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THE IMPACT OF COMPUTER-BASED INTERVENTION WITH AND WITHOUT PRIMARY LANGUAGE SUPPORT ON READING SKILLS OF ENGLISH LANGUAGE LEARNERS

by

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ABSTRACT

The Impact of Computer-based Intervention With and Without Primary Language Support on Reading Skills of English Language Learners

by

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Reading is the most important skill that English Language (EL) learners acquire in school (Slavin & Cheung, 2005). Success in reading has been shown to impact many areas of student social and economic opportunities (Peregoy & Boyle, 2005). Students who come to school with limited English proficiency have greater difficulty learning to read in English (Freeman & Freeman, 2004). With the rise in the number of EL learning students in schools, school districts are compelled to find ways to teach English literacy skills to students with primary languages other than English.

This study had two purposes. The first purpose was to determine the impact of the *Lexia Primary Reading Program* (Lexia, 2004), a computer-based reading program, on the English reading skills of first grade students whose primary language is Spanish. The second purpose was to determine how the language of instruction (i.e., Spanish or English) provided by the *Lexia Primary Reading Program* impacts the English reading skills of EL learners

Forty-one first-grade EL students whose primary language is Spanish participated in this study. Of the 41 first-grade students, 16 were male and 25 were female. Students were assigned to three groups. Students in the experimental groups received computer-based instruction from *Lexia Primary Reading Program* (Lexia, 2004). One of the experimental groups received English oral language instructions while the other experimental group received Spanish oral language instructions. Students in the comparison group received an equal amount of computer time with non-literacy based instruction.

Lexia Primary Reading Program (Lexia, 2004) was effective at increasing literacy skills in some of the areas measured (i.e., oral language, picture vocabulary, letter-word identification, and passage comprehension). Passage comprehension was the only area that showed a difference relative to the language of instruction provided. This study answered several important questions regarding literacy skills of EL learners.

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CHAPTER 1

INTRODUCTION

As schools in the United States become more diverse, they are presented with challenges and opportunities. The presence of culturally and linguistically diverse students in schools is creating richly diverse classrooms that are full of multiple viewpoints. This change also is occurring at a time when schools and teachers are being held more accountable. Recent changes in legislation are creating learning demands on teachers and students that may not be appropriate.

Diversity in school environments includes a number of students who come to school with proficiency in a language other than English (Banks, 2006). The majority of these students speak Spanish (National Center for Education Statistics [NCES], 2005). To add to the challenge, these students often come to school without enough proficiency in English to be able to learn in that language (Freeman & Freeman, 2004). They may also come to school without formal instruction in their primary language (Freeman & Freeman, 2004). English language (EL) learners often experience difficulty in learning English literacy skills in the primary grades (Haager & Windmueller, 2001). Monolingual peers continually outperform EL learners (Echevarría, Vogt, & Short, 2000). Finding strategies to help these children become successful readers in English is vital.

Reading is the most important skill that EL learners acquire in school (Slavin & Cheung, 2005). Success in reading has been shown to impact many areas of student

social and economic opportunities (Peregoy & Boyle, 2005). Students who come to school with limited English proficiency have greater difficulty learning to read in English (Freeman & Freeman, 2004). Support is needed for these students to experience success reading that monolingual English speakers typically experience.

English Language Learners

In the ten years between 1991 and 2001, the English Language (EL) learning population in United States public schools has risen by 105% (NCES, 2005). In that time, the total enrollment of students increased by only 12% (NCES, 2005). The highest concentration of EL learners is in the elementary grades. English Language (EL) learners in the United States speak one or more of 460 languages (NCES, 2005). The highest percentage of these students primary language is Spanish (NCES, 2005). In 2004, Nevada had 120,000 children who spoke a language other than English at home (Anne E. Casey Foundation (AECF), 2006). In the 2003-2004 school year, Nevada schools had 64,181 EL learners enrolled (Klein, 2004). Nevada has been ranked 6th highest in percentage of EL learners in the United States (Klein, 2004). Although EL learners are typically talked about as one group, there are three types of EL learners that have been identified (Olsen & Jaramillo, 1999; Ruiz de Velasco, Fix, & Clewell, 2000).

Types of English Language Learners (EL learners)

English Language (EL) learners comprise a diverse group that incorporates many degrees of language proficiency (Peregoy & Boyle, 2005). The three types of EL learners that have been identified include: (a) long-term English language learners, (b) recent arrivals to the United States with limited or interrupted formal education, and (c) recent

arrivals with sufficient formal education (Olsen & Jaramillo, 1999; Ruiz de Velasco, Fix, & Clewell, 2000).

Long-term English language learners. Students in the long-term category typically have been in the United States for many years (Freeman & Freeman, 2004). Often times long-term EL learners are placed in a bilingual or English-as-a-Second-Language (ESL) program (Freeman & Freeman, 2004). This type of EL learner typically speaks English; however, they also perform several grades below grade level in reading and writing (Ruiz de Velasco, et al., 2000). In addition, long-term EL learners do not have the English skills necessary to perform well in all academic areas. While EL learners in this group may be able to maintain grades of Bs and Cs in the classroom, they typically do not perform well on standardized tests. With the increase in use of standardized assessment to make judgments about students, poor performance on standardized tests may cause EL learners to become discouraged and drop out of school (Freeman & Freeman, 2004).

Recent arrivals with limited formal schooling. English language learners falling in this category typically have been in the United States for fewer than four years (Ruiz de Velasco, et al., 2000). This group of students has not had an adequate amount of formal instruction in any language (Freeman & Freeman, 2004). They exhibit oral language proficiency in their primary language but very little or no English oral language proficiency. However, English Language (EL) learners in this category demonstrate deficits in academic knowledge (e.g., pre-literacy skills, literacy skills, basic math skills) in their primary language (Freeman & Freeman, 2004). Therefore, they often do not perform well in class or on standardized assessments (Freeman & Freeman, 2004). This

category of students needs to develop oral language English skills while acquiring academic English.

Recent arrivals with adequate formal schooling. English language learners in this category have had formal instruction in their primary language (Freeman & Freeman, 2004), and they have also had adequate academic language and skills in their primary language (Freeman & Freeman, 2004). Research in second language acquisition indicates that children with literacy skills in their primary language have more success when learning a second language (Collier, 1995; Cummins, 1993; Lapp & Flood, 1992, Thomas & Collier, 1997). The primary goal for this category of EL learners is to learn oral English skills while learning academic English (Freeman & Freeman, 2004). This group of students will have an easier time than EL learners without formal schooling because they can transfer their prior academic skills in their primary language to academic skills in English (Collier, 1995; Cummins, 1993; Lapp & Flood, 1992, Thomas & Collier, 1997). Students who have adequate schooling in their native language become more proficient in English much faster than the students with no schooling in their first language (Collier, 1989). Current policy changes impact how all types of EL learners will learn English.

Educational Policy

Students who are EL learners often demonstrate academic achievement that lags behind their monolingual counterparts (Echevarría, et al., 2000). With the increase of students born to non-native English speakers, educators must identify appropriate instructional approaches for these students so that they may learn content and English

simultaneously. Approximately 40% of Latino students rank one grade level or more below in academic achievement when compared to the general school population (Ruiz de Velasco, et al., 2000). Only about 50% of Latino students graduate on schedule (García, 1994). Latino students, both English-speakers and EL learners, score below the general student population in literacy in elementary school, and by secondary school fall behind their peers an average of four years (August & Hakuta, 1997). Because literacy skills (i.e., listening, speaking, reading and writing) have an impact on all areas of academic success, these statistics exemplify the need for effective literacy instruction for EL learners.

The *No Child Left Behind Act* (P.L. 107-110) requires that EL learners be included in the yearly testing by which the schools are judged. Though EL learners are eligible for some modifications, they are typically tested on their understanding of academic subjects in the English language. With the number of EL learners in the United States is growing tremendously (NCES, 2005), it is alarming that few teachers have the special training needed to effectively instruct EL learners (Ruiz de Velasco, et al., 2000). The challenge of teaching EL learners has always existed, but because of the pressure on school districts to find successful teaching methods for these students is increasing (Slavin & Cheung, 2005).

Recent changes in legislation greatly impact the education of EL learners. The *No Child Left Behind Act* (2001) includes provisions for EL learners under Title I and Title III (NCLB, 2001). During this reauthorization, Title VII, the *Bilingual Education Act* was renamed Title III, the *English Language Acquisition, Language Enhancement, and Academic Achievement Act* of the *No Child Left Behind Act* (2001).

Through this legislation, schools are required to increase the oral language proficiency and academic skills of EL learners. Schools are judged by their ability to reclassify EL learners to English proficiency as soon as possible; however, the use of the primary language as a support is discouraged (Ovando, Collier, & Combs, 2003). School districts must choose and use scientifically-based methods to increase the English skills of their EL learners. School districts are required to ensure EL learners meet the same academic standards as all students (NCLB, 2001), but meeting the same standards as monolingual English speakers will be very difficult for EL learners who come to school with limited English proficiency (Peregoy & Boyle, 2005).

Current educational policy places an emphasis on English-as-a-Second-Language (ESL) methods as opposed to bilingual education, though research supports the use of primary language support (Krashen, 1991a; Krashen, 1996; Ramírez, Pasta, Yuen, Ramey & Billings, 1991). Schools are required to assess the academic skills of EL learners who have attended school in the U.S. for three or more years (Ovando, et al., 2003). Educators within schools that do not show English academic achievement for their EL learners are subject to penalties. Despite the fact that it can take EL learners five to ten years to learn academic skills in English (Cummins, 1991), schools are expected to show English academic skills for EL learners after only 3 years.

The *No Child Left Behind Act* (2001) presents difficulties for EL learners and educators (Peregoy & Boyle, 2005). This legislation states that EL learners, regardless of ability, are to achieve reading proficiency (McCollin & O'Shea, 2006). While funding for the education of EL learners is decreasing, the pressure on school districts to get these students to grade level is increasing. Schools are expected to assess all their students in

reading and math in 3rd and 8th grade (Peregoy & Boyle, 2005). School districts are required to help EL learners achieve at the level of their English-speaking peers (Peregoy & Boyle, 2005).

School districts are also required to use educationally sound techniques for teaching EL learners English as well as achieving progress equal to their monolingual peers in the core subjects. The difficulty for school districts is that most scientifically-based research is completed with monolingual English speakers and not with EL learners (Linan-Thompson & Hickman-Davis, 2002). One of the most effective ways to select instructional techniques to teach reading to EL learners is to understand the process of second language acquisition.

Second Language Acquisition

English language learners often encounter difficulty acquiring literacy skills in English (Troia, 2004). Literacy skills include listening, speaking, reading and writing. One of the most prominent theories in the field of second language acquisition is Cummins' theory of second language acquisition. This theory consists of two major domains, Basic Interpersonal Communication Skills (BICS) and Cognitive Academic Language Proficiency (CALP).

Basic Interpersonal Communication Skills (BICS) involve the informal language of conversation. This theory suggests that children learn BICS through informal interaction with their peers. Cummins (1991) suggests that mastery of BICS takes between two and three years. Children with good BICS are able to discuss topics with which they are very

familiar (e.g., school, television programs) and tend to engage in conversations which they can control the topic and direction.

Cognitive Academic Language Proficiency (CALP) refers to language skills that are associated with literacy and cognitive development. These skills are learned most often through formal instruction in school. Cognitive academic language proficiency is generally gained while at school and takes much longer to develop. According to Cummins (1991), development of proficiency in CALP skills can take between five and ten years. Roberts (1995) indicated that EL learners tend to spend only three years in special programs designed for their EL needs. Unfortunately, three years does not provide students with enough time to acquire the skills and therefore they are not ready to learn the necessary English literacy skills associated with CALP (Cummins, 1991).

Research in second language acquisition has shown that children with functional literacy skills in their primary language have more success in learning a second language (Collier, 1995; Cummins, 1993; Lapp & Flood, 1992, Thomas & Collier, 1997). Children taught to read in their primary language will learn to read in their second language faster than children who have to learn to read in a second language without prior understanding of the literacy rules in their primary language (Collier, 1995; Cummins, 1993; Lapp & Flood, 1992, Thomas & Collier, 1997).

Oral language skills develop faster than cognitive and academic skills (Cummins, 1981); therefore, bilingual children benefit from the use of their primary language as they learn language and literacy skills in their second language. It is becoming increasingly uncommon for bilingual children to be provided primary language support in the classroom. However, whether a child has literacy in his or her primary language or not,

when he or she enters a United States public school system they are required to learn English (McRight, 2002). This poses a substantial problem for both the school and the child (Collier, 1995).

Educational Methods

Due to a limited amount of research on the literacy acquisition of EL learners, most reading interventions are based on research that has been completed with monolingual English-speaking peers (Linan-Thompson & Hickman-Davis, 2002). More research is necessary to determine the effect of reading interventions on EL learners who are consistently behind their monolingual English-speaking peers academically (Echevarría, et al., 2000). Over the past 8 years, some of the most common scientifically-based methods school districts have implemented include: (a) the Cognitive Academic Language Learning Approach (CALLA), (b) the Sheltered Instruction Observation Protocol (SIOP), and (c) Computer-Assisted Language Learning (CALL) (Chamot & O'Malley, 1996; Echevarría, et al., 2000).

The Cognitive Academic Language Learning Approach (CALLA) is an instructional approach to language learning that is designed to increase the achievement of students who are being taught in a language in which they do not have proficiency. The CALLA approach was developed in 1986 by Chamot and O'Malley. The focus of this approach is on teaching EL learners to use and apply cognitive and meta-cognitive strategies (Herrera & Murry, 2005). An additional focus is on the development of critical thinking skills to assist in the acquisition of deep proficiency (Chamot & O'Malley, 1996). Chamot & O'Malley developed this approach to increase the CALP skills of EL learners. The

CALLA approach describes methods to address: (a) cognitive and academic instruction at grade level, (b) instruction that increases English skills in content areas, and (c) direct instruction of learning strategies (Chamot, 1995). This approach has been shown to be effective for EL learners in both English-as-a-Second Language (ESL) and general education classrooms (White Soltero, 2004).

Another approach used to teach EL learners is the SIOP model. The SIOP model uses sheltered instruction techniques and an observation tool to help instructors and administrators measure the effectiveness of the instruction (Echevarría, et al., 2000). Sheltered Instruction (SI) includes both language objectives and content objectives. The teacher who uses SI provides instruction in the English language and content area instruction. Another important factor of SI is that the teacher encourages classroom interaction. The method of SI uses gestures, visual aids, demonstrations, and hands-on experiences. Other SI techniques include slowed down speech, proper enunciation, short sentences, and regular comprehension checks (Ovando, et al., 2003). The SIOP model includes implementation tools, among them: (a) preparation, (b) building background, (c) comprehensible input, (d) strategies, (e) interaction, (f) practice/application, (g) lesson delivery, and (h) review/assessment (Echevarría, et al., 2000).

Computer-assisted instruction has been available in schools since the late 1970s and is another method used to teach EL learners (Díaz-Rico, 2004). Computer-Assisted Language Learning (CALL) is a language-learning approach delivered via computer (Díaz-Rico, 2004). This type of instruction is an offshoot of the audio-lingual method of language instruction. The major difference between the former and the latter is that in

CALL the computer is able to provide feedback to the EL learner (Meskill & Hilliker, 2005).

Computer-Assisted Language Learning (CALL) has been used to teach EL learners (Díaz-Rico, 2004). Computer-based, audio-lingual learning previously used drill-and-practice curricula; however, computer programs have become more complex (Egbert & Hanson-Smith, 1999). Computer-assisted instruction has grown from drill-and-practice software to the computer being viewed as a facilitator of language learning (Meskill & Hilliker, 2005). Computer-Assisted Language Learning provides students practice at their ability level that reinforces the instruction in areas of need for the individual student (Bender & Bender, 1996).

Literacy Development

Researchers have found that EL learners can benefit from instruction in English literacy before they have developed complete oral language fluency in English (Hudelson, 1984, 1986; Goodman, Goodman & Flores, 1979; Urzúa, 1987). Limited research on the literacy skills of EL learners is available (Peregoy & Boyle, 2005). Many factors impact the literacy learning of EL learners. These factors include primary language literacy, English language ability, cultural factors, teacher perceptions, and teacher-student relationships (Peregoy & Boyle, 2005). Despite these factors, which can impede achieving English literacy, EL learners are increasingly pressured to achieve the English literacy levels of their English-speaking peers. English language learners can benefit from literacy instruction while they are in the process of developing their own

oral language skills in English (Hudelson, 1984, 1986; Goodman, Goodman & Flores, 1979; Peregoy & Boyle, 2005; Urzúa, 1987).

Literacy development occurs in five stages. These stages are: (a) early emergent literacy, (b) emergent literacy, (c) beginning reading and writing, (d) almost-fluent reading and writing, and (e) fluent reading and writing (Cooper & Kiger, 2003). In the early emergent literacy stage, the child learns the fundamentals of literacy. During the emergent literacy stage, the child uses correct oral language patterns and learns basic literacy concepts, such as awareness of print, relationship of print to speech, comprehension of text structure, phonological awareness, and letter knowledge. The beginning reading stage is the stage in which children begin to read words. Oral language abilities are also further developed at this stage. In beginning reading stage, pronunciation and reading fluency are developed (Cooper & Kiger, 2003). In the almost-fluent reading stage, children are become proficient. In the final stage, the fluent reading stage, students demonstrate fluency across environments in reading and oral language many ways.

Various theories exist regarding how learners become literate in English (Chomsky, 1957; Cummins, 1981; Krashen, 1987; Skinner, 1968). These theories seem to suggest that English literacy development is similar for both monolingual English speakers and EL learners (Edelsky, 1981; Goodman & Goodman, 1978; Hudelson, 1984; Urzúa, 1987. English Language (EL) learners go through the same stages of literacy development as their monolingual English-speaking peers. One type of literacy instruction that focuses on these stages is phonics.

Phonics Instruction

Many EL learners have difficulty learning phonemes that are not found in their primary language (Troia, 2004). This may be a reason why EL learners continue to perform lower than their monolingual peers in reading (August & Hakuta, 1997). Various programs such as basal reading, whole language, language experience, and phonics have been are used to teach students to read (Cooper & Kieger, 2003). The computer program used in this present study is reinforces phonics awareness and phonics skills. Phonics instruction shows students the alphabetic principle is predictable and that there are systematic relationships between written forms and letter sounds (Peregoy & Boyle, 2005). Researchers have demonstrated that EL learners can benefit from direct instruction on the sounds in the English language (Vaughn, Bos, & Schumm, 2005).

Researchers have demonstrated positive effects of phonemic instruction to teach students to read in a non-dominant language (Nag-Arulmani, Reddy, & Buckley, 2003). Studies investigating the effects of explicit phonics instruction including phonemic awareness training have shown increases in letter-naming fluency, phoneme segmentation, nonsense word fluency, oral reading fluency, and word sentence skills in EL learners (Haager & Windmueller, 2001), suggesting that providing phonics instruction to EL learners may be important for their English literacy acquisition.

Computer-based Intervention

Computers are often used to provide differentiated instruction to students (Bender & Bender, 1996). Computers also have the flexibility to provide support to students in a variety of languages, including languages that the students' teachers are unable to speak.

Computer-based intervention also allows students to progress at their pace (Tillman, 1995). Computers have been shown to increase the motivation of EL learners (Cifuentes & Shih, 2001; Schofield, 1995; Stevens, 1991). The ability to work in an environment without the threat of embarrassment is especially vital for EL learners (Krashen, 1988). Having a low affective filter increases the speed with which a student will learn a second language (Krashen, 1988).

According to Krashen (1988), the optimum combination of internal variables is high motivation, good self-confidence, a good self-image, and a low level of anxiety (Krashen, 1988). Computer-based instructional programs, such as *Lexia Primary Reading Program* (Lexia, 2004), allow students to have the optimum combination of internal variables to increase language learning (Lexia, 2004). *Lexia Primary Reading Program* software is a computer program based on research-based best practices. *Lexia Primary Reading Program* incorporates all of the recommend literacy practices—phonemic awareness, phonics, fluency, vocabulary and comprehension.

It is also becoming increasingly more common for EL learners to be in classrooms where the teacher has not had the training needed to effectively instruct EL learners (Echevarría, et al., 2000). Computer-based intervention can provide primary language support. Computers can provide instruction to EL learners in their primary language or using EL methods. This type of instruction at a computer is especially important for EL learners when teachers are not trained to provide supports for them. The use of this technology can provide support for students that may not be otherwise accessible to them.

Statement of the Problem

The National Research Council (NRC, 1998) recommends that EL learners be taught oral language proficiency in English before they are taught to read in English (2003). However, the Council also states that children who do not learn to read English by the age of nine are at severe risk of reading failure (NRC, 1998). Research seems to indicate that it can take a child two to three years to develop oral language skills in a second language (Cummins, 1991). It can take a child five to ten years to acquire the academic language required to read in English. While waiting for a child to learn oral language proficiency in English, he or she is placed at a much higher risk of reading failure. The use of the student's primary language to teach reading in English may alleviate this problem. Very often teachers do not have the training in EL instructional methods, they need to effectively teach reading to EL learners (Ruiz de Velasco, et al., 2000). This has a great impact on the EL learners' ability to learn in schools (Ruiz de Velasco, et al., 2000).

Purpose of This Study and Related Research Questions

The purpose of this study is two fold:

(1) To determine the impact of the *Lexia Primary Reading Program* (Lexia, 2004), a computer-based reading program, on the English reading skills of first grade students whose primary language is Spanish.

(2) To determine how the language of instruction (i.e., Spanish or English) provided by the *Lexia Primary Reading Program* (Lexia, 2004) impacts the English reading skills of EL learners.

The *Lexia Primary Reading Program* was used in addition to the typical reading instruction received in the classroom. This study proposes to show that the students with the primary language support provided by the *Lexia Primary Reading Program* (Lexia, 2004) will make greater progress in English literacy skills than children with English-only instruction. Specifically, the following research questions were addressed:

Research Question 1: Does the *Lexia Primary Reading Program* increase the English oral language skills of first grade native Spanish-speaking EL learners?

Research Question 2: Does the *Lexia Primary Reading Program* increase the picture vocabulary skills of first grade native Spanish-speaking EL learners?

