J: Is sticky.
A: The starfish is. (Reading off screen.)
J: Sticky. Do jellyfish, jellyfish stick in your hand?
    They bite you?
A: Hmm. I don't know. I think they do.
J: I touch one. It didn't bite me.

With the exception of "showing concern for language form" the data do not provide evidence of remarkable quantitative differences in the number of acts per minute that occur in the various categories measuring quality of talk. As demonstrated through the various discourse excerpts, student talk may fall into certain categories without providing especially meaningful practice for
students. It is important to focus on student talk in order to determine whether or not the CALL programs being used can create the type of activity system which will allow the teacher's instructional objectives for the students to be realized.

**Frequency of Negotiation**

The frequency of negotiation was determined by averaging the acts per minute that occur in the categories of "inquiring" and "concern for language form."

Negotiation of meaning occurred at a rate of 7.91 acts per minute with *Picture Phonics* and a rate of 4.11 acts per minute with *Kid Pix*. Although negotiation of meaning, as defined in Abraham and Liou's study (1991), occurred more than twice as often with *Picture Phonics*, the fact that almost all of the acts in the category of "concern for language form" were confirmations that the typist was entering the intended response to the computer prompt cannot be overlooked. This definition of negotiation of meaning is qualitatively different from the type of negotiation that ensures that language learners are receiving "comprehensible input" or "comprehensible output."
CHAPTER 5

CONCLUSION

The goal of this study was to compare the quantity and quality of talk elicited by a drill and practice software program and an authoring software program.

Comparison of the discourse generated by the two different types of computer programs revealed fewer differences than were expected. The relatively small difference in the quantity of talk elicited by the two programs for two of the three dyads was surprising. It had been hypothesized that the authoring program would elicit a significant difference in the quantity of student talk generated by the task. This hypothesis was based on the assumption that students would be significantly more motivated to talk if they were discussing a topic and task of their choice. The small difference in the quantity of talk can be partially explained by the fact that although the turns were notably longer with the authoring program, there were longer stretches of silence while one student drew.

*Picture Phonics* elicited a higher number of acts of “repeating,” and a notable difference in the number of acts related to “concern for language form.” Students’ concern for language form as it related to spelling was anticipated due to the characteristics of the program. *Picture Phonics*
also generated a higher number of acts of “showing emotion” which was unanticipated. A review of the discourse revealed that part of the talk that was coded as emotion was frustration on the part of the English language learner (ELL) directed toward the English only (EO) student. At one point in the activity the EO student began to intentionally enter incorrect letters, pretending she could not spell. The excerpt demonstrates that while the EO student was amused by the game, the ELL student became quite frustrated.

A: Where’s the /n/./n/./n/?
A: (Laughing.) /nnnnnnn/.
You’re not looking.
A: /nnnnnn/.
J: Down here.
A: (Laughing.) /nnnnnn/.
J: Down here. Aimee, where you’re going?!
A: I don’t know. I don’t see it.
J: N, van. Van! Where you’re going?!
(Computer makes error beep.)
A: There it is. Looket. There I got it. Looket. One wrong.
According to the data collected in this study, the characteristics of a drill and practice CALL program encourage repetition and concern for language form. Perhaps most notably, the nature of drill and practice programs seems to limit conversation to relatively short, repetitive turns. If the goal of CALL activities is to provide students with social contexts in which they can internalize the speech that they hear while participating in social activities, we must consider the speech that occurs in the activities. The short turns generated by drill and practice programs would seem to limit the possibility of students engaging in discourse that would lead to true communicative competence.

Kid Pix did not generate as much of a difference in the types of language functions as anticipated. However, it did promote a greater number of words per turn than the drill and practice program. Additionally, it generated a greater number of acts per minute in the categories of "managing strategies for accomplishing tasks," "inquiring," and "responding." These are skills that are important to academic success in school. Although the differences in these categories with Kid Pix were only slightly greater than with Picture Phonics, it is important to observe that the students were talking about self-selected topics that related to their own need to create and negotiate meaning.
Based on the results of this study, it appears that CALL activities have limited potential for developing oral English language proficiency in Elementary-aged students. While the students seem to enjoy the CALL activities and often ask to use the computer, the oral language that is elicited during the activities is not of the same quantity or quality that students exhibit when working collaboratively on non-computer academic activities. Therefore, it seems that when the objective of an activity system is oral language development, a social context other than the computer may be preferable.

In spite of the limitations documented regarding the potential to develop oral communicative skills through CALL activities, the discourse generated during this investigation suggests that collaborative activities around the computer may not be wasted social interactions. Students living in a technological society must know how to use and communicate with computers. The talk that was generated and the work that the students created while using Kid Pix suggest that combining the objectives of computer literacy and writing may be a more realistic goal for creating social contexts for ELLs that include computers.
REFERENCES


Saracho, O. N. (1982). The effects of a computer-assisted instruction program on basic skills achievement and attitudes toward instruction of Spanish-speaking