Research Question 3: Does the *Lexia Primary Reading Program* increase the English verbal analogies scores of first grade native Spanish-speaking EL learners?

Research Question 4: Does the *Lexia Primary Reading Program* increase the English reading skills of first grade native Spanish-speaking EL learners?

Research Question 5: Does the *Lexia Primary Reading Program* increase the letter-word identification skills of first grade native Spanish-speaking EL learners?

Research Question 6: Does the *Lexia Primary Reading Program* increase the reading comprehension skills of first grade native Spanish-speaking EL learners?

Research Question 7: Does the *Lexia Primary Reading Program* increase the English phoneme segmentation fluency skills of first grade native Spanish-speaking EL learners?

Research Question 8: Does the *Lexia Primary Reading Program* increase the English nonsense word fluency skills of first grade native Spanish-speaking EL learners?

Research Question 9: Does the *Lexia Primary Reading Program* increase the oral reading fluency skills of first grade native Spanish-speaking EL learners?

Research Question 10: Is there a difference in how the language of instruction (i.e. Spanish or English) provided by the *Lexia Primary Reading Program* impacts the reading scores of first grade native Spanish-speaking EL learners?

Significance of the Study

Students who are learning English are impacted by factors that occur outside of school as well as in school. For example, English language learners are two times as likely as English speakers to live in poverty (Batalova, 2006). At a national level, EL learners are receiving their education at schools in racially and economically segregated and in urban areas that put them at a disadvantage (Cosentino de Cohen, Deterding, & Chu Clewell, 2005). Therefore, these schools will have the difficulties commonly associated with urban schools (e.g. large class sizes, larger school populations, higher rates of poverty, and health problems) (Cosentino de Cohen, et al., 2005).

Development of literacy skills is of utmost importance to EL learners (Slavin & Cheung, 2005). Being a competent reader has been shown to impact many areas of student social and economic opportunities (Peregoy & Boyle, 2005). Students who come to school with limited English proficiency have greater difficulty learning to read in English (Freeman & Freeman, 2004). Educational support is vital for EL learners to enjoy the success in reading that monolingual English speakers experience.

The results of the present study may provide teachers of EL learners an insight into computer-based interventions as a method to teach literacy skills to these students. The purposes of this study were to evaluate whether or not children who are learning English benefit from computer-based intervention to increase English reading and English oral language skills as well as to investigate the impact English and Spanish oral language instruction within the *Lexia Primary Reading Program* (Lexia, 2004) has on students' reading and oral language skills. The results of the present study provide educators information on whether or not using a computer-based reading program to provide primary language support for children who are learning English is effective in increasing English literacy skills.

Definitions

The following terms will be used in this study. Their interpretations are important to the understanding of the study.

Combined Experimental Group (CEG). In order to best answer research questions 1 through 9, it was necessary to combine the experimental group for data analysis. The combined experimental group consists of all the students who received the *Lexia Primary*

Reading Program with either English or Spanish oral language instructions. They rotated through the three centers according to their primary placement in EG1 or EG2.

Comparison Group (CG1). The children in the comparison group home language is Spanish. The children in this group rotated through three centers. The centers used small group instruction for 30 minutes, 30 minutes of computer-based instruction, and 30 minutes of independent work. The computer program that the participants used varied over time. Some of the programs utilized were *Orchard Math Software* (Ohio, 2002) and *MathBlaster®* (Knowledge, 1993).

Dynamic Indicator of Basic Early Literacy Skills (DIBELS) (Good & Kaminski, 2002). The *Dynamic Indicators of Basic Early Literacy Skills (DIBELS)* assessment is a set of standardized, individually administered measures of early literacy development. The following subtests were used: (a) phoneme segmentation fluency, (b) nonsense word fluency, and (c) oral reading fluency. These are designed to be used regularly to monitor the acquisition of pre-reading and early reading skills.

English Language Learners (EL learners). Students whose primary language is a language other than English. Specifically, in this study, the home language of all the participants was Spanish. These students are tested every year to determine if they are limited in their English proficiency.

Experimental Group 1 (EG1). Participants in Experimental Group 1 have a home language of Spanish. The children in this group rotated through three centers. The centers used small group instruction for 30 minutes, 30 minutes of computer-based instruction with the *Lexia Primary Reading Program* with English oral language instructions, and 30 minutes of independent work.

Experimental Group 2 (EG2). Participants in Experimental Group 2 have a home language of Spanish. The children in this group rotated through three centers. The centers used small group instruction for 30 minutes, 30 minutes of computer-based instruction with the *Lexia Primary Reading Program* with Spanish oral language instructions, and 30 minutes of independent work.

Lexia Primary Reading Program (Lexia, 2004). The computer software evaluated in this study. Exercises included drill-and-practice exercises in phonemic awareness, sight word recognition, sound-symbol correspondence (beginning and ending sounds, syllables, segmenting), listening, and comprehension (Lexia, 2004).

Limited English Proficient (LEP). This term is used interchangeably with EL learner. It signifies a student who has difficulty with English listening, speaking, reading, and writing skills.

Monolingual English speaking peers. Students in the same age and grade range that have learned to speak, read, and write only in English.

Teacher Directed Instruction (TDI). The students in all groups received 30 minutes of teacher directed small group instruction during their assigned rotation. Students received instruction from their teacher who used Trophies First Grade (Harcourt, 2005) curriculum.

Primary Language. The language the child acquired first. Most often, this continues to be the language of the home.

Second Language Acquisition (SLA). The process by which a student acquires a language other than his or her primary or native language.

Title I schools. Title I schools receive additional federal funding to provide services to economically disadvantaged students.

Woodcock-Muñoz Language Survey-Revised (WMLS-R). (Woodcock, Muñoz-Sandoval, Ruef, & Alvarado, 2005). This measure assesses oral language and reading and writing skills in English and Spanish. The subtests used in this study included — picture vocabulary, verbal analogies, letter-word identification, and passage comprehension. The subtests picture vocabulary and verbal analogies provide a composite score that is called oral language. The letter-word identification and passage comprehension subtest provide a composite score called reading.

Limitations of the Study

This study is limited to a school district in the southwestern United States, specifically one school within that district. The generalizability of the results to first graders is limited to those with similar populations in urban school districts with comparable English and Spanish skills.

Additional limitations include:

(1) Intrasubject variability – Because of the growth of first graders and the length of the study, maturation existed as a confounding variable.

(2) All EL learners in this study had Spanish as their primary language. Generalizability among EL learners with different language backgrounds is therefore confounded.

(3) This intervention was completed three times a week for eight weeks. Therefore, the long-term effects of this intervention were not measured.

(4) During this study, the computer program used experienced technical difficulties. The impact of this technical difficulty may not be known.

(5) The comparison group in this study used computer software that provided instruction in math. Therefore, differences seen between the groups may be due to increased exposure to literacy instruction.

Summary

Literacy skills are crucial for success in school and life (Slavin & Cheung, 2005). English language learners have great difficulty becoming proficient readers in English (Freeman & Freeman, 2004). School districts need to find ways to best instruct EL learners in English oral language and literacy. Use of scientifically-based instruction is now mandated by *No Child Left Behind* (2001). If school districts wait the recommended time for children to acquire oral language in English before teaching them literacy skills in English, the child will fall farther and farther behind their monolingual peers. Currently, there is limited research on teaching EL learners to read in English. The present study contributes to the literature by examining the use of a computer program to teach literacy skills to EL learners. This study also examines the use of primary language support to teach EL learners to read in English. Without effective reading practice especially designed for EL learners, they will effectively be shut out of the instruction in the classroom. By examining computer-based literacy instruction and primary language support delivered via computer, educators will receive more information regarding effective literacy instruction for EL learners.

There are currently voids in the research surrounding beginning reading and EL learners (Peregoy & Boyle, 2005). First, phonics-based reading instruction delivered via computers specifically for EL learners has not yet been examined. Second, the impact of primary language support delivered via computer for EL learners has not been examined. The present study was designed to address the current voids in the research.

CHAPTER 2

REVIEW OF RELATED LITERATURE

Throughout the course of U.S. history immigrants have brought with them their own language and culture. The children of these immigrant families have been educated in the U.S. public school system. The presence of children who come to school with limited English proficiency presents a great diversity and challenge for public schools. This chapter will address demographics of EL learners in U.S. schools, theories of second language acquisition, bilingual/ESL educational models, and the evolution of bilingual and ESL instruction in schools. Lastly, an overview of reading approaches used to develop the beginning reading skills of EL learners will be presented.

Demographics of English Language (EL) Learners

National

In 2005, the United States had almost 10 million children that spoke a language other than English at home (AECF, 2006). From 1979 to 2004, the number of children that spoke a language other than English in their home rose from 3.8 million to 9.9 million (NCES, 2005). During this time, the number of children who had difficulty speaking English increased from 1.3 million to 2.8 million children. Also, the general student population grew 18%, while the growth of EL learners was 162%, during this interval of time. There was also an increase in the number of students who spoke both

a language other than English at home and who spoke English with difficulty. Together, the percent of these students increased by 114% (NCES, 2005).English Language (EL) learners in the U.S. speak one or more of 460 languages. The highest percentage of these students' primary language is Spanish.

As stated earlier, Spanish is the most common language of EL learners in the United States. This is also the most common home language of students who speak a language other than English in the home as well as of students who speak English with difficulty. Younger students (ages 5-9) whose home language is Spanish comprise a higher percentage, 37%, in the category of speaking English with difficulty than older students (ages 10-17), 24% (NCES, 2005). It is increasingly important that students be provided assistance in learning English at a young age.

The majority of LEP students are concentrated in a low number of schools (Cosentino de Cohen, et al., 2005). That is, almost 70% of students who have been identified as EL learners attend 10% of schools in the United States. These schools are identified as High-LEP schools by Cosentino de Cohen, et al. Approximately 50% of the students at High-LEP schools are EL learners. School identified as Low-LEP schools by Cosentino de Cohen, et al. only have 5% of their student body identified as EL learners. Cosentino de Cohen, et al. found that EL learners are becoming increasingly segregated in schools.

The schools that EL learners attend are drastically different from schools where small numbers or no EL learners attend. Schools with high numbers of EL learners also have majority minority populations (Cosentino de Cohen, et al., 2005). Minority students account for 77% of the students at these schools. At schools where no EL learners attend, Caucasian students account for 76% of the student population. Most EL learners attend

schools where a high percentage of the students live in poverty and most of the students are EL learners (Cosentino de Cohen, et al., 2005). Schools with high numbers of EL learners are more likely to be in urban areas than schools with a low number or no EL learners. Schools with a high number of EL learners and schools with low or no EL learners differ not only in terms of language ability, but also in the areas of poverty, student ethnicity and school location (Cosentino de Cohen, et al., 2005). English language learners are impacted by internal (i.e., school climates, educational resources) and external factors (i.e., familial, community, economic factors) of the school.

Poverty impedes the success of EL learners to a significant degree. English language learners are two times as likely as monolingual English speakers to live in poverty (Batalova, 2006). Students who are EL learners are 185% more likely than bilingual students or English-only students to live below the federal poverty line. In 2000, 65% of EL learners lived in poverty (Batalova, 2006). The educational system must compensate for the poverty-related factors in which EL learners bring with them to school everyday.

High poverty schools continue to differ in skills of the educators in the schools. Schools with high numbers of EL learners tend to have teachers with less educational training than other schools. Schools with high EL learner populations have higher numbers of teachers that hold only bachelors degrees or have temporary licensure, emergency licensure, or provisional licenses (Cosentino de Cohen, et al., 2005). A lower percentage of teachers at high EL schools have master's degrees when compared to teachers at schools with low or no EL learners. Higher numbers of teachers at schools with high EL learners receive training in the education of EL learners. However, larger

percentages of teachers at schools with High EL learners are new to the teaching profession.

When teachers are new to teaching, they typically have less training. Approximately 50% of teachers in high EL learner schools are fully credentialed compared to 80% of teachers at school with low or no EL learning populations (Cosentino de Cohen, et al., 2005). Teachers at high EL learner schools are two to three times as likely to be uncertified. They are also twice as likely to be teaching under a temporary certification.

At a national level, EL learners are receiving their education at schools that put them at a disadvantage. The schools that they attend are more likely to be segregated and in urban areas. Therefore, these schools will have the difficulties commonly associated with urban schools (e.g., large class sizes, larger school populations, higher rates of poverty, and health problems) (Cosentino de Cohen, et al., 2005).

Nevada

Nevada, as many others states, is being impacted by the growth in the number of students with limited English proficiency. From the years 1984 to 1999, the total school population grew by 115% (Klein, 2004). From the school year 1988-1989 to the school year 1999-2000, the enrollment of students who do not speak English as a primary language grew by 682%. In 2004, Nevada had 120,000 children that spoke a language other than English at home (AECF, 2004). In the school year 2003-2004, Nevada had 64,181 EL learners enrolled in school. Nevada is currently ranked 6th in states with the highest percentage of EL learners. This ranking is based on a percentage of 11.8% from the 2000 census. In the ten years from 1994 to 2004, the state of Nevada has experienced a 325% growth in the amount of enrolled EL learners.

During this same time period, the total enrollment for the state of Nevada rose 56%. Latino students make up the majority of EL learners in Nevada. The five most common languages spoken by EL learners in the state of Nevada are Spanish, Tagalog, Chinese (Unspecified), Vietnamese and Korean (Kindler, 2002). Latino students, many of whom are Spanish speakers, made up 26% of the state's student population in 2000-01. In 2003-04, Latino students made up 30% of the population. Spanish speakers, adults and students together, make up 92% of the EL learners in the state. This shows that the number of EL learners is growing exponentially faster than the number of other students. Nevada, as many other states, is struggling to find the best way to serve their EL population. In 2004, only 17% of EL learners received primary language instruction (Klein, 2004).

In response to the *No Child Left Behind Act* (2001), the state of Nevada developed a plan to help their EL learners achieve the standards set by the state (Klein, 2004). The five goals set forth by the state's plan are: (a) by 2013-2014, all students will obtain proficiency or better in reading/language arts and math; (b) all EL learners will achieve English proficiency and obtain proficiency or better in reading/language arts and math; (c) by 2005-2006 all students will be taught by highly qualified teachers; (d) all students will be educated in environments that are safe; and (e) all students will graduate from high school.

Nevada continues to face challenges in meeting these goals for its EL learners. Of the 8th grade students who reported drug and alcohol use in the past year, the majority of those students were Latino (AECF, 2004). Nevada continues to have difficulty with high school dropouts. Nevada is ranked 49th in the number of students who drop out from

high school (AECF, 2004). Educators in Nevada need to be concerned with how to meet the needs of EL learners.

In order to meet the needs of EL learners in Nevada, the state will benefit from following the recommendations made by Klein (2004). These recommendations are: (a) increase the quality of education for students at a disadvantage; (b) guarantee that all learners read at or above grade level; (c) train and increase retention of all teachers; (d) keep schools safe and drug free; and (e) provide after-school programs for students who are at-risk.

Clark County School District

In the state of Nevada, Clark County School District has the highest number of EL learners in the state (Klein, 2004). Clark County School District (CCSD) is the fifth largest school district in the United States. The top five languages in the CCSD are Spanish, Tagalog, Chinese (Unspecified), Filipino, and Vietnamese. Clark County School District (CCSD) is experiencing a greater growth in EL learners than the rest of the United States and the state of Nevada. In CCSD (2006), there are currently 80,270 non- and limited-English proficient students. The average annual growth that CCSD is experiencing is 12.18% more EL learners per year (CCSD ELLP, 2006). The national growth is approximately 5%.

Clark County School District is attempting to meet the academic needs of EL learners in their schools. The model used in CCSD is the Intensive English Model (CCSD ELLP, 2006). This model provides for the integration of language and content areas. The core of this model is to incorporate content-area instruction into language classes. The Intensive English Model also incorporates the use of language learning strategies for the purpose of

educating EL learners in the content areas (e.g., reading, writing, math, science, social studies) (CCSD ELLP, 2006).

Language Acquisition for English Language Learners

Second Language Acquisition

Several theories exist to explain how people acquire a second language (Chomsky, 1957; Cummins, 1981; Krashen, 1987; Skinner, 1968). These theories are greatly influenced by first language acquisition theories. These theories attempt to explain how EL learners are acquiring English while in the public school setting. These theories can also be used to determine effective programming for EL learners. Below is a description of second language acquisition theories including behaviorist theory, innatist theory, and interactionist theory.

Behaviorist Theory

Behaviorist theory of language acquisition dominated the field from the 1940s to the 1960s. Much of behavior theory was based on the work of B.F. Skinner. Skinner (1968) extended his conditional learning theory to incorporate language learning. He believed that language learning was very similar to other types of learning. Behavior theorists believed that language learning (first or second) was learned through two processes (Macaro, 2003). The two processes are imitation and repetitive action. According to this theory language is thought to be learned through a series of mechanisms (Macaro, 2003). Second language learning is believed to be the development of new language habits. Behaviorists believe that first language habits may be an impediment to learning the

habits of the second language. Second language learners must replace the habits of their primary language with the habits of their second language (Gass & Selinker, 2001).

Lado (1957) discussed the difficulty for learners to learn a language that differs greatly from their primary language. He found that learners who had a primary language that varied greatly from the second language (e.g., alphabetic principles, formation) had a more difficult time learning the second language. He constructed the Contrastive Analysis Hypothesis. The Contrastive Analysis Hypothesis holds that elements of a language that are similar to the primary language will be easy to learn while the elements of language that are very different from the primary language will be very difficult to learn.

Behaviorists believe that through imitation, repetition, and reinforcement of syntax and morphology, second language acquisition is explained. Behaviorists believe that learners learn phrases similar to their native language (L1) more easily. Phrases that vary greatly from L1 will require much more practice for learning (Macaro, 2003). The behaviorist theory of language acquisition states that children learn language through a stimulus, response, and reinforcement cycle. Phrases that are similar to the primary language require little stimulus, response and reinforcement. While phrases that are very different from the primary language require many cycles of stimulus, response, and reinforcement. Children are exposed to language from the environment, produce a response to the environment, and learn from the reinforcement to their response also provided by the environment (Peregoy & Boyle, 2005). That is, children learn language through a series of responses and reinforcements.

Behaviorist theory had a great impact on the development of the audio-lingual method of teaching a second language. The audio-lingual method uses dialogues and drills for language acquisition. Typically, in an audio-lingual session students hear phrases and then repeat the phrases. Key patterns and phrases are repeated often to develop new habits. Errors are corrected immediately to prevent bad habits from forming. The objectives of the audio-lingual method are correct grammar and pronunciation, ability to respond appropriately, and knowledge of adequate vocabulary to correctly use grammar skills.

However, behaviorist theory could not answer all the events seen in children acquiring two languages. One major criticism of this theory is that it does not explain phrases that children speak that are not imitations of adults (e.g., two mouses). Linguists began to notice that children did not speak in the large phrases that were memorized. Noam Chomsky provided the biggest critique of this theory of language learning. Chomsky (1957) stated that because children are able to use the words they know to make new sentences they must have an internal device for learning language. Chomsky became a leader in the Innatist theory of second language acquisition.

Innatist Theory

The leader in innatist theory was Chomsky (1957). Chomsky disagreed that language was learned due to stimulus, response, and reinforcement cycles. Innatists believe that children are born with a certain capacity for learning language. Humans are genetically built to learn and convey language. Chomsky (1957) believed that the human brain has a mechanism for language, the Language Acquisition Device (LAD). The language acquisition device is preprogrammed to infer the rules of language when it is stimulated

by language. Once the LAD has been turned on, children begin to discover the patterns of language and internalize grammar rules. Innatists believe that language is acquired and not learned (White Soltero, 2004).

Chomsky's theory of first language acquisition had an impact on the theories of second language acquisition. One theory that developed from Chomsky's work was Dulay, Burt & Krashen's (1982) Creative Construction Theory. The Creative Constructive Theory proposes that EL learners make similar mistakes while learning English that monolingual English peers make. When they are developing English language skills, EL learners construct the rules for second language acquisition that are observed in English first language acquisition. For example, children over generalize the *–s* ending rules to words that are exceptions (e.g., *mans* rather than *men*).

Building on the Innatist Theory, Krashen developed his own theory of second language acquisition. Krashen's Theory of Second Language Acquisition (1987, 1988) consists of five hypotheses: (a) acquisition-learning hypothesis, (b) monitor hypothesis, (c) natural order hypothesis, (d) input hypothesis, and (e) affective filter hypothesis.

Acquisition-learning hypothesis. According to Krashen (1987), there are two independent systems of second-language performance. The first is the acquired system, which is the result of a subconscious process similar to the one used to learn a first language. In order for this system to develop, a child needs significant contact with the second language. This interaction with the new language allows the learner to concentrate on the act of communication rather than the appropriate use of grammar. The second system is the learned system, which involves the instruction of grammar rules and the

learner's conscious efforts to learn a new language. It is important to develop the acquired system before a student develops the learned system.

Monitor hypothesis. The monitor hypothesis is the summation of the acquisition and the learning system (Krashen, 1987). Here the acquisition system is responsible for making utterances, whereas the learner system acts as the editor or monitor. The learner develops an internal monitor of language. Monitoring aids in the planning, editing, and correcting of the new language. It is the internal voice that corrects language before the student speaks.

Three specific conditions must be present in this stage to ensure successful language learning: (a) the second-language learner must spend enough time with the second language. This amount of time varies by learner (e.g. some children will only need months of exposure whereas another child made need years), (b) the learner must focus on the form of the new language (e.g., when is it appropriate to use the *–ed* ending), and (c) the learner must think about the correctness of the language he or she uses. These conditions are assisted by the internal monitor/editor that monitors speech. Krashen (1987) suggests that the editor/monitor role should be minor in that it should be used to correct deviation and to make speech more polished. Krashen identifies three types of monitors: (a) learners who overuse their monitor (monitor all of their speech or do not speak out of fear that the monitor is not correct), (b) learners who have not learned to monitor or choose not to monitor their conscious knowledge (speak before taking the time to monitor and therefore use incorrect speech), and (c) learners who use their monitor properly (thinking the sentence through and then speaking without error).

Affective filter hypothesis. The affective filter hypothesis deals with the affective variables that play a facilitative role in second-language acquisition: motivation, self-confidence, and anxiety. The optimum combination of these variables is high motivation, good self-confidence, a good self-image, and a low level of anxiety (Krashen, 1988). This combination allows for the easiest time learning a second language. Low motivation, low self-esteem, and very high anxiety, on the other hand, can combine to raise the affective filter and result in a mental block that prevents input from being used for language acquisition. When such blockage occurs, it often obstructs second-language acquisition. Computer-based intervention can alleviate some of the affective factors that students may face while learning a second language.

Natural order hypothesis. The natural order hypothesis involves the acquisition of formal language in a natural order. This order is predictable and encompasses the stages of pre-production, early production, speech emergence, and intermediate fluency. In the pre-production stage, the learner is obtaining information about the patterns and pragmatics of a language at a nonverbal level. That is, the student is learning about sentence structure by listening to others. Interaction with peers is very important at this stage.

Input hypothesis. The input hypothesis is concerned with the acquisition system, not the learning system of language. Learners follow a natural order when they receive input from a second language (Krashen, 1988). Thus, the language input should be one step beyond their current level of linguistic capability. If a student has mastered the present tense, information can be provided in the past tense.

The improvement and progression exhibited by the learner also follow this natural order. It is important to remember that not all learners can be at the same linguistic competence level at the same time. Krashen (1988) suggests that the natural communicative input be used to increase the student's understanding of the second language. Language commonly used in the second language is often used at the student's level.

This hypothesis is important in the justification for using Spanish to increase English proficiency. English language learners are being forced to learn to read in English before they have the oral language proficiency that is recommended. The comprehensible input that may be the most appropriate for them may be in their primary language. Later in the discussion, *Lexia Primary Reading Program* (Lexia, 2004), a computer software program will be discussed. This is one of the few programs that allows for the use of Spanish to teach English literacy skills. The *Lexia Primary Reading Program* (2004) provides oral instruction in Spanish for students who speak Spanish, but are learning to read in English.

Interactionist Theory

Interactionists believe that language is learned through a stimulus, response, and reinforcement pattern and that humans are born with an ability to learn language. Language is produced by genetic and environmental factors. In this theory, family or caregivers are a critical piece in the child's language acquisition (Peregoy & Boyle, 2005). Caregivers facilitate the child's ability to use their innate language ability. Interactionists believe that language acquisition occurs from communication and that acquisition is facilitated by caregivers. They also believe that the child's innate ability and the environment both play an important piece in the student's ability to learn

language. Children will make greater progress in a language if they have opportunities to interact with native speakers of the language (Peregoy & Boyle, 2005).

Interactionists believe that during the process of second language acquisition interaction between native and nonnative speakers is central to acquisition. These natural conversations provide opportunities for nonnative speakers to express themselves and therefore be exposed to more comprehensible input as they learn the language. When EL learners are in a natural setting, they will use language that they understand and interact with others who speak at a level higher than their own. Probably the most widely applied theory of second language acquisition is that of Cummins (1981), who incorporates psychological and cognitive factors in the language acquisition process.

Common Underlying Proficiency Theory. Cummins (1981) hypothesized a developmental interdependence influenced by the importance of cognitive skills in the language process, maintaining that the level of second language ability is related to the competence of a learner in the development of his or her first language. He argued that first-language acquisition plays an important role in second-language development. This is a result of the transfer of the cognitive skills used in the acquisition of the first language to the acquisition of the second language. Cummins' theory of second-language acquisition consists of two major dimensions, Basic Interpersonal Communication Skills (BICS) and Cognitive/Academic Language Proficiency (CALP).

Basic Interpersonal Communication Skills (BICS) involve the informal language of conversation. Basic Interpersonal Communication Skills (BICS) are often referred to as the language of the playground in that most children learn BICS through informal interaction with their peers. Cummins (1991) suggests that the acquisition of this level of

communication takes between two and three years of exposure with the target language. Children who are proficient at the BICS level will be able to discuss topics with which they are very familiar (e.g., school, television programs). Cognitive Academic Language Proficiency refers to language skills that are associated with literacy and cognitive development. As opposed to BICS, these skills are learned most often through formal instruction in school. Cognitive academic language proficiency is generally gained while at school; therefore, it takes much longer to develop. According to Cummins (1991), it takes a learner 5-10 years to obtain CALP. This is the type of language that is necessary to learn in the content areas.

The common underlying proficiency theory applies easily to the acquisition of oral language as well as reading. When students understand the oral language instruction, they will acquire reading skills as well. Students who are able to use BICS skills in their primary language may be able to use these skills to obtain literacy skills in English.

The common underlying proficiency theory states that first-language and second-language acquisition and the cognitive factors in second language acquisition are closely tied. Ervin-Tripp (1974) studied children who spoke English as their first language. They were living in Geneva attending a French-speaking school. She found that the students made errors in the second language based on adhering to the grammar rules of their first language. This shows that students were transferring their previous knowledge of language rules to their new language.

Other studies have also found that student use their primary language rules when acquiring a new language. For example, Krashen and Biber (1988) concluded that the ease with which students attain academic achievement in a second language is directly

related to the strength of their native language achievement. Further, students who have adequate schooling in their native language become more proficient in English much faster than the students with no schooling in their first language (Bernhardt & Kamil, 1995; Brisbois, 1995; Collier, 1989).

In summary, current theories of second language acquisition center around genetic ability and environment. The behaviorist theory of language acquisition states that children learn language through a stimulus, response, and reinforcement cycle. Innatists believe that children are born with a certain capacity for learning language. Interactionists believe that language is learned through a stimulus, response, and reinforcement pattern and that humans are born with an ability to learn language. One of the most popular interactionist theories is the common underlying proficiency theory which incorporates BICS and CALP and describes the time that is necessary for a child to be able to learn a language. Each of these theories plays an important role in the development of this present research study. Understanding these theories is vital when discussing educational models that are used to teach EL learners.

History of Educational Models and Approaches

Many types of educational programs are used to teach EL learners, with and without disabilities. Some people believe that the best way for EL learners to learn reading and writing in English is to be taught only in English, while others believe that the child must become proficient in the primary language first. There are various programs designed to educate children who are learning English. Some of these programs rely on bilingual education for students while others use only English as the language of instruction. The

main difference between these programs is the amount of the primary language that is used. Below is a description of English language programs including bilingual instruction, transitional bilingual, maintenance bilingual, dual language programs, two-way immersion, English-as-a-Second Language (ESL), submersion, Canadian-style immersion, Sheltered subject matter, and Structured English Immersion (SEI).

Bilingual Programs

Bilingual Instruction. The bilingual approach teaches children academic knowledge in both their primary language and English simultaneously. One of the most important features of bilingual education is the use of the first language as an instrument of instruction. The primary language is used in conjunction with English to instruct the students.

Research shows that continual education in both the primary language and the second language (most often, English) supports linguistic and cognitive development (Collier, 1989, Ervin-Tripp, 1974; Krashen & Biber, 1988). A child taught to read in the primary language will learn to read in his or her second language faster than a child who has to learn the oral language of the second language, while at the same time learning to read in the second language without any prior reading skills to transfer from the primary language. Oral language skills develop faster than reading and writing skills, therefore, bilingual children will benefit from the use of their primary language while learning English.

Schmitt (1994) conducted a longitudinal study of a bilingual early-childhood program with 40 EL learners. After two years, the students who were in the bilingual preschool scored higher on the achievement test in English than the comparison group, consisting of

ELL preschool children in an English-only program. The data indicate that the effects of the bilingual preschool can be long lasting for both the primary language and the second language.

Transitional Bilingual. This type of bilingual programming uses the student's primary language for two to three years and then phases the student out of bilingual instruction into English-only as soon as possible. The belief behind this type of programming is that if the student is not quickly transitioned into English-only programming, he or she will fall behind monolingual peers (Cushner, McClelland, & Safford, 2003). These programs use the primary language less and less as the child become more proficient in English (Díaz-Rico & Weed, 2006).

Maintenance Bilingual. This type of bilingual programming also uses the student's primary language as a support for instruction. Maintenance bilingual programming allows the student to have bilingual support for more time than the transitional program. These types of programs extend through elementary school and sometimes through middle school. While students advance through the grades, they are exposed to meaningful English content instruction. At the same time, students are also given learning opportunities in their primary language. The primary goal of this type of programming is for students to become bilingual and biliterate (Díaz-Rico & Weed, 2006).

Dual Language Programs

This type of education uses two languages to educate students. The major difference between this type of programming and maintenance bilingual education is that dual language programs instruct students that are EL learners together with monolingual English speakers in the same classroom. Maintenance bilingual programming is only for

EL learners. Dual language programs have been called by many different names, such as—bilingual immersion, bilingual enrichment, developmental bilingual education, double immersion, and two-way immersion (White Soltero, 2004). The goal of dual language programs is for the students to become bilingual and biliterate. This programming houses English-only students as well as EL learners. The class is usually made up of an equal number of monolingual English-speaking students and EL learners. These programs foster oral and academic skills in the two languages. When students leave this type of program they can speak, read and write in both languages. The instructors in these programs need to be able to speak fluently in both languages. However, teachers consistently speak only one language to the children. Two teachers provide instruction for the students. These teachers take turns teaching the students in his or her language, never speaking to the children in the other teachers' language.

English Language Instructional Programs

There are different types of English language instructional programming for students who are learning English. The focus of this type of program is to teach EL learners English as quickly as possible. These programs are very common in the United States and are supported by current policy (NCLB, 2001). Types of these programs include English-as-a-Second-Language (ESL), Submersion, Canadian-style immersion, Sheltered subject matter, and Structured English Immersion.

English-as-a-Second Language (ESL). Providing English-as-a-Second-Language support to students is a common way of giving support to EL learners. Thomas and Collier (1997) found that ESL programs are implemented throughout the United States in many forms and with different degrees of effectiveness. These types of programs have

been implemented in the classroom as well as in a pull out format. There are generally two types of ESL programs—traditional and content-based. In the traditional ESL program, English is taught as a single subject. In other words, English is taught as in a foreign language class. This model places emphasis on grammar, vocabulary, and error correction. Drill and practice exercises are used to teach the students English.

Content-based ESL emphasizes the learning of English through content. This programming does not teach English as a separate subject. Instead, English language and literacy is taught along with core subjects. English is integrated while teaching reading, math, science, and social studies. The teacher also includes strategies to increase the students' English language and literacy skills. English Language Development (ELD) and Specifically Designed Academic Instruction in English (SDAIE) are types of Content-based ESL (White Soltero, 2004). English Language Development (ELD) is a type of programming in English to build vocabulary, comprehension, and fluency in English. This programming is focused on learners in the beginning stages of learning English. Specifically Designed Academic Instruction in English (SDAIE) is an approach to teaching EL students that makes the content comprehensive while increasing English language development (White Soltero, 2004). This type of programming is typically used for EL learners in the intermediate to later stages of second language acquisition.

Submersion. Submersion programming is actually a lack of programming for students who are learning English. Submersion instruction provides no support in the student's primary language. This is a sink-or-swim type of programming. EL learners are placed into classrooms and expected to learn at the same level as their monolingual English-speaking peers with no support in their primary language. This programming often occurs

when there is no one in a school district who can provide the needed support for EL learners. Students who are put in a submersion environment may develop problems with both languages because of the lack of first-language development (Collier, 1995).

Canadian-style immersion. Canadian-style immersion has been used with French-speaking children in Canada. These students, who come from mostly middle-class families, are taught most of their academic skills in their second language (in this case, English) at a level the students understand. While many consider this to be English immersion type of program, this is not truly an English-only program because the goal of the program is bilingualism, not the replacement of one language with another. In comparison, in the United States many EL learners come from families living in poverty (National Center for Children in Poverty (NCCP, 2003). Students who live in poverty are at a higher risk for factors that negatively affect learning (e.g., low birth weight, poor nutrition) than students who come from middle-class families. As a result, this type of programming has not been successful in the United States.

Sheltered subject matter. This type of programming is based on Canadian-style immersion (Krashen, 1991b). In this program, academic skills are taught in the primary language, and students are early-exited into English immersion for all subjects. In the sheltered subject-matter program, children slowly work their way up to full immersion, beginning with only their electives (e.g., music, art, and library) in English. In early-exiting programming, the children are given early instruction in their primary language and then placed into English-only programming as soon as possible.

Structured English immersion. Structured English Immersion (SEI) uses English instruction at the learner's readiness level with teachers providing instruction in English

70-90% of the time (Baker, 1998). This is not an English-only program in the true sense; however, it uses far less of the student's primary language than bilingual programming. Proponents of SEI believe that students can successfully learn English and non-language subjects taught in English at an appropriate level and at the same time (Baker, 1998).

In summary, different types of programs exist to teach EL learners. Bilingual education approaches include the teaching of academic knowledge in both their primary language and English simultaneously. Dual language programs instruct EL learners and monolingual English speakers to become bilingual and biliterate. English language programming focuses on teaching EL learners English as quickly as possible. School districts need to understand how the process of second language acquisition occurs, so they can make appropriate choices about the language and literacy instruction for these students. The history of bilingual education in United States provides a context for understanding the implementation of various types of bilingual and ESL programs overtime.

History of Educational Policy

In the colonial era, bilingual programs were not truly bilingual. They were programs taught in the student's primary language (e.g., German, French, and Scandinavian) and English was taught as a subject in the school (Escot, Lee, Villarreal, & Zavala, 2000). Most of these schools were not publicly run institutions but schools run by churches. In 1855, the California Bureau of Instruction stated that English must be the language used in schools. In the 1870s, a St. Louis superintendent supported the idea of having bilingual education. This started a trend of public school taught in languages other than English.

At the end of the 1800s, there were schools with instruction in German in Cincinnati, St. Louis, San Francisco, St. Paul, and Louisville. In the beginning of the 1900s, approximately 4% of students who spoke German received part of their instructional day in German (Escot, et al., 2000). After the United States entered World War I, there were increased anti-German feelings and most German-language programs were discontinued. In the 1940s, many ESL programs were used. By 1963, present-day bilingual education programs had developed. These programs were first used in Miami, Florida with Spanish-speaking students arriving from Cuba in classrooms with their monolingual English-speaking peers (Escot, et al., 2000).

Prior to the late 1960s, the most common method used to teach children who did not speak English was immersion. Immersion occurs when EL learners are placed in an educational setting with no primary language support. Policy on how to educate English language learners in the United States has a long history of controversy often tied to immigration and English-only litigation. In 1968, the *Bilingual Education Act* was passed. This is referred to as the first federal acknowledgement of the needs of EL learners (Stewner-Manzanares, 1988). The act became Title VII of the *Elementary and Secondary Education Act*. Title VII of the *Elementary and Secondary Education Act* provided funding for school districts to use native language support to educate EL learners.

Various types of bilingual programs were implemented and later criticized. Research has been reported to support both sides of this controversy Rossell & Baker, 1996; Greene, 1998; Ramírez et al, 1991; Thomas & Collier, 1997; Thomas & Collier, 2002). The *Ramírez Report* published the findings of an eight-year study to determine what

types of programs are best suited to helping Latino children achieve in school (Cummins, 1992).

The primary purpose of this study was to compare the effectiveness of two types of programming for EL learners (Ramírez et al, 1991). The programs that were compared were early-exit bilingual programs, late-exit bilingual program, and the Structured English Immersion (SEI) strategy. The uniqueness of the Ramírez Study is that researchers for and against bilingual education accepted the design of the study. All parties had a say in the design of the study. This eight-year study began in the 1983-1984 school year and ended in the 1990-1991 school year. The intervention took place over four years. There were over 1000 participants per year. The participants in this study were all Spanish-speaking EL learners. The data were collected from 9 school districts, 46 schools, and 136 classrooms.

The *Ramírez Report* evaluated the academic progress of Latino EL learning elementary students in three types of programs. The first program was an English immersion program. This program used English almost exclusively throughout the academic day. In the next program, the early-exit bilingual program, Spanish was used one-third of the time in kindergarten and first grade and then phased out rapidly after that. In the late-exit program, Spanish was the primary language of instruction in kindergarten. In first grade, English was used about one-third of the time. By third grade, each language was used 50% of the time. In fourth grade and after, English was used about 60% of the time.

Data were collected using a variety of instruments. The *IDEA Language Proficiency Test* was used to assess the student's oral language proficiency. The *Test of Basic*

Experiences (TOBE) was used to measure English language arts, English reading, math assessed in English, Spanish language arts, Spanish reading, and math assessed in Spanish for the students in kindergarten. The *California Test of Basic Skills* (CTBS) was used to measure English language arts, English reading, math assessed in English, Spanish language arts, Spanish reading, and math assessed in Spanish for students in the other grades. Teacher interviews were conducted to determine class schedule, special needs of the student, teacher level of training, teacher experience, and English/Spanish use in the classroom. Parent interviews were conducted to determine income, parent education, parent employment, home/community language usage, parent participation, parent attitudes, and length of time in the United States.

Data were analyzed using an Analysis of Covariance (ANCOVA) for the analysis of the math, language arts and reading skills (Ramírez, et. al., 1991). The secondary analysis was done based on an individual growth curve for each student. A computer program which developed a hierarchical linear model related the individual growth curves to background information (e.g., school information, parent/home information).

When the immersion program and the early-exit program were compared, it was found that EL learners in immersion programs and early-exit programs were performing at comparable levels in English language skills and math (Ramírez, Yuen, & Ramey, 1991). Although these groups were performing comparably to each other they were both very far behind the general population (Cummins, 1992). These findings showed that the amount of time that students spent in an English classroom was not the key. If this were the case, the students in the immersion program would have outperformed the students in the early-exit program.

It was found that students in the late-exit program achieved better than both of the other groups in math (Ramírez, Yuen, & Ramey, 1991). The report found that in the areas of math, English reading and English language, students who had the greatest opportunity to receive primary language skills had a greater growth. If the primary language support is continued, it is to be expected that EL learners would catch up to the average achievement of all students in math (Ramírez, Yuen, & Ramey, 1991).

EL learners in the three types of programming increased their skills in math, English language, and reading as quick as or quicker than other students (Ramírez, et. al., 1991). This shows that providing students with instruction in their primary language does not hinder their English skills acquisition.

Therefore, this project supports the efficacy of bilingual education and the use of the primary language to develop second language acquisition and literacy. Not only did this show that late-exit bilingual programming can help students achieve in their primary language as well as English, but along the way it showed that previous interventions such as time-on-task (e.g., provides more instruction in English) are flawed (Cummins, 1992).

Rossell and Baker's (1996) conducted a review of research that purported to show the ineffectiveness of bilingual education. Rossell & Baker (1996) read over 300 research articles and found that 72 of them were methodologically acceptable. This meant that the study had an experimental and a comparison group, and that if the subjects were not randomly assigned then a statistical control was used to account for pre-intervention differences (Rossell & Baker, 1996). Most of the participants in the reviewed studies were Spanish-speakers and were in elementary or junior high school. The purpose of the

study was to summarize the quantitative data available regarding the effectiveness of bilingual education.

In the 72 research studies that were reviewed, Rossell & Baker (1996) used simple percentages to determine the most effective type of programming for EL learners. The research studies were divided into the following categories: (a) Transitional Bilingual Education (TBE), (b) submersion, (c) ESL, (d) structured Immersion, and (e) maintenance bilingual education (Rossell & Baker, 1996).

When comparing TBE to submersion, it was found that in the area of reading 78% of the studies reviewed (N = 60) TBE was no different or worse than submersion. In the area of language, 93% of the studies (N = 14) showed that TBE was no different or worse than submersion. In the area of math, 91% of the reviewed studies (N = 34) found that TBE was no different or worse than submersion.

When comparing TBE to ESL, it was found that in the area of reading none of the studies reviewed (N = 7) found TBE to be better than ESL. In the area of language none of the studies reviewed (N = 3) found TBE to be better than ESL. In the area of math, 3 of the reviewed studies (N = 4) found that TBE was no different or worse than ESL.

When comparing TBE to structured immersion, it was found that in the area of reading none of the studies reviewed (N = 12) found TBE to be better than structured immersion. In the area of language, none of the studies reviewed (N = 1) found TBE to be better than structured immersion. In the area of math, none of the studies reviewed (N = 8) found TBE to be better than structured immersion. When comparing TBE to maintenance bilingual education, only one study that compared these types of

programming was reviewed. It showed that TBE was better than maintenance bilingual in increasing the reading skills of EL learners.

Rossell & Baker (1996) concluded that additional methodologically sound studies need to be conducted to assist in more informed decisions regarding EL learners. Rossell & Baker (1996) also stated that the support for transitional bilingual education has not been based on research that is methodologically sound. This report stated that its findings do not support transition bilingual education. Initially, opponents of bilingual education used these results in their arguments against bilingual education. Then, Greene (1998) conducted a meta-analysis of the effectiveness of bilingual education, which is a more sound design than the vote-counting method used by Rossell & Baker (1996).

Greene (1998) conducted a meta-analysis of the review of the literature that Rossell & Baker (1996) completed. Greene (1998) found that only 11 of the studies that Rossell & Baker (1996) reviewed were methodologically sound according to standards. Greene (1998) stated more clearly the requirements for methodically sound research that Rossell & Baker (1996) had set and that one additional requirement was necessary for the studies to be considered sound research. The new requirement was that the bilingual programs had been implemented for at least one school year.

In order to complete the meta-analysis, Greene (1998) followed the conventional meta-analysis technique (Rosenthal, 1991). An effect size and a z-score were calculated for the 11 studies considered acceptable. The effect size and z-scores were calculated for English skills, reading skills measured in English, math skills in English, and if applicable Spanish measures. The skills for the EL learners were then combined to

produce an average gain score. The average gain score was compared to students in the comparison groups.

Greene (1998) found that having some primary language support accounted for an average gain score in English reading of .21 standard deviations. This equates to a z-score of 2.46. Greene (1998) concluded that both of these scores signify statistical significance. Therefore, it can be concluded that some primary language support increases the acquisition of English reading skills.

Greene (1998) did not find the same results in the area of math. The average gain score for students receiving primary language support was .12. The z-score that equates to this growth is 1.65. This falls short of statistical significance in this area $p = .10$. Though some primary language support may be beneficial it is not certain that the primary language support is the cause of the gain in the math score.

Greene (1998) found that bilingual programming was very beneficial to Spanish language skills. The average gain score for students receiving primary language support was .74. The z-score that equates to this growth is 3.53. It can be concluded that giving students primary language support allows students to maintain and increase their primary language skills. Greene provided support for bilingual education through his research. Greene concluded that students who receive some type of instruction in their native language perform significantly better than those taught only in English. Greene selected his studies for review from the previous work of Rossell and Baker (1996).

Thomas & Collier (1997) conducted the first study to look at the long-term impact of bilingual education based on the type of program that the student received. This study was completed over 12 years. From 1982 to 1996, data were collected on EL learners in

differing types of EL programs (i.e., dual language, maintenance, transitional bilingual with content-based ESL, transitional bilingual with pullout ESL, content-based ESL only and pullout ESL only). The primary purpose of this study was to determine not only which type of programming was better for EL learners, but also to determine what components of an effective program for EL learners produce higher long-term achievement.

Thomas & Collier (1997) included five school districts in the study. The number of participants was 42,317. The K-12 students who participated attended one of the schools for more than four years. Students spoke one of 150 languages. Spanish was the most represented in the sample. Data were analyzed over the long-term. Researchers found that all the EL learners made reading progress around 3rd to 4th grade. However, this progress did not continue in the long-term. Thomas & Collier reported English reading scores in the 12th grade were not equal across programming type.

Students in the dual language program had the highest NCE score of 61. The scores dropped based on the amount of time spent in bilingual programming. Students in the maintenance bilingual program had a NCE score of 52. The students who were in the transitional bilingual with content-based ESL had a NCE score of 40. The students who received programming through transitional bilingual with pullout ESL obtained a NCE score of 35. Students who received content-based ESL instruction had a NCE score of 34. The group that had the lowest NCE (24) was the group that had the students received pullout ESL instruction.

Thomas & Collier (1997) reported that this pattern was seen in science and social studies as well. This study strongly supports bilingual education for EL learners. An

additional finding of the study was that students who received content-based ESL and pullout ESL were more likely to drop out of school than students in dual language or maintenance programs.

Thomas & Collier (2002) continued their research through another longitudinal study that examined the effectiveness of different types of bilingual programs on the academic skills of EL learners. This study occurred in five school districts in Maine, Oregon, Texas, and Florida. Data analyzed were 210,054 student records. Each student record included all the school district records for the student collected over the school year (e.g., student characteristics, grade level, school program(s) that student attended, and academic achievement measures).

The assessments used to assess the English skills of the students were the Iowa Test of Basic Skills, Stanford 9 (2002), Terra Nova, and the California Test of Basic Skills. The programs that were compared in this study were dual language, 50-50 two-way bilingual immersion, 90-10 developmental bilingual one-way education, 50-50 one-way bilingual education, 90-10 transitional bilingual education, 50-50 transitional bilingual education, content-based ESL, and English mainstreaming. Their findings were very similar to the 1997 study.

Students who had been placed in the immersion settings had the lowest English reading median NCE score of 25 in the 11th grade. Students who received programming through maintenance and dual language programs had positive outcomes in English reading skills. Students in these programs were the only students to reach the 50th percentile in both English and their primary language. They also reported that the fewest students dropped out from this type of programming. Many times research is used to

impact legislation. Legislation has made an important impact on how programming is offered to EL learners.

Legislation

In 1968, the *Bilingual Education Act* was passed. This is recognized as the first federal acknowledgement of the needs of EL learners (Stewner-Manzanares, 1988). The act became Title VII of the *Elementary and Secondary Education Act.* Title VII of the *Elementary and Secondary Education Act* provided funding for school districts to use native language support to educate EL learners. Through this act all schools were compelled to provide bilingual education programs. This law was passed during a period of high immigration rates into the United States. Through this act, federal funding was provided for bilingual education. The first year provided resources for 76 bilingual programs across the nation for students with 14 different home languages (Escot, et al., 2000).

However, discontent with bilingual education began to rise. This discontent was realized legally when the *Bilingual Education Act* was reauthorized. In 1978, the *Bilingual Education Act* became the *Transitional Bilingual Education Act.* The *Transitional Bilingual Education Act* resulted in less financial support for bilingual instruction. Only when language support was necessary for the child to acquire competence in English would the school receive funding. This change was the catalyst for the English-only movement that started in mid 1980s.

Many states have moved to pass English-only laws in their states (Crawford, 2004). Currently, 22 states have laws that adopt English as the official language. California, Massachusetts and Arizona have passed legislation that makes bilingual education illegal.

In 1998, California passed its English-only education legislation. This law stated that students in California were to be taught English by being taught in English. Students who are EL learners would be taught through Sheltered English Immersion (SEI). This law provided for parental waivers if requested. Use of these waivers allowed parents to request alternative instructional programming, such as bilingual education for their children.

In 2002, Massachusetts passed similar legislation. The requirements for education in Massachusetts became that children be taught in English-only classrooms. Parents could request bilingual education through models such as two-way immersion. In 2002, Arizona also passed similar legislation. This legislation has since been repealed as a violation of First Amendment rights. In 2002, Colorado attempted to pass a similar law, but the citizens of the state did not pass the measure. These laws are critical for EL learners. These states set precedence for other states. In general, these laws, which mandate English-only instruction for EL learners have and will continue to have a negative impact on the achievement of EL learners (Ovando, et al., 2003).

These laws do not allow for primary language support in the classroom and require the same instructional programming (e.g., English-only) for all EL learners, limit the rights of parents to choose the programming for their children, threaten teachers with penalties for violating these laws, and block further legislation to change the current laws without a super majority (Ovando, et al., 2003). There are flaws in this type of instruction for EL learners. It presents in the relatively lower language and literacy performance of EL learners on standardized achievement tests as compared to their non-ELL peers (Freeman & Freeman, 2004).

The most recent impact on the education of EL learners was the *No Child Left Behind Act* of 2001. During this reauthorization, Title VII, the *Bilingual Education Act* was renamed Title III, the *English Language Acquisition, Language Enhancement, and Academic Achievement Act.* Funding is still available through the *No Child Left Behind Act*; however, the accountability for schools to educate EL learners has changed. Schools are judged by their ability to reclassify EL learners as soon as possible. Primary language support is discouraged. The law also severely changed the funding for programs that provided services to EL learners. The new emphasis of programs funded by these monies is to emphasize English acquisition and academic achievement in English. Bilingual education is not encouraged nor supported through this legislation. The emphasis is instead placed on English-as-a-Second Language (ESL) methods as opposed to bilingual education. Schools, which do not show English academic achievement for their EL learners, are subject to penalties.

The *No Child Left Behind Act* (2001) presents difficulties for EL learners. While funding for the education of EL learners decreased, the pressures on school districts to get these students to grade level is increasing. Schools are expected to assess all their students in reading and math in 3rd and 8th grade. By the school year 2007-2008, assessments in science will also be required. The act mandates that teachers in bilingual programs must be fluent in English and other languages used in the classroom. Under this act, parents have the right to enroll their children in bilingual education programs, but it puts a three-year time limit on bilingual programming. After three years, the student must be enrolled in English-only instruction regardless of student or parent preference.

Litigation

There have been several significant court cases that have decided the fate of bilingual and ESL education. One of the first cases decided was *Meyer v. State of Nebraska* (1923). The decision in this case stated that English should be the language of the schools. It also stated that no languages other than English should be taught before the eighth grade. It was ruled that English should be the primary language of children taught in Nebraska. The reason provided by the court was that this was necessary in the interest of public safety.

In 1971, *United States v. State of Texas* stated that schools could not discriminate against students based on race, color, or national origins. At that time, EL learners were greatly segregated from monolingual English speakers. The two segregated school districts were ordered to be joined. After they were joined, the school district was instructed to incorporate bilingual and bicultural education programs for the students.

In 1974, *Lau v. Nichols*—a cornerstone case in the fight for EL learners' rights—was decided. In this case, the appellate court found that providing equal materials to students who do not have English skills is not meaningful instruction. Students must also be taught oral English language skills. This meant that students who did not speak English were being denied quality education if the school did not provide support for the learning of English. This ruling states that it is not enough to provide instruction only in English, schools must also provide English in a comprehensible manner. In 1975, guidelines for school districts were developed. These guidelines assisted schools in identifying and evaluating EL learners and for planning appropriate bilingual education and ESL education.

After the Lau decision, Congress adopted section 1703(f) of the *Equal Opportunity Act.* This section states that "no State can reject opportunities to anyone on the basis of race, color, sex, national origin, or by the failure of the educational agency to take actions to overcome language barriers that impede equal participation of the students in the programs" (Equal, 1974).

Another court case, *Castañeda v. Pickard* (1981) ruled that school districts must meet two fundamental needs of EL learners in order to comply with the new requirement of section 1703(f). The school district must provide programming through which EL learners can acquire the English skills necessary to compete academically with their English-speaking peers and the school must make sure the EL learners do not experience educational or academic deficits because of their English language limitations.

It is important to note that the school district has the responsibility to teach the student English while keeping him or her at the appropriate grade level in the core subjects. This court case provides for a process to determine if school districts were keeping up with the requirements of the new law. This involves a three-step process. It assures that the school district is using empirically based educational strategies, that the strategies are reasonably implemented, and that the end result of these strategies relieves the language barriers (Castañeda, 1981). While current legislation threatens the findings of the court case, this procedure is still currently in effect.

In 1999, *Flores v. Arizona* was argued. This case was brought to the courts because EL programs in the state were not helping students become proficient in English nor to have access to the curriculum (Arizona Education Association (AEA, 2005). A trial was held to determine if the state was appropriately funding EL programs. The state was

ordered to complete a review of how EL programs were being funded. After several flawed reviews, the state was ordered to provide appropriate funding to educate EL learners by 2002.

In summary, the United States has gone through many legislative and policy changes regarding the education of EL learners. It has been supported through legislation and federal court cases that school districts are required to help EL learners achieve at the level of their English-speaking peers. The school districts are to use educationally sound techniques for teaching English to EL learners as well as to keep them to the level of their peers in skills and in core subjects. Schools districts use various reading techniques to teach EL learners to read. One must understand the process of literacy development for EL learners before effective reading techniques can be selected.

Literacy Development: Beginning Reading

What is Beginning Reading?

Literacy development occurs in five stages. The stages are early emergent literacy, emergent literacy, beginning reading and writing, almost-fluent reading and writing, fluent reading and writing (Cooper & Kiger, 2003). In the early emergent literacy stage, the child learns the fundamentals of literacy. During the emergent literacy stage, the child uses correct oral language patterns and learns concepts such as awareness of print, relationship of print to speech, comprehension of text structure, phonological awareness, and letter knowledge. The beginning reading stage is the stage in which the child actually begins to read words. Oral language is also further developed in this stage. In this stage, pronunciation and fluency are developed (Cooper & Kiger, 2003). In the almost-fluent

reading stage, the child is becoming a more proficient reader. He or she is able to read silently and oral language continues to develop. In the fluent reading stage, reading and oral language are used in many ways. While there is overlap in the stages, most of the students in this study were in the beginning reading stage.

The beginning reading stage focuses on the child learning to decode words (Cooper & Kiger, 2003). The beginning reading stage contains four steps—pre-alphabetic, partial alphabetic, full alphabetic, and consolidated alphabetic (Ehri, 1995). These phases focus on the child's ability to word read. The phases appear to be the same for typically developing readers and struggling readers (Ehri & McCormick, 1998). Each of the phases will be described below.

At the pre-alphabetic stage knowledge of letters and sounds is not used to word read (Ehri, 2004). This stage is also referred to as the selective cue stage or the pared-associate stage (Juel & Minden-Cupp, 2000; Gough & Hillinger, 1980). Students in this phase do not use letter-sound knowledge to read words (Pikulski, Templeton, & Chard, 2000). This phase is centered on the student's ability to use cues to read words. Students in this stage of literacy development are able to read words that they are familiar with from their environment. When environmental cues are removed the child is no longer able to read the words (Mason, 1980). Students in this phase will have problems learning to read words without context clues. In this stage, context clues are used to guess the words. Students in this phase do not know many letter sounds and lack phonemic awareness (Ehri, 2004).

In the partial-alphabetic phase, the student has some knowledge of letters and their sounds (Ehri, 2004). Students are able to associate the letters and sounds in words usually

at the beginning and ending sounds (Pikulski, et al., 2000). The students in this stage can read some sight words. This is also referred to as the visual recognition stage or the rudimentary-alphabetic stage (Mason, 1980). Students in this phase are able to use partial-letter cues to guess word that they do not know (Stahl & Murray, 1998). During this phase, students learn the correct reading direction (Ehri, 2004). Students in this phase have some phonemic awareness skills. With instruction, students move from the partial alphabetic stage to the full alphabetic phase.

The full alphabetic stage is when the student has a good understanding of the letter-sound relationship. Students in this phase are able to identify all the sounds in a word (Pikulski, et al., 2000). Students in this phase are able to decode unfamiliar words (Ehri, 2004). This phase has also been referred to as the spelling-sound stage and the cipher-reading stage (Juel, 1991; Gough & Hillinger, 1980). Students in this phase have a good understanding of letter-sound relationships. They experience an increase in their sight word vocabulary. While early in this phase students may have difficulty in sounding out words it becomes easier with practice (Ehri, 2004). As they become more fluent readers they move into the consolidated alphabetic phase. The consolidated alphabetic phase tends to begin in the full alphabetic phase (Ehri, 2004).

In the consolidated alphabetic phase, students are able to read letter-sound blends. This phase has also been referred to as the orthographic phase (Ehri, 1991). In this phase, children are less reliant upon individual letter-sound relationships and are able to rely on their knowledge of letter patterns to facilitate their word reading (Vacca, Vacca, & Gove, 2000). Students become more aware of letter sequences that are seen repeatedly in the

language (Ehri, 2004). Sight word vocabulary also continues to grow throughout this phase. Students become better able to read unfamiliar words.

In summary, students, who are beginning to read, move through five stages of literacy development. Reading that is the result of formal instruction begins during the beginning reading phase. It is important to examine the literacy development of EL learners compared to the literacy development of monolingual English speakers.

How is Beginning Reading Different Between L1 and L2?

There is a dearth of literature on how EL learners become literate in English (Peregoy & Boyle, 2005); however, there is evidence that English literacy development is similar for monolingual English speakers and EL learners (Edelsky, 1981; Goodman & Goodman, 1978; Hudelson, 1984; Urzúa, 1987). Therefore, it can be assumed that EL learners go through the similar stages of literacy development as their monolingual English-speaking peers.

Review of Beginning Reading Approaches for EL learners

Various programs have been are used to teach EL learners to read. These programs include basal reading, whole language, language experience and phonics.

Whole Language Approach. The whole language approach to reading instruction uses the students' language and experiences to teach reading and writing skills (Mercer & Mercer, 2005). An importance is placed on reading for meaning. In the whole language approach there is no emphasis placed on teaching the students decoding skills. The student is taught to read meaningful texts. This approach teaches all language arts skills in unison. It does not teach individual skills (e.g., reading, writing) in isolation. Teachers who implement this approach generally use the following guidelines: (a) reading aloud to

students, (b) using predictable books and patterns, (c) including writing activities, (d) include journaling, and (e) supplying meaningful texts.

Language Experience Approach. The language experience approach develops reading skills along with listening, speaking, and writing skills (Mercer & Mercer, 2005). This approach encourages students to advance at their own rate. Educators who use a language experience approach believe that—what students think about they can talk about—and what students can say they can write. Student's experiences play a large role in this approach. Children are encouraged first to talk about and then write about ideas and experiences that are interesting to them. This approach is mainly used as a way to teach beginning reading.

Phonics Approach. The phonics approach incorporates the print form of letters with the sounds that the letters make. This instruction tends to focus on helping students understand the relationship between graphemes and phonemes. A grapheme is the smallest unit of written language that represents a phoneme in the spelling of the word (National Reading Panel (NRP, 2003). Teachers using phonics instruction model the alphabetic principle. They teach their students that there is a predictable and systematic relationship between written letter forms and letter sounds. The following are guidelines for teaching with phonics: (a) use lowercase letters for beginning instruction, (b) introduce the most useful sounds first, (c) introduce easy sounds and letters first, (d) introduce new letter-sound patterns at an appropriate rate, (e) introduce the vowels early, but consonants should be taught first, (f) emphasize the common sound first, (g) teach continuous sounds prior to top sounds, (h) teach sound blending early, (i) introduce consonant blends, (j) introduce consonant digraphs, (k) introduce regular words before

irregular words, and (l) use connected text that reinforces the phonics patterns (Mercer & Mercer, 2005). Below, three studies highlight the effectiveness of phonics instruction on beginning reading achievement of EL learners.

Phonics-based Intervention for English Language Learners. The basis of the computer program used in this present study is phonics instruction. Therefore, it is important to review the effectiveness of phonics-based instruction for English language learners.

Nag-Arulmani, et al. (2003) conducted research to determine if phonics instruction, as compared to other interventions, was more effective in increasing reading skills in a non-dominant language. Participants (N = 118) included 3rd-grade students between 7- and 8-years-of-age. Students with and without reading difficulty in English were included. Ninety of the students had reading difficulties while 28 did not. The students attended four schools in India in which English was the language of instruction.

The study consisted of three phases. The intervention took place between the first and second phases. The three interventions consisted of phonological intervention, language exposure intervention, and craft and calligraphy intervention. The phonological intervention consisted of phonological activities including blending, identification, segmenting, deletion, substitution, and transposition. All the students had to try all the activities. In the language exposure intervention, students were encouraged to explore the non-dominant language. Flashcards were used greatly in this intervention. Segmentation of words was not encouraged. The craft and calligraphy intervention was the intervention received by the comparison group. This intervention focused on the use of arts and crafts.

The students in this group received the same amount of intervention as student in the control group.

The instruments used in this study were the *Wechsler Objective Reading Dimensions (WORD)* (Rust, Golombok, & Trickey, 1993) and *Test for the Reception of Grammar (TROG)* (Bishop, 1989). The *WORD* assessment is a measure of literacy skills. Skills that were measured were single-word reading, reading comprehension, non-word reading, phonological skills and language proficiency. The measures used in this study were Kannada language comprehension, non-verbal reasoning, letter-sound correspondence, WORD single-word reading, WORD reading comprehension, WORD spelling skills, non-word reading, and TROG proficiency.

The design of the study was built around studying the effectiveness of two interventions (i.e., phonics intervention and language exposure intervention). The design used was pretest/posttest comparison group design. Nag-Arulmani, et al. (2003) planned the interventions to determine if it was necessary to increase oral language proficiency for students to read in their non-dominant language or if increasing the student's basic reading skills would be successful in increasing reading in a second language.

Statistical analysis was run using a two-way ANOVA. There was a main significant effect on all three measures. Nag-Arulmani, et al. (2003) found that the students who received the phonics intervention as opposed to the language exposure intervention or control group showed significantly better gain in reading and spelling measures.

This study suggests that phonics instruction can be more effective in increasing reading skills than teaching oral language skills. Furthermore, this study shows that

phonemic instruction is an effective way to teach students to read in a non-dominant language.

Haager & Windmueller (2001) completed a research study to determine the reading outcomes for 1st and 2nd-grade EL learners, reading outcomes for EL learners with reading difficulties who received intervention, and the nature of teacher implementation of a reading intervention of students at risk for reading disabilities. Participants in this study were 335 students (156 first graders and 179 second graders) in an urban school district. Included in the 335 students were 267 students that had been designated as EL learners. The primary language of the EL learners was Spanish.

Teachers were trained by the local university to implement the early reading intervention. The intervention implemented in this study included phonemic awareness, alphabetic principle, oral reading fluency, English language development, and assessment. Skills that were measured for this study included letter naming fluency, phoneme segmentation, nonsense word fluency, oral reading fluency, and word sentence.

The pre and post assessment used in this study was the *DIBELS* (Good & Kaminski, 2002). The researchers found growth in all the measures. This study shows that an intervention program that includes phonemic awareness training will increase the letter naming fluency, phoneme segmentation, nonsense word fluency, oral reading fluency, and word sentence skills in EL learners.

Linan-Thompson, Vaughn, Hickman-Davis, and Kouzekanani (2003) conducted a study to determine the effectiveness of a supplemental reading instruction program on the reading skills of EL learners at-risk for reading problems. This study included 26 students that were in the second grade. The students attended seven Title I-elementary schools in

two school districts in the southwestern United States. All of the students who participated had been identified as EL learners who were having difficulty learning to read English.

This study incorporated a pretest/posttest follow-up design. The students received the intervention for 58 weeks. Follow up assessments were done at 4 weeks and 4 months. The intervention program included fluent reading for 5 minutes, phonological awareness development for 5 minutes, instructional level reading for 10 minutes, and word study for 5 minutes. This intervention included several EL methods. Some of the EL methods that were implemented included opportunity for skill acquisition and vocabulary in isolation. Redundancy was built into the lesson and in student-directed activities.

Pre and post measures used in this study were the *Texas Primary Reading Inventory (TPRI)* (Texas Education Agency, 1998b), *Woodcock Reading Mastery Test-Revised (WRM)* (American Guidance Services, 1987), *Test of Reading Fluency (TORF)* (Children's Educational Services, 1987), *DIBELS* (Good, & Kaminski, 2002), and *Woodcock-Muñoz Language Survey (WMLS)* (Woodcock & Muñoz-Sandoval, 1993). Skills measured in this study were—word attack, passage comprehension, segmentation fluency, and TORF (Children's Educational Services, 1987).

A series of univariate repeated measures was conducted by the researchers. In addition to that analysis, the Bonferroni approach was used to analyze post-hoc pairwise comparisons. Three dependant t-tests were performed. The researchers found statistically significant differences between pre-and post test in word attack skills, the time effect of passage comprehension, the time effect of segmentation fluency, and the time effect of fluency. A limitation of this study was that it did not include a control group.

Linan-Thompson, et al. (2003) believed that the explicit instruction in the letter sounds and word patterns had an impact on the outcomes. Similar to the previous two studies, this study showed reading intervention that included phonics training and EL methods is effective with EL learners struggling with reading.

In summary, phonics-based approaches have been found to be effective for EL learners to read; A phonics-based approach to reading was implemented in the current study. Nag-Arulmani, et al. (2003) found that phonemic instruction is an effective way to teach students to read in a non-dominant language. An intervention program that includes phonemic awareness training will increase letter-naming fluency, phoneme segmentation, nonsense word fluency, oral reading fluency, and word sentence skills in EL learners (Haager & Windmueller, 2001). Linan-Thompson, et. al. (2003) found reading intervention that includes phonics training and EL methods is effective with EL learners struggling with reading. While none of the aforementioned studies utilized phonics-based approaches on computer, there is much evidence to support literacy development using computer-based reading program. Computer-based approaches to literacy development are reviewed next.

Computer-based Approaches to Literacy Development

Computer-based programs have increasingly been used as a teaching intervention for developing literacy skills among all students. Computers have been shown to be effective in teaching children in public schools. Computers have been used to teach many academic skills. As schools struggle with the best way to increase English academics for their EL learners, they continue to try to find ways to provide appropriate education for

them. Computers have been used to provide instruction to students who require more time on the part of the teacher. The use of technology to teach reading will be the focus of this section.

The *No Child Left Behind Act* of 2001 (P.L. 107-110) mandates enhancing education through technology. This mandate proposes to increase the academic achievement of elementary and secondary students by using computers. The mandate states that all students should be computer literate by the eighth grade. It also states that teachers should be using technology in the classroom to increase achievement. This act also provides monies to be available for schools to pay for the computers that are necessary to meet these mandates. A review of studies examining computer-based programs for developing literacy skills among elementary school students follows.

Children with reading difficulties

A study was conducted by Kim, et al. (2006) to determine if the researcher-developed computer program, *Computer-assisted Collaborative Strategic Reading* (CACSR), was effective with middle school students with disabilities. The purpose of the study was to determine the effects of the computer program on the reading comprehension of the students. The students who participated in the study (N = 34) were middle school students with disabilities. Students were able to decode words at a 2.5 grade level or above, were at least one year below in reading comprehension, and attended a reading class for students with reading difficulties.

After the teacher training, students in the experimental group received computer intervention twice a week for 10 to 12 weeks. Students worked with partners during the computer intervention. Students in the comparison and the experimental groups received

the same reading instruction three other days of the weeks. The computer program, CACSR, uses features of an effective comprehension strategy and computer-based instruction. The comprehension strategy taught was Collaborative Strategic Reading (CSR). The computer program provided individualized learning pace, choices in the learning paths and reading passages, and reading level options.

Pre- and posttest data were collected using the *Woodcock Reading Mastery Test-Revised (WRMT-R)* passage comprehension subtest (Woodcock, 1998) and the CSR measure. The CSR measure, which measured the specific skills taught by the CACSR was developed by Kim et al. (2006). Students were required to read a short passage and then write the main idea of the paragraph (the Gist subtest) and write a question about each paragraph (the Question subtest). Rubrics were used to score the students' answers.

This study used a pretest/posttest comparison group design. An ANCOVA was used to determine the effectiveness of the program as measured by the *WRMT-R* passage comprehension subtest (Woodcock, 1998). The pretest scores were used as the covariate. The students in experimental group outperformed the students in the comparison group. On the CSR measure, the students in the experimental outperformed the students in the comparison group on both the Gist and the Question subtests.

Kim et al. (2006) concluded that the students in the experimental group significantly improved their reading comprehension as measured by the CSR measure and the *WRMT-R.* Kim et al. showed that computer-based instruction can be used to increase the reading comprehension skills of adolescents with learning disabilities. In addition, Kim et al. concluded that computers can be used to facilitate instruction of reading comprehension strategies to students with learning disabilities.

Lonigan, et al. (2003) evaluated the impact of computer-assisted instruction on the phonological skills of preschool at-risk students with reading problems. The purpose of the study was to determine if a computer program that uses phonological intervention was effective for preschool children at-risk for learning problems. The students were identified as at-risk by their enrollment in a Head Start program. There were 45 children who participated. The children attended a Head Start program in Florida. The children were assigned randomly to the control of the experimental group.

The computer programs, *DaisyQuest* (Erickson, Foster, Foster, Torgeson, & Packer, 1992) and *Daisy's Castle* (Erickson, Foster, Foster, Torgeson, & Packer, 1993) were used in the intervention phase of this study. Children in the experimental group used the computer programs for 8 weeks. Intervention occurred 4 to 5 times per week for 15 to 20 minutes.

The children's oral language, print knowledge, and phonological sensitivity were measured. The instruments used to measure these skills were phonological sensitivity tasks, the *Expressive One-Word Picture Vocabulary Test–Revised (EOWPVT-R;* Gardner, 1990), and print knowledge tasks. During the phonological sensitivity tasks the students completed tasks that required them to rhyme, blend sounds, and delete parts of words to make new words. The *EOWPVT-R* (Gardner, 1990) measures the student's ability to look at picture stimuli and name the picture. The print knowledge tasks required the students to complete two decoding measures and two-letter knowledge measures.

A pretest/posttest control group design was used. Lonigan et. al., (2003) evaluated the data using a series of repeated measure ANOVAs. The children in the experimental group performed significantly better than the children in the comparison group in the area of

phonological sensitivity. Lonigan et. al. concluded that phonological sensitivity training using computers with preschool age children is effective. Therefore, computer-based interventions have increased the phonological awareness in young children at-risk for reading problems.

Doty, Popplewell, and Byers (2001) compared the use of a CD-Rom storybook and a print book on the students' reading comprehension. The students in this study were 39 second graders from a Title I-elementary school in an urban school district in the Midwest United States. The students attended two self-contained classrooms. The purpose of the study was to determine if students who used an interactive CD-Rom storybook, *Thomas' Snowsuit* (Munsch, 1994) scored higher on oral retelling and reading comprehension measures.

Students in the experimental group used the CD-Rom to read the book. The CD-Rom did not read the book to the students. Students in the experimental group could click on words for definition and pronunciation. Students in the control group used the traditional print version of the book. The measures used in the study were the *Stieglitz Informal Reading Inventory* (Stieglitz, 1997) and retellings. Answers to the comprehension questions and the retellings were audio taped. These measures were used pre- and posttest.

Data were analyzed using an ANCOVA. The initial reading level was used as the covariate. Doty, Popplewell, and Byers (2001) found that the students with access to the CD-Rom had higher comprehension than the students with the traditional texts. The students in the experimental group had significantly higher scores on the comprehension test than the students in the comparison group. Doty, et al. (2001) concluded that reading

comprehension can be improved through the use of CD-Rom storybooks. Computer-based instruction can increase the reading comprehension of young students.

Howell, Erickson, Stanger, & Wheaton (2000) conducted a study that investigated the effects of *Intelliwords Reading* software on the early reading skills of first grade students. The first graders in the experimental group (N = 55) had been identified by their teachers as having potential for reading failure, or had been found eligible for special education due to an educational disability. The students in the experimental group received computer-based instruction as a supplement to their regular reading instruction.

The comparison group in this study was made up of typical developing students from the same classrooms as the students in the experimental group. Howell, et al. (2000) measured the effectiveness of the computer software on the skills of onset-rime decoding skills, phonemic awareness skills, sight word recognition, and developmental writing and spelling skills. The assessments used to measure these skills were developed by Howell, et al. (2000).

The assessment measured onset, rime, phonemic awareness, write total and developmental spelling and word identification. The onset subtest was based on Cunningham, et al,'s (1999) assessment of word attack. The focus of the assessment was the proper pronunciation of the onset with the assigned word ending. The rime subtest was also based on Cunningham et. al. The focus of the assessment was the correct pronunciation of the entire rime. The phonemic awareness subtest was developed based on the work of Snider (1997). This subtest measured: (a) phoneme segmentation, (b) strip initial consonant, (c) substitute initial consonant, (d) rhyme supply, and (e) initial consonant same. Clay's (1993) word generation task was the basis of the write total and

developmental spelling subtest. This subtest measured the students' ability to write words in 10 minutes. The word identification subtest was a curriculum-based measure. Students were required to read a list of 15 words.

Statistical analyses were run using an ANOVA. The comparison group scored higher on the pretest on all of the areas. Howell, et al. (2000) found that with computer-assisted instruction, the students in the experimental group approached the level of the skill of the criterion group. A weakness in this study is that it did not contain a true control group. The students in the control group (n = 25) had not been identified as having any reading difficulty. Therefore, the study showed it was successful in remediating difficulties for struggling students.

Jones, Torgeson, & Sexton (1987) completed a study to evaluate a computer program, *Hint and Hunt I* (Beck & Roth, 1984), designed to improve word analysis and decoding skills of students with reading difficulty. The study included 20 students with learning disabilities. All the students who participated had full scale IQ scores above 85 as measured by the *WISC-R* (Wechsler, 1974). The students attended two elementary schools that had middle to lower middle class populations.

The purpose of the study was to find out if computer-based intervention using the *Hint and Hunt I* program was more effective than the traditional program designed to help students learn new spelling words. Students in the experimental group practiced using the *Hint and Hunt I* program which provides practice on five short vowels and four vowel diphthongs and digraphs (Jones, et al., 1987). Students who were in the comparison group used a different program that was designed to help them learn their

new spelling words. Both programs were presented via computer. An additional 10 students without disabilities were used as a non-computer use comparison group.

Four types of assessments were used. The first assessment was given through computer. The students were presented lower-case letter on the computer screen. The computer recorded the students' response time and number of correct answers. The second assessment tested the student's fluency with the 47 target words used in the *Hint and Hunt I* program. Another assessment measured the students' abilities to read 47 generalization words. The generalization words are words that are similar to the target words from the *Hint and Hunt I* program. These words were used because the *Hint and Hunt I* program is reported to increase student's ability to decode words. The final test required the students to read a paragraph. The number of errors (e.g., omissions, mispronunciations) and total time were recorded.

Jones, et al. (1987) used a pretest/posttest comparison group design. This study had two comparison groups. The data were analyzed using an ANOVA. Jones, Torgeson, & Sexton (1987) found that the experimental group gained more speed and accuracy in their reading than the control group. Jones, et al. (1987) concluded that the *Hint and Hunt I* program was effective for increasing the phonetic decoding skills in children with reading disabilities. In sum, Jones, et al. (1987) were able to show that the computer-based program was effective at increasing the fluency and accuracy of the students' reading.

In summary, after computer-based interventions were used to develop reading skills, students achieved significantly greater gains in the area of basic reading. Doty, et al. (2001) found that reading comprehension can be improved for young learners through the use of CD-Rom storybooks. Kim et al. (2006) concluded that the students in the

experimental group significantly improved their reading comprehension. Computer-based programs have been successful in remediating difficulties for struggling students (Howell, Erickson, Stanger, & Wheaton, 2000). Lonigan et al., (2003) found that computer-based interventions have increased the phonological awareness in young children at-risk for reading problems. Computer-based intervention has been found to be effective in increasing the literacy skills of students at-risk for reading failure. These findings have also been found for EL learners as well.

English language learners

Troia (2004) studied the effectiveness of the computer program *Fast ForWord* on the oral language and academic skills of migrant students in the first through sixth grades. The students attended one of seven students in Central Washington State. The participants in the study (N = 191) were first through sixth grade students in Washington State. All of the students were migrants whose home language was Spanish.

This study used a pretest/posttest design with a no-control group. Participants were matched by grade, IQ, and English language proficiency at four of the research sites. At three of the research sites, the students were randomly assigned. The English proficiency, oral language in English, phonological awareness, basic reading skills and classroom behavior were assessed for each student that participated in the study.

Measures that were used in this study were *Language Assessment Scales-Oral (LAS-O)* (DeAvila & Duncan, 1990), *WMLS* (Woodcock & Sandoval, 1993), *Oral and Written Language Scales* (Carrow-Woolfolk, 1995), *Lindamood Auditory Conceptualization* (Lindamood & Lindamood, 1979), *Woodcock-Johnson Psycho-Educational Battery-*

Revised (WJ-R) (Woodcock & Johnson, 1990), and *Social Skills Rating Scale* (Gresham & Elliott, 1990).

Statistical analysis included an ANOVA and a MANOVA. After the intervention, the students in the control group achieved higher measures on the sound blending subtest and the experimental rhyming subtest. No significant effects were found in the English proficiency of the students. No significant effect was found between the experimental and control groups in the areas of phonological awareness or classroom behavior.

The experimental group achieved significantly greater gains in the area of basic reading. Basic reading was the only area that the experimental group achieved higher than the comparison group. Children who received the computer-based intervention also demonstrated a slight increase (about 1/3 SD) in their sight word reading. Troia (2004) stated that research with EL learners is inconclusive and further research is needed to determine if the slight gains received through this and other computer-interventions warrant the class time that is missed.

Tozcu & Coady (2004) completed a study to measure the effect of vocabulary instruction via Computer-assisted Language Learning (CALL). This study was completed to answer the following questions: (a) do the students in the experimental group learn significantly more high frequency vocabulary than students in the comparison group? (b) do students in the experimental group decrease their reaction time to high frequency vocabulary as compared to students in the comparison group? and (c) do students in the experimental group increase their reading comprehension more than students in the comparison group?

The students in this study (N = 56) had an intermediate English proficiency level. The students attended two different universities. This study used a pretest/posttest comparison group design. The students in the study were assessed in reading comprehension, vocabulary, and reaction time pre- and posttest. The vocabulary and reaction time assessments were as developed from English-as-a-Foreign Language tests by Dr. Meara. The *Degrees of Reading Power Test* (Touchstone, 2004) was used to measure reading comprehension skills. This assessment uses a cloze procedure to assess reading comprehension.

Students in the experimental group used the computer program, *New Lexis* (McVicker, 1995), to study high frequency words in English. Students in the comparison group were required to read two 2-page passages per week and to answer four comprehension questions on the articles.

Analysis for this study was completed using mixed designs ANOVAs. In the area of vocabulary, the students in the experimental group experienced a significantly greater increase in their vocabulary knowledge as compared to the students in the comparison group. In the area of reaction time, the students in the experimental group showed a significantly greater increase in their rate of speed of recognition of high frequency words as compared to the students in the comparison group. In the area of reading comprehension, the students in the experimental group showed significantly greater increase in their reading comprehension as compared to the students in the comparison group.

Tozcu & Coady (2004) concluded that direct vocabulary instruction of high frequency English words increases reading comprehension and vocabulary and decreases

reaction time to high frequency words, although both groups experienced significant gains in the three areas assessed. The students in the experimental group performed significantly better than the comparison group. Computer-based intervention is able to increase the vocabulary and reading comprehension of EL learners.

Lexia Software. Macarcuso, Hook, & McCabe (2006) studied the effect of *Lexia Phonics Based Reading Program* (2001) and *Strategies for Older Students* (2001) in a public school. *Lexia Phonics Based Reading Program* (2001) and *Strategies for Older Students* (2001) are computer programs based on scientifically based instruction. Lexia incorporates all of the recommend literacy practices—phonemic awareness, phonics, fluency, vocabulary and comprehension. The intent was to measure the improvement of reading comprehension skills.

The students in this study were 179 first graders. Students with disabilities, students who live in poverty, and EL learners were included in the study. The *Lexia Phonics Based Reading Program* (2001) and *Strategies for Older Students* (2001) were used 2 to 4 times per week between 30 to 60 minutes per session by the students in the experimental group. The intervention was implemented for approximately six months. Both the students in the experimental and control groups received daily instruction in reading using the standard curriculum, *Scott Foresman Reading Language Arts* (McFall, 2000) and/or *Bradley Reading and Language Arts* (Bradley, 1999).

The reading comprehension skills were measured using the *Gates MacGinitie Reading Test* (MacGinitie & MacGinitie, 1989). An ANCOVA was conducted to determine if the effects were significantly effective. While the Macarcuso, Hook, & McCabe (2006) did not find a significant significance between the experimental and

control group, there was a trend favoring the experimental group. Macarcuso, et al. (2006) believed they did not find a significant difference due to the large standard deviation within the groups. Macarcuso, et al. (2006) conducted secondary analysis on the students who were Title I-eligible. Title I-students in the experimental group experienced growth that Title I-student in the control group did not make. Macarcuso, et al. (2006) concluded that the transfer of phonics skills to the word and paragraph comprehension was an important finding. All of the students in the current research project are eligible for Title I services.

Stevens (2000) studied the impact of *Lexia Phonics Based Reading Program* (Lexia, 1999) on reading comprehension and math skills of elementary students in southern Texas. The purpose of the study was to determine if there was any difference in the gain scores for the experimental and the control group. The students who participated in this study (N = 70) were in the fourth and fifth grade. The school district was 98% Hispanic and 96% of low SES.

The students started the program with *Lexia Phonics Based Reading Program* (Lexia, 1999) and then upon completion started the *Lexia Guided Reading Program* (1999) program. The reading comprehension skills and math skills were measured using the *Texas Assessment of Academic Skills* (TAAS) (Texas Education Agency (TEA, 1998a). The TAAS (TEA, 1998a) is a standardized assessment that assesses reading, writing and math. For this study, the reading comprehension and math subtests were used.

Using a multiple regression analysis, Stevens (2000) indicated that the software improved the students' reading ability. Through the same analysis, Stevens (2000) found that there was a statistically significant impact on the student's math ability. Stevens

(2000) concluded that the computer-based intervention was associated with the improvement the students, many of whom were EL learners, experienced on the *TAAS* (TEA, 1998) in the areas of reading and math ability.

In summary, computer-based programs have been found to increase the accuracy and fluency of reading in students with reading difficulties (Jones, et al., 1987). Computer-based programs have been successful in remediating difficulties for struggling students (Howell, et al., 2000). Stevens (2000) found that computer-based intervention was associated with the improvement in the areas of reading and math ability. Lonigan et al., (2003) found that computer-based interventions have increased the phonological awareness in young children at-risk for reading problems. These findings have also been found for EL learners as well. Computer-based intervention has been found to be effective for increasing literacy skills for struggling students and EL learners.

Summary

Federal policy requires that school districts provide EL learners equitable effective educational opportunities so they achieve at the level of their English-speaking peers. The school districts are to use educationally sound techniques for teaching EL learners English as well as keep them to the level of their peers in the core subjects. Schools districts use different reading techniques to teach EL learners to read.

After examining second language acquisition and literacy development, it is clear that EL learners learn to read English in the same way as monolingual English students. Phonological interventions have been found to be effective in teaching students to read in

a non-dominant language. Very little research exists that shows phonics instruction via computer is effective for EL learners.

The current study attempted to address the void in the literature. *Reading First* (NCLB, 2001) mandates that all K-3 reading programs contain explicit and systematic instruction in phonemic awareness, phonics, vocabulary development, reading fluency, and reading comprehension. These facets of instruction have been included in the *Lexia Primary Reading Program* (Lexia, 2004). Researchers have found that computer-based intervention is an effective way to teach reading skills to EL learners (Tozcu & Coady, 2004; Troia, 2004). Many studies have been conducted that measure computer-based intervention or phonics-based intervention. There is no current research that measures the effectiveness of a phonics-based program with computer-based intervention for EL learners only. This present study provides needed research in this field.

Based on this review of literature, this study was designed with two purposes. This study examined the impact of the *Lexia Primary Reading Program* (Lexia, 2004) on the literacy skills of EL learners. This study also examined the impact of providing primary language support via a phonics-based computer program to EL learners.

CHAPTER 3

METHOD

The purpose of this study was to investigate the effects of the *Lexia Primary Reading Program* (Lexia, 2004) program on the reading skills and oral language skills of EL learners. Another purpose of this study was to determine if the language of instruction (i.e., English or Spanish) provided by the software program had an effect on first grade EL learners' reading ability. Data were collected to determine the effectiveness of the *Lexia Primary Reading Program* on the reading and oral language skills of first grade native Spanish-speaking EL learners using the *WMLS-R* and *DIBELS*. The following questions were addressed:

> Research Question 1: Does the *Lexia Primary Reading Program* (Lexia, 2004) increase the English oral language skills of first grade native Spanish-speaking EL learners?

It was predicted that the *Lexia Primary Reading Program* would increase the English oral language skills of first grade native Spanish-speaking EL learners.

> Research Question 2: Does the *Lexia Primary Reading Program* (Lexia, 2004) increase the picture vocabulary skills of first grade native Spanish-speaking EL learners?

It was predicted that the *Lexia Primary Reading Program* would increase the English picture vocabulary skills of first grade native Spanish-speaking EL learners.

Research Question 3: Does the *Lexia Primary Reading Program* (Lexia, 2004) increase the English verbal analogies scores of first grade native Spanish-speaking EL learners?

It was predicted that the *Lexia Primary Reading Program* would increase the English verbal analogies skills of first grade native Spanish-speaking EL learners.

Research Question 4: Does the *Lexia Primary Reading Program* (Lexia, 2004) increase the English reading skills of first grade native Spanish-speaking EL learners?

It was predicted that the *Lexia Primary Reading Program* would increase the English reading skills of first grade native Spanish-speaking EL learners.

Research Question 5: Does the *Lexia Primary Reading Program* (Lexia, 2004) increase the letter-word identification skills of first grade native Spanish-speaking EL learners?

It was predicted that the *Lexia Primary Reading Program* would increase the English letter-word identification skills of first grade native Spanish-speaking EL learners.

Research Question 6: Does the *Lexia Primary Reading Program* (Lexia, 2004) increase the reading comprehension skills of first grade native Spanish-speaking EL learners?

It was predicted that the *Lexia Primary Reading Program* would increase the English reading comprehension skills of first grade native Spanish-speaking EL learners.

Research Question 7: Does the *Lexia Primary Reading Program* (Lexia, 2004) increase the English phoneme segmentation fluency skills of first grade native Spanish-speaking EL learners?

It was predicted that the *Lexia Primary Reading Program* would increase the English phoneme segmentation fluency skills of first grade native Spanish-speaking EL learners.

Research Question 8: Does the *Lexia Primary Reading Program* (Lexia, 2004) increase the English nonsense word fluency skills of first grade native Spanish-speaking EL learners?

It was predicted that the *Lexia Primary Reading Program* would increase the English nonsense word fluency skills of first grade native Spanish-speaking EL learners.

Research Question 9: Does the *Lexia Primary Reading Program* (Lexia, 2004) increase the oral reading fluency skills of first grade native Spanish-speaking EL learners?

It was predicted that the *Lexia Primary Reading Program* would increase the English oral reading fluency skills of first grade native Spanish-speaking EL learners.

Research Question 10: Is there a difference in how the language of instruction (i.e., English or Spanish) provided by the *Lexia Primary Reading Program* (Lexia, 2004) impacts the reading scores of first grade native Spanish-speaking EL learners?

It was predicted that the language of instruction provided by the *Lexia Primary Reading Program* would impact the reading scores of first grade native Spanish-speaking EL learners.

This chapter is organized into six sections: (a) description of subjects and setting, (b) description of the research instrumentation, (c) materials and equipment, (d) design and procedures, (e) experimental design, and (f) treatment of the data.

Description of the Subjects and Setting

Participants. The participants in this study were 41 first-grade students who had been identified as EL learners. All of the students' home language was Spanish. The students ranged in age from 6 to 8 years. Participants were selected from a large school district in the southwestern United States. Demographic information on the students is provided in Table 1. Only participants with parental permission were included in the study.

Parental permission was gained at the school (see Appendix A). The investigator held a parent meeting to explain the procedures of the study. The study was explained in both English and Spanish. The permission forms were translated into Spanish. Due to the age of the students, the students signed child assent forms. Also, the students agreed to participate in this research study (see Appendix B). Only the information from participants whose parents gave permission and who assented was used in this study.

Fifty consent forms were distributed and 43 were returned with consent given. No forms were returned that were not signed. Of the 43 students whose parents gave permission, 41 of them finished the study. Two of the students moved during the intervention phase.

Research team. The research team consisted of three members, the primary investigator, school psychologist, and a psychological assistant. The primary investigator was a doctoral student in the Department of Special Education at the University of Nevada Las Vegas with five years experience as a licensed bilingual school psychologist in the state of Nevada. The second member of the research team was a licensed bilingual school psychologist who obtained her license in the same year the study was conducted. The third member of the research team was a bilingual

psychological services assistant who had three years experience conducting the WMLS-R and the DIBELS assessments.

Setting. The children were chosen from a Title I elementary school with a population of 90.7% Hispanic students and where 74.1% of the students had been designated EL learners by the school district. The school did not meet Academic Yearly Progress (AYP) and was on the designated watch list for not meeting five of the *No Child Left Behind Act* (2001) criteria in the area of English language arts.

Pre and post testing were completed on the school campus. Testing took place in empty classrooms. During intervention, participants rotated through three centers. Teacher directed instruction and independent work centers were completed in the students' classroom (i.e., Classroom A, Classroom B, and Classroom C). The third center was located in the computer lab which contained 28 Gateway computers.

Table 1

Participants' Gender, Ethnicity, and Mean Age

Characteristics		
Gender		
	Male	16
	Female	25
Ethnicity		
	Latino	41
	Other	0
Mean Age		7.15 years

Description of Research Instrumentation

The data in this study were collected using two instruments. The instruments were the *Woodcock-Muñoz Language Survey-R (WMLS-R)* (Woodcock, Muñoz-Sandoval, Ruef, & Alvarado, 2005) and the *Dynamic Indicator of Basic Early Literacy Skills (DIBELS)* (Good & Kaminski, 2002). Together, these two instruments produced the dependent variable measures.

Dynamic Indicator of Basic Early Literacy Skills (DIBELS) (Good & Kaminski, 2002). The *DIBELS* assessment is a set of standardized, individually administered measures of early literacy development. The following subtests were used: (a) phoneme segmentation, (b) nonsense word fluency, and (c) oral reading fluency. These subtests are

designed to be used regularly to monitor the acquisition of pre-reading and early reading skills.

Woodcock-Muñoz Language Survey-R (WMLS-R). (Woodcock, et al., 2005). This instrument assesses English and Spanish oral language, reading, and writing skills. The subtests used in this study were picture vocabulary, verbal analogies, letter-word identification, and passage comprehension. The picture vocabulary and verbal analogies subtests provided the composite score called oral language. The letter-word identification and passage comprehension subtests provided the composite score called reading.

Materials and Equipment

The computer program used for this study was *Lexia Primary Reading Program* (Lexia, 2004). This program provides instruction in the five areas (i.e., phonemic awareness, phonics, fluency, vocabulary, and text comprehension) identified by the National Reading Panel (2003) as critical for literacy success. Some of the skills taught by this program are beginning and ending sounds, segmenting words, and decoding skills. The program is designed to reinforce phonemic awareness and phonics skills.

The *Lexia Primary Reading Program* (Lexia, 2004) is a computer-based literacy program that allows students to work independently. The students work through the tasks by following verbal directions and clicking on images with the mouse. The program then adjusts automatically to meet the needs of the student performance. The computer program takes the student back through areas that are difficult and moves on to new material when the student is ready. The *Lexia Primary Reading Program* stored

information on the students' progress and attempts necessary to pass certain skills which allowed for monitoring of a student's progress by the investigator.

While receiving the intervention, the students were seated at a computer. The investigator was present at the time of intervention. The materials needed to complete this intervention were a computer, *MathBlaster®* (Knowledge, 1993), *Orchard Math Software* (Ohio, 2002), *Lexia Primary Reading Program* (Lexia, 2004) for 30 minutes a day three times a week.

Design and Procedures

This study was conducted over an eight week period and consisted of five phases: (a) Phase One: Permission and Training, (b) Phase Two: Consent, (c) Phase Three: Pretest and Group Assignments, (d) Phase Four: Implementation of Intervention and Fidelity of Treatment, and (e) Phase Five: Posttest.

Phase One

Permission. Prior to the start of the study, permission for the study was obtained from the Office of the Protection of Research Subjects at the University of Nevada, Las Vegas (See Appendix C) and from the Clark County School District Research and Accountability Office (See Appendix D). The investigator also met with the building principal and finalized procedural details.

Training. During this part of phase 1, the members of the research team, which included two school psychologists and a psychological services assistant, were trained in the administration procedures of the *Dynamic Indicators of Basic Literacy Skills (DIBELS)* and the *Woodcock-Muñoz Language Survey-Revised (WMLS-R).* The teachers

were trained on the schedule and the classroom procedures to be implemented during the rotations. The primary investigator of this study met with the teachers and explained how each of the groups would move through the rotations. The expectations for the fidelity of treatment were also explained to the teachers. These expectation were that the students in all groups would receive the same instruction while in the teacher directed instruction and the independent work time, students would rotate with their correct group, groups are rotated at the correct time, and all teachers use the same curriculum. The curriculum used by the teachers in this study was Trophies First Grade (Harcourt, 2005).

Phase Two

Consent. During this phase, the investigator worked with school administrators to obtain consent. School administrators arranged a meeting after school to provide an opportunity for the investigator to ask for participation from the parents and the students. The investigator explained the purpose of the study and encouraged parents to ask any questions they had about the study. The meeting was conducted in English and Spanish. Consent forms were sent home in Spanish for parents unable to attend the meeting. Fifty consent forms were distributed and 43 were returned with consent. Contact information was given on the consent forms to address any concerns that the parents may have had about the study. Assessment data were not collected on students whose parents did not consent or students who did not assent. Student assent was obtained by the assessors prior to pretesting.

Phase Three

Pretest. During this phase, all the participants whose parents gave permission and who agreed were assigned an identification number. Students who did not participate had

equal access to the computer time and there was no pressure from the investigators or the school for participation. Members of the research team tested participants from each group (Comparison Group, Experimental Group 1 and Experimental Group 2). The pretests were administered individually. Pretesting was completed in classrooms on the school campus that were not being used. The pretests were the *DIBELS* and the *WMLS-R.* Students were assigned to each of the three groups (Comparison Group, Experimental Group 1 and Experimental Group 2) so as to ensure no differences before the intervention in the areas of Spanish oral language skills and English reading composite scores.

During the pretest phase of the study, all children involved received the *Dynamic Indicators of Basic Literacy Skills* and the *WMLS-R.* These assessments were given at the school in a one-on-one setting. The *WMLS-R* is a standardized assessment of oral language and reading achievement. This assessment is available in English and Spanish and was given in both languages. The *DIBELS* assessment is a standardized measure of early literacy skills. All of the assessments were available in more than one form, and the different forms were used for pre/post comparison. The amount of time needed to assess each student was about one half to one hour.

In order to ensure that results obtained from the assessment were reliable, 20% of the assessments were completed with the investigator scoring along with another member of the assessment team. The formula that was used to determine the percentage of agreement was the number of agreements divided by the number of opportunities for agreement X 100.

Group assignment. The information from these data was used to determine assignment of students to groups in the study (See Appendix E). Students were placed

into their groups by teacher, English reading ability, and Spanish oral language ability. Students of equal English reading ability and Spanish oral language ability were placed simultaneously in each group. As much as possible, equal numbers of students from each classroom were in each group.

Phase Four

The students in all groups received computer-based instruction. The students in the comparison group (CG) received computer-based intervention using a variety of programs (e.g., *MathBlaster®* (Knowledge, 1993) and *Orchard Math Software* (Ohio, 2002). The two experimental groups received computer-based intervention using only *Lexia Primary Reading Program* (Lexia, 2004) software program.

Teacher Directed Instruction. The students in all groups received 30 minutes of teacher directed small group instruction during their assigned rotation. Students received instruction from their teacher who used Trophies First Grade (Harcourt, 2005) curriculum.

Independent Work Time. The students in all groups recevied 30 minutes of independent work time. The independent work students engaged in were assignments from Trophies First Grade (Harcourt, 2005) curriculum.

Comparison group. The students in the comparison group (CG) received 30 minutes of computer instruction with other computer programs (i.e., *MathBlaster®* (Knowledge, 1993), *Orchard Math Software* (Ohio, 2002)). Next, they completed 30 minutes independent work time. Lastly, the students had small group instruction for 30 minutes from their teachers.

Experimental Group 1. The students in the first Experimental Group (EG1) received small group instruction for 30 minutes. Next, they received 30 minutes of computer-based instruction with *Lexia Primary Reading Program* (Lexia, 2004) with English language instruction (See Appendix F). Lastly, they completed 30 minutes of independent work time.

Experimental Group 2. The students in the second Experimental Group (EG2) completed 30 minutes independent work time. Next, they received small group instruction for 30 minutes from their teachers. Lastly, they received 30 minutes of computer-based instruction with the *Lexia Primary Reading Program* (2004) with Spanish language instruction (See Appendix F). The participants rotated through the centers based on the following schedule (See Table 2). All centers, but the computer lab were completed in the students' classroom.

Table 2

Timetable for Rotation

1st Session - 10:55 – 11:25 am		
Classroom A	Classroom B	Classroom C
CG1 COMP LAB	CG1 COMP LAB	CG1 COMP LAB
EG1 TDI	EG1 TDI	EG1 TDI
EG2 Ind Work	EG2 Ind Work	EG2 Ind Work
2nd Session – 11:25 – 11:55 am		
Classroom A	Classroom B	Classroom C
CG1 Ind Work	CG1 Ind Work	CG1 Ind Work
EG1 Comp Lab	EG1 Comp Lab	EG1 Comp Lab
EG2 TDI	EG2 TDI	EG2 TDI
3rd Session – 11:55 am – 12:25 pm		
Classroom A	Classroom B	Classroom C
CG1 TDI	CG1 TDI	CG1 TDI
EG1 Ind Work	EG1 Ind Work	EG1 Ind Work
EG2 Comp Lab	EG2 Comp Lab	EG2 Comp Lab

Fidelity of treatment. Each of the three classrooms was observed by one of the members of the research team six times throughout the study. The observer used the

classroom instruction checklist (See Appendix G) to ensure the sequence of rotation and instruction components were used consistently throughout the intervention. Items on the classroom instruction checklist were: (a) schedule was posted in the room, (b) students are in the correct group, (c) same content given to all groups, (d) same activity during independent work time, (e) groups rotated at the correct time, and (f) same curriculum as other teachers was used. If any of the requirements of the checklist were not being fulfilled, the member of the research team made note of it on the fidelity of treatment form and then addressed the issue with the classroom teacher.

Phase Five

Posttest. The post assessment was completed the week after the intervention stopped, which was nine weeks after the start of the intervention. The *DIBELS* and the *WMLS-R* were readministered in a one-on-one setting. Different forms of the assessments were used for the *DIBELS* and the English portions of the *WMLS-R*. This was done to minimize the possibility of pretest/posttest gains as a result of using the same assessment forms. The protocols were coded with no names on them. Members of the research team assessed the same students pre- and posttest.

Students' progress through the computer program was monitored with the teacher logs available through the programs. This is a permanent product recording of the students' success with the program. Though this was not used as a measure in the study, the investigator printed weekly reports from the program until the database from the program became corrupted and weekly reports were not available. The information provided by the weekly reports includes what level the student was on, what rate of progress the student was making, and what is the average ability level of the child. The

weekly reports become unavailable during this study because a storage malfunction occurred in the program.

Experimental Design

The experimental design used in this study was a Pretest/Posttest Comparison Group Design; this is also referred to as a mixed design (Keppel & Wickens, 2004). A statistical comparison was done at the pretest stage of the study to ensure that no statistical significance existed between the groups before intervention in the areas of Spanish oral language and English reading ability measures. Within this mixed design, there is one between variable—computer instruction—and one within variable—the pretest/posttest data. For the analysis of question 10, this design is repeated. In this analysis, the between variable was the language of instruction and the within variable was the pretest/posttest data.

After the groups were defined, the intervention was introduced. This design contains three groups—comparison group, experimental group 1, and experimental group 2. The first phase was pretest testing. This testing was used to yoke sample the participants. After the intervention period, the second form of the assessments was given as a post-test. The standardized scores from the assessments were statistically analyzed answer the research questions.

Repeated testing threats to internal validity were controlled by the use of two different forms pretest and posttest, minimizing pretest/posttest gains due to the use of the same assessments. Threats to external validity were addressed by the sampling procedures (i.e., stratified yoke sampling) to maintain homogeneity of the groups.

Sampling was done through measuring for significant difference between the groups in the areas of Spanish oral language skills and English reading skills prior to intervention.

Treatment of the Data

The first nine questions in this study revolve around the effectiveness of the *Lexia Primary Reading Program* (Lexia, 2004) regardless of the language of instruction. To answer these questions, the two experimental groups were combined into one group identified as the Combined Experimental Group (CEG) for the analysis of the data.

Data from the *WMLS-R* were analyzed to answer Research Question 1. Does the *Lexia Primary Reading Program* (Lexia, 2004) increase the English oral language skills of first grade native Spanish-speaking EL learners? An Analysis of Variance (ANOVA) was used to analyze posttest group differences. To control for any pretest differences, an Analysis of Covariance (ANCOVA) with the pretest score as the covariate was also used to analyze the data. A .05 confidence level was used to determine statistical significance.

Data from the *WMLS-R* were analyzed to answer Research Question 2: Does the *Lexia Primary Reading Program* increase the picture vocabulary skills of first grade native Spanish-speaking EL learners? An Analysis of Variance (ANOVA) was used to analyze posttest group differences. To control for any pretest differences, an Analysis of Covariance (ANCOVA) with the pretest score as the covariate was also used to analyze the data. A .05 confidence level was used to determine statistical significance.

Data from the *WMLS-R* were analyzed to answer Research Question 3: Does the *Lexia Primary Reading Program* (Lexia, 2004) increase the English verbal analogies scores of first grade native Spanish-speaking EL learners? An Analysis of Variance

(ANOVA) was used to analyze posttest group differences. To control for any pretest differences, an Analysis of Covariance (ANCOVA) with the pretest score as the covariate was also used to analyze the data. A .05 confidence level was used to determine statistical significance.

Data from the *WMLS-R* were analyzed to answer Research Question 4: Does the *Lexia Primary Reading Program* (Lexia, 2004) increase the English reading skills of first grade native Spanish-speaking EL learners? An Analysis of Variance (ANOVA) was used to analyze posttest group differences. To control for any pretest differences, an Analysis of Covariance (ANCOVA) with the pretest score as the covariate was also used to analyze the data. A .05 confidence level was used to determine statistical significance.

Data from the *WMLS-R* were analyzed to answer Research Question 5: Does the *Lexia Primary Reading Program* (Lexia, 2004) increase the letter-word identification skills of first grade native Spanish-speaking EL learners? An Analysis of Variance (ANOVA) was used to analyze posttest group differences. To control for any pretest differences, an Analysis of Covariance (ANCOVA) with the pretest score as the covariate was also used to analyze the data. A .05 confidence level was used to determine statistical significance.

Data from the *WMLS-R* were analyzed to answer Research Question 6: Does the *Lexia Primary Reading Program* (Lexia, 2004) increase the reading comprehension skills of first grade native Spanish-speaking EL learners? An Analysis of Variance (ANOVA) was used to analyze posttest group differences. To control for any pretest differences, an Analysis of Covariance (ANCOVA) with the pretest score as the covariate was also used to analyze the data. A .05 confidence level was used to determine statistical significance.

Data from the *DIBELS* were analyzed to answer Research Question 7: Does the *Lexia Primary Reading Program* increase the English phoneme segmentation fluency skills of first grade native Spanish-speaking EL learners? An Analysis of Variance (ANOVA) was used to analyze posttest group differences. To control for any pretest differences, an Analysis of Covariance (ANCOVA) with the pretest score as the covariate was also used to analyze the data. A .05 confidence level was used to determine statistical significance.

Data from the *DIBELS* were analyzed to answer Research Question 8: Does the *Lexia Primary Reading Program* increase the English nonsense word fluency skills of first grade native Spanish-speaking EL learners? An Analysis of Variance (ANOVA) was used to analyze posttest group differences. To control for any pretest differences, an Analysis of Covariance (ANCOVA) with the pretest score as the covariate was also used to analyze the data. A .05 confidence level was used to determine statistical significance.

Data from the *DIBELS* were analyzed to answer Research Question 9: Does the *Lexia Primary Reading Program* increase the oral reading fluency skills of first grade native Spanish-speaking EL learners? An Analysis of Variance (ANOVA) was used to analyze posttest group differences. To control for any pretest differences, an Analysis of Covariance (ANCOVA) with the pretest score as the covariate was also used to analyze the data. A .05 confidence level was used to determine statistical significance.

In order to answer the last question which focused on the impact of the language of instruction provided by the *Lexia Primary Reading Program* (Lexia, 2004), the data collected from EG1 and EG2 were compared.

Data from the *DIBELS* and the *WMLS-R* were analyzed to answer Research Question 10: Is there a difference in how the language of instruction (i.e., Spanish or English)

provided by the *Lexia Primary Reading Program* (Lexia, 2004) impacts the reading scores of first grade native Spanish-speaking EL learners? An Analysis of Variance (ANOVA) was used to analyze posttest group differences. To control for any pretest differences, an Analysis of Covariance (ANCOVA) with the pretest score as the covariate was also used to analyze the data. A .05 confidence level was used to determine statistical significance.

CHAPTER 4

RESULTS

A primary purpose of this study was to determine the impact of the *Lexia Primary Reading Program* (Lexia, 2004), a computer-based reading program, on the English reading skills of first grade students with a primary language of Spanish. This purpose was addressed through nine subquestions that reflect the subtest areas measured. In order to best address this purpose and to answer Research Questions 1 through 9, the two experimental groups were collapsed into one group identified as the Combined Experimental Group (CEG) for the analysis of the data. This allowed for an increased number of the participants included in the analysis. A second major purpose of this study was to determine if the language of instruction (i.e., English or Spanish) delivered by the *Lexia Primary Reading Program*, a computer-based reading program, made a significant difference on the English reading skills of first grade students with a primary language of Spanish.

The first group served as the comparison group (CG1). The second group (i.e., EG1) received the *Lexia Primary Reading Program* (Lexia, 2004) to teach English literacy skills with English as the language of instruction. The third group (i.e., EG2) received the *Lexia Primary Reading Program* to teach English literacy skills with Spanish as the language of instruction. Interrater reliability for the measures used in this study is reported. Following that, the results for each of the 10 questions are

provided. The content of this chapter is organized around the research questions. Each question is stated followed by the statistical analysis of the data.

Interrater Reliability

Assessments were completed at pretest and posttest. There were three members of the assessment team. In order to ensure that results obtained from the assessment were reliable, 20% of the assessments were completed with the investigator scoring along with another member of the assessment team. The formula that was used to determine the percentage of agreement was the number of agreements divided by the number of opportunities for agreement X 100. See Table 3 for the percent agreements between the assessment team.

Table 3

Interrater Reliability for Assessments Used.

Source		Percent of Agreement
WMLS		
	Picture Vocabulary	97.9%
	Verbal Analogies	98.2%
	Letter-Word Identification	97.4%
	Passage Comprehension	97.6%
DIBELS		
	Phoneme Segmentation Fluency	97.1%
	Nonsense Word Fluency	97.1%
	Oral Reading Fluency	98.7%

Effectiveness of the *Lexia Primary Reading Program* (Lexia, 2004)

Research Questions and Related Findings

The first major topic of this study is covered through nine subquestions. The nine subquestions in this study focused on the effectiveness of the *Lexia Primary Reading Program* (Lexia, 2004) at increasing literacy skills in EL learners.

Research Question 1: Does the *Lexia Primary Reading Program* (2004) increase the English oral language skills of first grade native Spanish-speaking EL learners?

The *WMLS-R* was used to assess the students' English oral language skills. All students participated in pretest and posttest assessment of these skills. The pre and

post assessments were administered to each student by the same member of the research team.

In order to determine if there was a statistically significant difference between the performance of the combined experimental group (CEG) and the comparison group (CG) at posttest, a one-way between groups analysis of variance (ANOVA) was run to compare the effectiveness of the *Lexia Primary Reading Program* (Lexia, 2004) on the English oral language skills of the students. The independent variable was the computer software and the dependant variable was the posttest scores of English oral language skills of the students as measured at posttest. There was a statistically significant difference between the comparison (M = 82.15) and the combined experimental (M = 90.89) groups, [$F(1, 39) = 5.616$, $p = .023$].

To control for any pretest differences, a one-way between groups analysis of covariance (ANCOVA) was run. The students' scores on the pretest of their English oral language skills were used as a covariate in the analysis. After adjusting for the pretest scores, there was a statistically significant difference between the comparison (adjusted mean = 84.77) and the combined experimental (adjusted mean = 89.68) groups on the posttest, English Oral Language skills, [$F(1, 38)=5.747$, $p =.022$], indicating that there was a statistically significant difference in the English oral language skills between the comparison and the combined experimental group. Thus, the adjusted posttest mean of the combined experimental group was statistically higher than the adjusted mean of the comparison group in the area of oral language skills.

Research Question 2: Does the *Lexia Primary Reading Program* (Lexia, 2004) increase the picture vocabulary skills of first grade native Spanish-speaking EL learners?

The *WMLS-R* was used to assess the students' English picture vocabulary skills. All students participated in pretest and posttest assessment of these skills. The pre and post assessments were administered to the student by the same member of the research team.

In order to determine if there was a statistically significant difference between the performance of the combined experimental group and the comparison group, a one-way between groups analysis of variance (ANOVA) was conducted to compare the effectiveness of the *Lexia Primary Reading Program* (Lexia, 2004) on the English picture vocabulary skills of the students. The independent variable was the computer software and the dependent variable was the English picture vocabulary skills of the students as measured at posttest. There was a statistically significant difference between the comparison (M = 72.62) and the combined experimental (M = 84.54) groups, [$F(1, 39) = 5.641$, $p = .023$].

To control for any pretest differences, a one-way between groups analysis of covariance (ANCOVA) was run. The students' scores on the pretest of their English picture vocabulary skills were used as a covariate in the analysis. After adjusting for the pretest scores, there was a statistically significant difference between the comparison (adjusted mean = 75.58) and the combined experimental (adjusted mean = 83.16) groups on the posttest, English picture vocabulary skills, [$F(1, 38)=6.633$,

p =.014], indicating that there was a statistically significant difference in the English picture vocabulary skills between the comparison and the combined experimental group. Thus, the adjusted posttest mean of the combined experimental group was statistically higher than the adjusted mean of the comparison group in the area of picture vocabulary skills.

Research Question 3: Does the *Lexia Primary Reading Program* (Lexia, 2004) increase the English verbal analogies scores of first grade native Spanish-speaking EL learners?

The *WMLS-R* was used to assess the students' English verbal analogies skills. All students participated in pretest and posttest assessments of these skills. The pre and post assessments were administered to the student by the same member of the research team.

In order to determine if there was a statistically significant difference between the performance of the combined experimental group and the comparison group, a one-way between groups analysis of variance (ANOVA) was run to compare the effectiveness of the *Lexia Primary Reading Program* (Lexia, 2004) on the English verbal analogies skills of the students. The independent variable was the computer software and the dependant variable was the English verbal analogies skills of the students as measured at posttest. There was not a statistically significant difference between the comparison (M = 95.00) and the combined experimental (M = 99.46) groups, [$F(1, 39) = 2.582$, $p = .116$].

To control for any pretest differences, a one-way between groups analysis of covariance (ANCOVA) was run. The students' scores on the pretest of their English

verbal analogies skills were used as a covariate in this analysis. After adjusting for the pretest scores, there was not a statistically significant difference between the comparison (adjusted mean = 75.58) and the combined experimental (adjusted mean = 83.16) groups on the posttest, English Verbal Analogies, [$F(1, 38)=.867$, $p =.358$], indicating that there was no statistically significant difference between the verbal analogies skills of the comparison and the combined experimental group. Thus, the adjusted mean of either group was not significantly higher than the other group in the area of English Verbal Analogies skills.

Research Question 4: Does the *Lexia Primary Reading Program* (Lexia, 2004) increase the English reading skills of first grade native Spanish-speaking EL learners?

The *WMLS-R* was used to assess the students' English reading skills. All students participated in pretest and posttest assessments of these skills. The pre and post assessments were administered to the student by the same member of the research team.

In order to determine if there was a statistically significant difference between the performance of the combined experimental group and the comparison group at posttest, a one-way between groups analysis of variance (ANOVA) was run to compare the effectiveness of the *Lexia Primary Reading Program* (Lexia, 2004) on the English reading skills of the students. The independent variable was the computer software and the dependant variable was the English reading skills of the students as measured at posttest. There was not a statistically significant difference between the comparison (M = 94.62) and the combined experimental (M = 103.11) groups, [$F(1, 39) = 3.499$, $p = .069$].

To control for any pretest differences, a one-way between groups analysis of covariance (ANCOVA) was run. The students' scores on the pretest of their English reading skills were used as a covariate in this analysis. After adjusting for the pretest scores, there was not a statistically significant difference between the comparison (adjusted mean = 97.86) and the combined experimental (adjusted mean = 101.60) groups on the posttest, English reading, [$F(1, 38) = 1.102$, $p = .300$], indicating that there was no statistically significant difference between the reading skills of the comparison and the combined experimental group. Thus, the adjusted mean of either group was not significantly higher than the other group in the area of reading skills.

Research Question 5: Does the *Lexia Primary Reading Program* (2004) increase the letter-word identification skills of first grade native Spanish-speaking EL learners?

The *WMLS-R* was used to assess the students' English letter-word identification skills. All students participated in pretest and posttest assessments of these skills. The pre and post assessments were administered to the student by the same member of the research team.

In order to determine if there was a statistically significant difference between the performance of the combined experimental group and the comparison group at posttest, a one-way between groups analysis of variance (ANOVA) was run to compare the effectiveness of the *Lexia Primary Reading Program* (Lexia, 2004) on the English letter-word identification skills of the students. The independent variable was the computer software and the dependent variable was the English letter-word identification skills of the students as measured at posttest. There was a statistically

significant difference between the comparison (M = 96.46) and the combined experimental (M = 107.18) groups, [F(1, 39) = 8.262, p = .007].

To control for any pretest differences, a one-way between groups analysis of covariance (ANCOVA) was run. The students' scores on the pretest of their English letter-word identification skills were used as a covariate in this analysis. After adjusting for the pretest scores, there was a statistically significant difference between the comparison (adjusted mean = 100.79) and the combined experimental (adjusted mean = 105.17) groups on the posttest, English letter-word identification, [F(1, 38) = 4.542, p = .040], indicating that there was a significant difference between the letter-word identification skills of the comparison and the combined experimental group. Thus, the adjusted posttest mean of the combined experimental group was statistically higher than the adjusted mean of the comparison group in the area of letter-word identification.

Research Question 6: Does the *Lexia Primary Reading Program* (Lexia, 2004) increase the reading comprehension skills of first grade native Spanish-speaking EL learners?

The *WMLS-R* was used to assess the students' English the reading comprehension skills. All students participated in pretest and posttest assessments of these skills. The pre and post assessments were administered to the student by the same member of the research team.

In order to determine if there was a statistically significant difference between the performance of the combined experimental group and the comparison group at posttest, a one-way between groups analysis of variance (ANOVA) was run to

compare the effectiveness of the *Lexia Primary Reading Program* (2004) on the English reading comprehension skills of the students. The independent variable was the computer software and the dependent variable was the English reading comprehension skills of the students as measured at posttest. There was a statistically significant difference between the comparison (M = 93.31) and the combined experimental (M = 101.71) groups, [F(1, 39) = 7.598, p = .009].

To control for any pretest differences, a one-way between groups analysis of covariance (ANCOVA) was run. The students' scores on the pretest of their English reading comprehension skills were used as a covariate in this analysis. After adjusting for the pretest scores, there was a statistically significant difference between the comparison (adjusted mean = 93.31) and the combined experimental (adjusted mean = 101.71) groups on the posttest, English reading comprehension, [F(1, 38) = 5.220, p= .0280], indicating that there was a statistically significant difference between the reading comprehension skills of the comparison and the combined experimental group. Thus, the adjusted posttest mean of the combined experimental group was statistically higher than the adjusted mean of the comparison group in the area of reading comprehension.

Research Question 7: Does the *Lexia Primary Reading Program* (Lexia, 2004) increase the English phoneme segmentation fluency skills of first grade native Spanish-speaking EL learners?

The *DIBELS* was used to assess the students' English phoneme segmentation fluency skills. All students participated in pretest and posttest assessments of these

skills. The pre and post assessments were administered to the student by the same member of the research team.

In order to determine if there was a statistically significant difference between the performance of the combined experimental group and the comparison group at posttest, a one-way between groups analysis of variance (ANOVA) was run to compare the effectiveness of the *Lexia Primary Reading Program* (2004) on the English phoneme segmentation fluency skills of the students. The independent variable was the computer software and the dependant variable was the English phoneme segmentation fluency skills of the students as measured at posttest. There was not a statistically significant difference between the comparison (M = 38.92) and the combined experimental (M =44.82) groups, [$F(1, 39) = 1.956$, $p = .170$].

To control for any pretest differences, a one-way between groups analysis of covariance (ANCOVA) was run. The students' scores on the pretest of their English phoneme segmentation fluency skills were used as a covariate in this analysis. After adjusting for the pretest scores, there was not a statistically significant difference between the comparison (adjusted mean = 42.01) and the combined experimental (adjusted mean = 43.39) groups on the posttest, English phoneme segmentation fluency, [$F(1, 38) = .189$, $p = .666$], indicating that there was not a statistically significant difference between the phoneme segmentation fluency skills of the comparison and the combined experimental group. Therefore, there was no statistically significant difference between the posttest adjusted means in the area of phoneme segmentation fluency.

Research Question 8: Does the *Lexia Primary Reading Program* (Lexia, 2004) increase the English nonsense word fluency skills of first grade native Spanish-speaking EL learners?

The *DIBELS* was used to assess the students' English nonsense word fluency skills. All students participated in pretest and posttest assessments of these skills. The pre and post assessments were administered to the student by the same member of the research team.

In order to determine if there was a statistically significant difference between the performance of the combined experimental group and the comparison group at posttest, a one-way between groups analysis of variance (ANOVA) was run to compare the effectiveness of the *Lexia Primary Reading Program* (Lexia, 2004) on the English nonsense word fluency skills of the students. The independent variable was the computer software and the dependent variable was the English nonsense word fluency skills of the students as measured at posttest. There was not a statistically significant difference between the comparison (M = 45.62) and the combined experimental (M = 60.04) groups, [$F(1, 39) = 1.463$, $p = .234$].

To control for any pretest differences, a one-way between groups analysis of covariance (ANCOVA) was run. The students' scores on the pretest of their English nonsense word fluency skills were used as a covariate in this analysis. After adjusting for the pretest scores, there was not a statistically significant difference between the comparison (adjusted mean = 52.88) and the combined experimental (adjusted mean = 56.67) groups on the posttest, English nonsense word fluency, [$F(1, 38) = .242$,

p =.626], indicating that there was not a statistically significant difference between the nonsense word fluency skills of the comparison and the combined experimental group. Therefore, there was no statistically significant difference between the posttest adjusted means in the area of nonsense word fluency.

Research Question 9: Does the *Lexia Primary Reading Program* (Lexia, 2004) increase the oral reading fluency skills of first grade native Spanish-speaking EL learners?

The *DIBELS* was used to assess the students' English oral reading fluency skills. All students participated in pretest and posttest assessments of these skills. The pre and post assessments were administered to the student by the same member of the research team.

In order to determine if there was a statistically significant difference between the performance of the combined experimental group and the comparison group at posttest, a one-way between groups analysis of variance (ANOVA) was run to compare the effectiveness of the *Lexia Primary Reading Program* (Lexia, 2004) on the English oral reading fluency skills of the students. The independent variable was the computer software and the dependent variable was the English oral reading fluency skills of the students as measured at posttest. There was a statistically significant difference between the comparison (M = 34.15) and the combined experimental (M = 57.89) groups, [$F(1, 39) = 6.059$, $p = .018$].

To control for any pretest differences, a one-way between groups analysis of covariance (ANCOVA) was run. The students' scores on the pretest of their English oral reading fluency skills were used as a covariate in this analysis. After adjusting

for the pretest scores, there was not a statistically significant difference between the comparison (adjusted mean = 46.92) and the combined experimental (adjusted mean = 51.96) groups on the posttest, English oral reading fluency, [$F(1, 38) = 1.749$, $p = .194$], indicating that there was not a statistically significant difference between the oral reading fluency skills of the comparison and the combined experimental group. Therefore, there was no statistically significant difference between the posttest adjusted means in the area of oral reading fluency.

Table 4

Summary of ANOVA for the Posttest Group Differences - Questions 1 through 9

Dependent Variable	Source	F	*p*
Oral Language	Group	5.616	.023*
Picture Vocabulary	Group	5.641	.023*
Verbal Analogies	Group	2.582	.116
Reading	Group	3.499	.069
Letter-Word Identification	Group	8.262	.007*
Passage Comprehension	Group	7.598	.009*
Phoneme Segmentation Fluency	Group	1.956	.170
Nonsense Word Fluency	Group	1.463	.234
Oral Reading Fluency	Group	6.059	.018*

Note. * Significant at the $p < .05$ level.

Table 5

Summary of ANCOVA for Posttest Group Differences - Questions 1 through 9

Dependent Variable	Source	F	*p*
Oral Language	Group	5.747	.022*
Picture Vocabulary	Group	6.633	.014*
Verbal Analogies	Group	0.867	.358
Reading	Group	1.102	.300
Letter-Word Identification	Group	4.542	.040*
Passage Comprehension	Group	5.220	.020*
Phoneme Segmentation Fluency	Group	0.189	.666
Nonsense Word Fluency	Group	0.242	.626
Oral Reading Fluency	Group	1.749	.194

Note. * Significant at the $p < .05$ level.

Impact of Language of Instruction

Research Question and Related Findings

The final question of this study focused on the impact of the language used by the *Lexia Primary Reading Program* (Lexia, 2004). Research Question 10: Is there a difference in how the language of instruction (i.e. Spanish or English) provided by the *Lexia Primary Reading Program* impacts the reading scores of first grade native Spanish-speaking EL learners?

Oral language. The *WMLS-R* was used to assess the students' English oral language skills. All students participated in pretest and posttest assessment of these skills. Data from the students in the two experimental groups were analyzed. The pre and post assessments were administered to the student by the same member of the research team.

In order to determine if there was a statistically significant difference between the performance of the two experimental groups at posttest, a one-way between groups analysis of variance (ANOVA) was run to compare the effectiveness of the language of instruction used by the *Lexia Primary Reading Program* (Lexia, 2004) on the English oral language skills of the students. The independent variable was the language of instruction used by the computer software and the dependent variable was the English oral language skills of the students as measured at posttest. There was not a statistically significant difference between EG1 (M = 90.64) and EG2 (M = 91.14) groups, [$F(1, 26) = .012$, $p = .914$].

To control for any pretest differences, a one-way between groups analysis of covariance (ANCOVA) was run. The students' scores on the pretest of their English oral language skills were used as a covariate in this analysis. After adjusting for the pretest scores, there was not a statistically significant difference between EG1 (adjusted mean = 90.83) and EG2 (adjusted mean = 90.96) groups on the posttest, English oral language, [$F(1, 25) = .003$, $p = .957$], indicating that there was not a statistically significant difference between the oral language skills of the two experimental groups. Therefore, there was no statistically significant difference between the posttest adjusted means in the area of oral language skills.

Picture Vocabulary. The *WMLS-R* was used to assess the students' English picture vocabulary skills. All students participated in pretest and posttest assessment of these skills. Data from the students in the two experimental groups were analyzed. The pre and post assessments were administered to the student by the same member of the research team.

In order to determine if there was a statistically significant difference between the performance of the two experimental groups, a one-way between groups analysis of variance (ANOVA) was run to compare the effectiveness of the language of instruction used by the *Lexia Primary Reading Program* (Lexia, 2004) on the English picture vocabulary skills of the students. The independent variable was the language of instruction used by the computer software and the dependant variable was the English picture vocabulary skills of the students as measured at posttest. There was not a statistically significant difference between EG1 (M = 84.93) and EG2 (M = 84.14) groups, [$F(1, 26) = .017$, $p = .896$].

To control for any pretest differences, a one-way between groups analysis of covariance (ANCOVA) was run. The students' scores on the pretest of their English picture vocabulary skills were used as a covariate in this analysis. After adjusting for the pretest scores, there was not a statistically significant difference between EG1 (adjusted mean = 84.55) and EG2 (adjusted mean = 84.52) groups on the posttest, English picture vocabulary, [$F(1, 25) = .000$, $p = .995$], indicating that there was not a statistically significant difference between the picture vocabulary skills of the two experimental groups. Therefore, there was no statistically significant difference between the posttest adjusted means in the area of English picture vocabulary.

Verbal Analogies. The *WMLS-R* was used to assess the students' English verbal analogies skills. All students participated in pretest and posttest assessment of these skills. Data from the students in the two experimental groups were analyzed. The pre and post assessments were administered to the student by the same member of the research team.

In order to determine if there was a statistically significant difference between the performance of the two experimental groups, a one-way between groups analysis of variance (ANOVA) was run to compare the effectiveness of the language of instruction used by the *Lexia Primary Reading Program* (Lexia, 2004) on the English verbal analogies skills of the students. The independent variable was the language of instruction used by the computer software and the dependent variable was the English verbal analogies skills of the students as measured at posttest. There was not a statistically significant difference between EG1 (M = 97.61) and EG2 (M = 101.07) groups, [$F(1, 26) = 1.10$, $p = .304$].

To control for any pretest differences, a one-way between groups analysis of covariance (ANCOVA) was run. The students' scores on the pretest of their English verbal analogies skills were used as a covariate in this analysis. After adjusting for the pretest scores, there was not a statistically significant difference between EG1 (adjusted mean = 98.72) and EG2 (adjusted mean = 100.10) groups on the posttest, English verbal analogies, [$F(1, 25) = .433$, $p = .517$], indicating that there was not a statistically significant difference between the verbal analogies skills of the two experimental groups. Therefore, there was no statistically significant difference between the posttest adjusted means in the area of verbal analogy skills.

Reading. The *WMLS-R* was used to assess the students' English reading skills. All students participated in pretest and posttest assessment of these skills. Data from the students in the two experimental groups were analyzed. The pre and post assessments were administered to the student by the same member of the research team.

In order to determine if there was a statistically significant difference between the performance of the two experimental groups, a one-way between groups analysis of variance (ANOVA) was run to compare the effectiveness of the language of instruction used by the *Lexia Primary Reading Program* (Lexia, 2004) on the English reading skills of the students. The independent variable was the language of instruction used by the computer software and the dependent variable was the English reading skills of the students as measured at posttest. There was not a statistically significant difference between EG1 (M = 105.07) and EG2 (M = 101.14) groups, [$F(1, 26) = .447$, $p = .510$].

To control for any pretest differences, a one-way between groups analysis of covariance (ANCOVA) was run. The students' scores on the pretest of their English reading skills were used as a covariate in this analysis. After adjusting for the pretest scores, there was not a statistically significant difference between EG1 (adjusted mean = 102.02) and EG2 (adjusted mean = 104.20) groups on the posttest, English reading skills, [$F(1, 25) = .267$, $p = .610$], indicating that there was not a statistically significant difference between the reading skills of the two experimental groups. Therefore, there was no statistically significant difference between the posttest adjusted means in the area of English reading skills.

Letter-Word Identification. The *WMLS-R* was used to assess the students' English letter-word identification skills. All students participated in pretest and posttest assessment of these skills. Data from the students in the two experimental groups were analyzed. The pre and post assessments were administered to the student by the same member of the research team.

In order to determine if there was a statistically significant difference between the performance of the two experimental groups, a one-way between groups analysis of variance (ANOVA) was run to compare the effectiveness of the language of instruction used by the *Lexia Primary Reading Program* (Lexia, 2004) on the English letter-word identification skills of the students. The independent variable was the language of instruction used by the computer software and the dependent variable was the English letter-word identification skills of the students as measured at posttest. There was not a statistically significant difference between EG1 (M = 108.00) and EG2 (M = 106.36) groups, [$F(1, 26) = .133$, $p = .719$].

To control for any pretest differences, a one-way between groups analysis of covariance (ANCOVA) was run. The students' scores on the pretest of their English letter-word identification skills were used as a covariate in this analysis. After adjusting for the pretest scores, there was not a statistically significant difference between EG1 (adjusted mean = 106.55) and EG2 (adjusted mean = 107.81) groups on the posttest, English letter-word identification skills, [$F(1, 25) = .379$, $p = .544$], indicating that there was not a statistically significant difference between the letter-word identification skills of the two experimental groups. Therefore, there was no statistically significant difference between the posttest adjusted means in the area of

letter-word identification skills.

Passage Comprehension. The *WMLS-R* was used to assess the students' English passage comprehension skills. All students participated in pretest and posttest assessment of these skills. Data from the students in the two experimental groups were analyzed. The pre and post assessments were administered to the student by the same member of the research team.

In order to determine if there was a statistically significant difference between the performance of the two experimental groups, a one-way between groups analysis of variance (ANOVA) was run to compare the effectiveness of the language of instruction used by the *Lexia Primary Reading Program* (Lexia, 2004) on the English passage comprehension skills of the students. The independent variable was the language of instruction used by the computer software and the dependant variable was the English passage comprehension skills of the students as measured at posttest. There was not a statistically significant difference between EG1 (M = 100.93) and EG2 (M = 102.50) groups, [$F(1, 26) = .169$, $p = .684$].

To control for any pretest differences, a one-way between groups analysis of covariance (ANCOVA) was run. The students' scores on the pretest of their English passage comprehension skills were used as a covariate in this analysis. After adjusting for the pretest scores, there was a statistically significant difference between EG1 (adjusted mean = 98.51) and EG2 (adjusted mean = 104.92) groups on the posttest, English passage comprehension skills, [$F(1, 25) = 5.693$, $p = .025$], indicating that there was a statistically significant difference between the passage

comprehension skills of the two experimental groups. Therefore, there was a statistically significant difference between the posttest adjusted means in the area of English reading comprehension.

Phoneme Segmentation Fluency. The *DIBELS* was used to assess the students' English phoneme segmentation fluency skills. All students participated in pretest and posttest assessment of these skills. Data from the students in the two experimental groups were analyzed. The pre and post assessments were administered to the student by the same member of the research team.

In order to determine if there was a statistically significant difference between the performance of the two experimental groups, a one-way between groups analysis of variance (ANOVA) was run to compare the effectiveness of the language of instruction used by the *Lexia Primary Reading Program* (Lexia, 2004) on the English phoneme segmentation fluency skills of the students. The independent variable was the language of instruction used by the computer software and the dependant variable was the English phoneme segmentation fluency skills of the students as measured at posttest. There was not a statistically significant difference between EG1 (M = 39.71) and EG2 (M = 49.93) groups, [$F(1, 26) = 4.173$, $p = .051$].

To control for any pretest differences, a one-way between groups analysis of covariance (ANCOVA) was run. The students' scores on the pretest of their English phoneme segmentation fluency skills were used as a covariate in this analysis. After adjusting for the pretest scores, there was not a statistically significant difference between EG1 (adjusted mean = 42.48) and EG2 (adjusted mean = 47.17) groups on the posttest, English phoneme segmentation fluency skills, [$F(1, 25) = 2.028$,

p =.167], indicating that there was not a statistically significant difference between the phoneme segmentation fluency skills of the two experimental groups. Therefore, there was no statistically significant difference between the posttest adjusted means in the area of phoneme segmentation fluency.

Nonsense Word Fluency. The *DIBELS* was used to assess the students' English nonsense word fluency skills. All students participated in pretest and posttest assessment of these skills. Data from the students in the two experimental groups were analyzed. The pre and post assessments were administered to the student by the same member of the research team.

In order to determine if there was a statistically significant difference between the performance of the two experimental groups, a one-way between groups analysis of variance (ANOVA) was run to compare the effectiveness of the language of instruction used by the *Lexia Primary Reading Program* (Lexia, 2004) on the English nonsense word fluency skills of the students. The independent variable was the language of instruction used by the computer software and the dependent variable was the English nonsense word fluency skills of the students as measured at posttest. There was not a statistically significant difference between EG1 (M = 54.29) and EG2 (M = 65.79) groups, [$F(1, 26) = .659$, $p = .424$].

To control for any pretest differences, a one-way between groups analysis of covariance (ANCOVA) was run. The students' scores on the pretest of their English nonsense word fluency skills were used as a covariate in this analysis. After adjusting for the pretest scores, there was not a statistically significant difference between EG1 (adjusted mean = 57.28) and EG2 (adjusted mean = 62.79) groups on the posttest,

English nonsense word fluency skills, [F(1, 25) = .480, p =.495], indicating that there was not a statistically significant difference between the nonsense word fluency skills of the two experimental groups. Therefore, there was no statistically significant difference between the posttest adjusted means in the area of English nonsense word fluency.

Oral Reading Fluency. The *DIBELS* was used to assess the students' English oral reading fluency skills. All students participated in pretest and posttest assessment of these skills. Data from the students in the two experimental groups were analyzed. The pre and post assessments were administered to the student by the same member of the research team.

In order to determine if there was a statistically significant difference between the performance of the two experimental groups, a one-way between groups analysis of variance (ANOVA) was run to compare the effectiveness of the language of instruction used by the *Lexia Primary Reading Program* (Lexia, 2004) on the English oral reading fluency skills of the students. The independent variable was the language of instruction used by the computer software and the dependant variable was the English oral reading fluency skills of the students as measured at posttest. There was not a statistically significant difference between EG1 (M = 64.14) and EG2 (M = 51.64) groups, [F(1, 26) = 1.160, p = .291].

To control for any pretest differences, a one-way between groups analysis of covariance (ANCOVA) was run. The students' scores on the pretest of their English oral reading fluency skills were used as a covariate in this analysis. After adjusting for the pretest scores, there was not a statistically significant difference between EG1

(adjusted mean = 58.36) and EG2 (adjusted mean = 57.43) groups on the posttest, English oral reading fluency skills, [$F(1, 25) = .042$, $p = .840$], indicating that there was not a statistically significant difference between the oral reading fluency skills of the two experimental groups. Therefore, there was no statistically significant difference between the posttest adjusted means in the area of English oral reading fluency.

Table 6

Summary of ANOVA for Posttest Group Differences – Question 10

Dependent Variable	Source	F	*p*
Oral Language	Group	.012	.914
Picture Vocabulary	Group	.017	.896
Verbal Analogies	Group	1.10	.304
Reading	Group	.447	.510
Letter-Word Identification	Group	.133	.719
Passage Comprehension	Group	.169	.684
Phoneme Segmentation Fluency	Group	4.173	.051
Nonsense Word Fluency	Group	.659	.424
Oral Reading Fluency	Group	1.160	.291

Note. * Significant at the $p < .05$ level.

Table 7

Summary of ANCOVA for Posttest Group Differences – Question 10

Dependent Variable	Source	F	*p*
Oral Language	Group	.003	.957
Picture Vocabulary	Group	.000	.995
Verbal Analogies	Group	.433	.517
Reading	Group	.267	.610
Letter-Word Identification	Group	.379	.544
Passage Comprehension	Group	5.693	.025*
Phoneme Segmentation Fluency	Group	2.028	.167
Nonsense Word Fluency	Group	.480	.495
Oral Reading Fluency	Group	.042	.840

Note. * Significant at the $p < .05$ level.

CHAPTER 5

DISCUSSION

During this study, data were collected regarding two major questions. The first question was to determine the effectiveness of the *Lexia Primary Reading Program* (Lexia, 2004) on the reading and oral language skills of first grade EL learners. This major question was addressed through nine subquestions that reflect the subtest areas assessed. The second major question focused on the impact of the language (i.e., English or Spanish) of the oral instruction used by the *Lexia Primary Reading Program* on the reading and oral language skills of first grade EL learners. The findings as related to each research question are discussed in the following sections of this chapter. Then, conclusions derived from this study are described. Additionally, practical implications of the information learned through this study are discussed. Finally, recommendations for future research are provided.

Effectiveness of the *Lexia Primary Reading Program* (Lexia, 2004)

The first major topic of this study is covered through nine subquestions. The nine subquestions in this study focused on the effectiveness of the *Lexia Primary Reading Program* (Lexia, 2004) at increasing literacy skills in EL learners. *Lexia Primary Reading Program* was effective at increasing literacy skills in some of the areas measured (i.e., oral language, picture vocabulary, letter-word identification, and passage

comprehension). This study answered several important questions regarding literacy skills of EL learners.

The first question regarding the effectiveness of *Lexia Primary Reading Program* (Lexia, 2004) discussed is: Does the *Lexia Primary Reading Program* increase the English oral language skills of first grade native Spanish-speaking EL learners? It was predicted that the *Lexia Primary Reading Program* would increase the English oral language skills of first grade native Spanish-speaking EL learners.

Since the question focused upon the effectiveness of the *Lexia Primary Reading Program* (Lexia, 2004), the two experimental groups were combined in one group, the combined experimental group, for analysis. This allowed for a larger number of participant data to be subjected to the analysis. The data from the comparison and the combined experimental group indicated a significant group difference, meaning that the two groups were significantly different. Students in the combined experimental group performed significantly better than the students in the comparison group in the area of English oral language skills. Students who received the computer-based instruction from the *Lexia Primary Reading Program* performed better on the subtests that assessed English oral language skills. Therefore, the *Lexia Primary Reading Program* is effective at increasing oral language skills for EL learners.

Oral language skills are vital pre-literacy skills for EL learners learning to read in English. Oral language skills provide the skills necessary for reading comprehension. Oral language proficiency in the second language affects reading comprehension in the second language (Peregoy & Boyle, 2005). With limited oral language proficiency, reading comprehension can be difficult for EL learners. Anderson and Roit (1998) stated

that oral language skills in English are vital for EL learners; however, they are very often left out of instruction. Therefore, interventions that increase oral language skills are important for EL learners.

The next question regarding the effectiveness of the *Lexia Primary Reading Program* (Lexia, 2004) discussed is: Does the *Lexia Primary Reading Program* increase the picture vocabulary skills of first grade native Spanish-speaking EL learners? It was predicted that the *Lexia Primary Reading Program* would increase the English picture vocabulary skills of first grade native Spanish-speaking EL learners.

The data from the comparison and the combined experimental group indicated a significant group difference, meaning that the two groups were significantly different. That is, the students in the combined experimental group performed significantly better in the area of English picture vocabulary skills. Students who received the computer-based instruction from the *Lexia Primary Reading Program* (Lexia, 2004) performed better in the area of English picture vocabulary skills. Picture vocabulary skills are important pre-literacy skills for EL learners learning to read in English.

Level of vocabulary knowledge has been shown to be a significant predictor of reading comprehension and fluency for EL learners (Grabe, 1991; McLaughlin, 1987). Vocabulary skills are important skills for EL learners to be taught. Students with higher vocabularies have better reading comprehension skills (NRP, 2003). When students know the meaning of the words they are reading, they are better able to comprehend the text. EL learners need opportunities for vocabulary instruction. It is necessary for oral language and literacy development for EL learners (Hickman, Pollard-Durodola, &

Vaughn, 2004). The *Lexia Primary Reading Program* (Lexia, 2004) can be used as a way to increase the vocabulary skills of EL learners.

Another question regarding the effectiveness of the *Lexia Primary Reading Program* (Lexia, 2004) to be discussed is: Does the *Lexia Primary Reading Program* increase the letter-word identification skills of first grade native Spanish-speaking EL learners? It was predicted that the *Lexia Primary Reading Program* would increase the English letter-word identification skills of first grade native Spanish-speaking EL learners.

The data from the comparison and the combined experimental group indicated a significant group difference, meaning that the two groups were significantly different. That is, the students in the combined experimental group performed significantly better in the area of English letter-word identification skills. Students who received the computer-based instruction from the *Lexia Primary Reading Program* (Lexia, 2004) performed better in the area of English letter-word identification skills. Students who received the *Lexia Primary Reading Program* performed better in the area of letter-word identification than students who did not receive the *Lexia Primary Reading Program*. Therefore, the *Lexia Primary Reading Program* is effective in increasing the letter-word identification skills of EL learners.

The letter-word identification subtest of the WMLS-R measures the students' ability to read familiar and unfamiliar letters and words. Findings from this research support the use of the *Lexia Primary Reading Program* (Lexia, 2004) to teach letter-word identification skills to EL learners. This is important as EL learners continue to perform lower than monolingual English speakers in the area of reading (Freeman & Freeman, 2004). As EL learners continue to struggle with literacy skills (August et al, 2006),

finding appropriate interventions to assist them is important. The *Lexia Primary Reading Program* could be used to assist EL learners that are struggling with letter-word identification skills in English.

Another question regarding the effectiveness of the *Lexia Primary Reading Program* (Lexia, 2004) to be discussed is: Does the *Lexia Primary Reading Program* increase the reading comprehension skills of first grade native Spanish-speaking EL learners? It was predicted that the *Lexia Primary Reading Program* would increase the English reading comprehension skills of first grade native Spanish-speaking EL learners.

The data from the comparison and the combined experimental group indicated a significant group difference, meaning that the two groups were significantly different or that the students in the combined experimental group performed significantly better in the area of English reading comprehension skills. Students who received computer-based instruction from the *Lexia Primary Reading Program* (Lexia, 2004) performed better in the area of English reading comprehension skills. Students who received the *Lexia Primary Reading Program* performed better in the area of reading comprehension than students who did not receive the *Lexia Primary Reading Program.* Therefore, the *Lexia Primary Reading Program* is effective in increasing the reading comprehension skills of EL learners.

This research supports using the *Lexia Primary Reading Program* to support instruction in reading comprehension skills of EL learners. Increasing reading comprehension skills for EL learners is important for continued success in school. The reason for reading is to gain understanding from the text (NRP, 2003). If a student does not understand what they are reading, they are not reading. Increased reading

comprehension will help EL learners succeed in many areas of the curriculum. When students have increased reading comprehension they will be able to learn more from the text they are reading. As EL learners continue to drop out from school at higher rates than other groups of students, improving literacy skills for EL learners will help them in many areas.

Five questions regarding the effectiveness of the *Lexia Primary Reading Program* (Lexia, 2004) did not result in a significant difference between the two groups. The four dependent variables that did not result in a significant difference are:

1. *Verbal analogies*. The overall group differences between the two groups were not significantly different, meaning that the students in the two groups had similar skills in the area of verbal analogies. Though no statistical difference was found between the two groups, both the mean and the adjusted mean of the combined experimental group were higher than the mean and adjusted mean of the comparison group.
2. *Reading Skills Composite*. The overall group differences between the two groups were not significantly different, meaning that the students in the two groups had similar skills in the area of English reading skills. The English reading score is a composite of the letter-word identification and the passage comprehension score. Composite scores are impacted by the compounding of measurement error in the subtests that are combined to make the composite, and this can limit the capability to find statistically significant differences when using composite scores. Though the difference between the two groups was not statistically significant, both the

mean and the adjusted mean of the combined experimental group were higher than the mean and adjusted mean of the comparison group.

3. *Phoneme Segmentation Fluency.* The overall group differences between the two groups were not significantly different, meaning that the students in the two groups had similar skills in the area of English phoneme segmentation fluency skills. Though no statistical difference was found between the two groups, both the mean and the adjusted mean of the combined experimental group were higher than the mean and adjusted mean of the comparison group.
4. *Nonsense Word Fluency.* Though no statistical difference was found between the two groups both the mean and the adjusted mean of the combined experimental group were higher than the mean and adjusted mean of the comparison group. A factor that could have impacted the findings in this area was the standard deviation of the scores. The standard deviations were very high (i.e., comparison group SD = 31.32, combined experimental group SD = 37.23).
5. *Oral Reading Fluency.* Though there was a statistical difference found between the two groups on the ANOVA, there was a statistical difference between the two groups prior to intervention. The ANCOVA indicated no statistical difference between the two groups when the pretest score is used as a covariate.

Impact of Language of Instruction

The last major question in this research study was: Is there a difference in how the language of instruction (i.e., Spanish or English) provided by the *Lexia Primary Reading Program* (Lexia, 2004) impacts the reading scores of first grade native Spanish-speaking

EL learners? It was predicted that the language of instruction provided by the *Lexia Primary Reading Program* will impact the reading scores of first grade native Spanish-speaking EL learners.

Reading comprehension skills. When the data were analyzed using an ANOVA, no significant group difference was indicated. When the data were analyzed using an ANCOVA, a statistical group difference was indicated. After analyzing the posttest data with the pretest score as a covariate, the data indicated that the students who received the Spanish oral language instructions performed better than the students who received English oral language instructions. The students who received Spanish oral language instruction performed significantly better on the passage comprehension subtest than the students who received English oral language instruction.

Primary language support via computer accounted for an increase in the reading comprehension subtest of the WMLS-R. The use of students' primary language has been shown to increase the literacy skills of EL learners (Greene, 1998; Rossell & Baker, 1996). This research further supports the use of primary language support via computer to increase the English reading comprehension skills of EL learners.

None of the other areas that were analyzed to answer this question resulted in a significant difference between the group that received English oral language instructions and the group who received Spanish oral language instructions. Specifically, the dependent variables that did not result in significance regarding the language of instruction (i.e., English or Spanish) are:

1. *Oral language skills.* The data from experimental group 1 and experimental group 2 indicated that there was no significant group difference. The overall group

differences in the two groups were not significantly different, meaning that the students who received Spanish language instructions performed no better than the students who received English oral language instructions. Therefore, the language of instruction did not impact the students' progress in English oral language skills.

2. *Picture vocabulary skills.* The data from experimental group 1 and experimental group 2 indicated that there was no significant group difference. The overall group differences in the two groups were not significantly different, meaning that the students who received Spanish language instructions performed no better than the students who received English oral language instructions. Therefore, the language of instruction did not impact the students' progress in English picture vocabulary skills.
3. *Verbal analogies skills.* The data from experimental group 1 and experimental group 2 indicated that there was no significant group difference. The overall group differences in the two groups were not significantly different, meaning that the students who received Spanish language instructions performed no better than the students who received English oral language instructions. Therefore, the language of instruction did not impact the students' progress in English verbal analogy skills.
4. *Reading skills.* The data from experimental group 1 and experimental group 2 indicated that there was no significant group difference. The overall group differences in the two groups were not significantly different, meaning that the students who received Spanish language instructions performed no better than the

students who received English oral language instructions. Therefore, the language of instruction did not impact the students' progress in English reading skills.

5. *Letter-word identification skills.* The data from experimental group 1 and experimental group 2 indicated that there was no significant group difference. The overall group differences in the two groups were not significantly different, meaning that the students who received Spanish language instructions performed no better than the students who received English oral language instructions. Therefore, the language of instruction did not impact the students' progress in English letter-word identification skills.
6. *Phoneme segmentation fluency skills.* The data from experimental group 1 and experimental group 2 indicated that there was no significant group difference. The overall group differences in the two groups were not significantly different, meaning that the students who received Spanish language instructions performed no better than the students who received English oral language instructions. Therefore, the language of instruction did not impact the students' progress in English phoneme segmentation fluency skills.
7. *Nonsense word fluency skills.* The data from experimental group 1 and experimental group 2 indicated that there was no significant group difference. The overall group differences in the two groups were not significantly different, meaning that the students who received Spanish language instructions performed no better than the students who received English oral language instructions. Therefore, the language of instruction did not impact the students' progress in English nonsense word fluency skills.

8. *Oral reading fluency skills.* The data from experimental group 1 and experimental group 2 indicated that there was no significant group difference. The overall group differences in the two groups were not significantly different, meaning that the students who received Spanish language instructions performed no better than the students who received English oral language instructions. Therefore, the language of instruction did not impact the students' progress in English oral reading fluency skills.

Conclusions

Several conclusions can be drawn from this study. The following conclusions are based on quantitative data collected in this study.

1. Children in the combined experimental group showed a significant increase in their oral language skills as measured by the *WMLS-R.*
2. Children in the combined experimental group showed a significant increase in their picture vocabulary skills as measured by the *WMLS-R.*
3. Children in the combined experimental group showed a significant increase in their letter-word identification skills as measured by the *WMLS-R.*
4. Children in the combined experimental group showed a significant increase in their passage comprehension skills as measured by the *WMLS-R.*
5. The language of instruction (i.e., English or Spanish) provided by the *Lexia Primary Reading Program* (Lexia, 2004) did not impact the scores of the EL learners except for in the area of passage comprehension.

Practical Implications

There is a great need for educators to find interventions that are effective for EL learners. English language learners continue to perform lower in academics areas than monolingual peers. At this time of increased accountability for the learning of students, school districts may feel tempted to pour large sums of money into interventions that have not been researched. Many times computer programs are very expensive and have not been find to be effective through research. Computer-based learning programs can cost schools tens of thousands of dollars for a site-license. Understanding the benefit that this money will bring is important for all.

This study brought forward several important implications for EL learners. The first is that while the *Lexia Primary Reading Program* (Lexia, 2004) is effective in increasing several literacy skills of EL learners, people interested in this type of program need to understand that the students in this study used this program on a regular, consistent basis. It is not believed that the impact of the program would have been so dramatic if the program was used sporadically. If a school is going to spend a large amount of money on the *Lexia Primary Reading Program*, they will need to ensure proper implementation of the program for its students.

Another important implication of this study was that many of the students who participated in the Spanish language group stated that they liked having the computer speak to them in Spanish. None of the students had been exposed to a computer program that spoke to them in Spanish prior to this intervention. The idea of student choice in language of instruction is one that needs to be researched further to determine its impact on the learning of EL learners.

A further use of the information provided through the research is for Response to Intervention. Response to Intervention (RTI) is a model of special education eligibility that allows for instruction and interventions to be made at the child's instructional level. This model can be very effective for all students. Especially, EL learners who are often not included in norming groups for standardized assessments. The use of these assessments is diminished and the academic needs of the individual student are addressed through the RTI model.

One of the most important aspects of the RTI model is that prior to testing for special education services the student receives research-based interventions. Currently, much of the research that has been done on effective reading interventions has been for English speaking students. Reading interventions that have been found effective for English speaking students may not take into account the very different needs of EL learners (Pollard-Durodola, Mathes, Vaughn, Cardenes-Hagan, & Linan-Thompson, 2006). The information derived from this study can be used to provide effective interventions for EL learners in the RTI process.

Suggestions for Further Research

Though this current study answered several questions related to the reading skills of EL learners. Research is still needed that focuses on success in reading for EL learners. Based on the results of this study, the following areas are suggested for further research.

1. A variation of this study that includes longer intervention and maintenance periods, as this may produce different results.

2. A variation of this study that includes a larger sample size, as this may produce different results.
3. Additional research with participants of different ages should be conducted to determine if the intervention is effective for different age EL learners.
4. A variation of this study that includes a component of student choice in language of instruction will provide important information to the field.
5. A variation of this study in which the comparison group uses a literacy-based program, as this may produce different results.
6. A variation of this study in which the participants have primary languages other than Spanish to determine the effectiveness of computer-based instruction for more types of EL learners.

Summary

This study contributes to the literature by focusing on the use of *Lexia Primary Reading Program* (Lexia, 2004) to increase the literacy skills of EL learners. Few studies have been conducted to focus on using computers with EL learners. The results from this study suggest that *Lexia Primary Reading Program* can be used to increase oral language skills, picture vocabulary skills, reading skills, letter-word identification, and passage comprehension of EL learners.

Reading is the most important skill that EL learners acquire in school (Slavin & Cheung, 2005). Success in reading has been shown to impact many areas of student social and economic opportunities (Peregoy & Boyle, 2005). Students who come to school with limited English proficiency have greater difficulty learning to read in English

(Freeman & Freeman, 2004). Support is needed for these students to enjoy the success in reading that monolingual English speakers experience.

English language learners continue to struggle in school at one of the highest rates (Hickman, Pollard-Durodola, & Vaughn, 2006). Many times this struggle leads to inappropriate referrals to special education. Spanish-speaking EL learners, who don't receive appropriate bilingual early reading instruction, are more likely to be referred inappropriately to special education or to exhibit deficits in both languages (Cloud, 2002; Segan, 1998). .

As schools in the United States become more diverse, educators must meet students' unique needs. Meeting the needs of EL learners continues to be a challenge for school districts to provide effective education. At the same time, this effective education is becoming vitally important for both school districts and EL learners. In these times of accountability and frequent assessment of all learners, effective interventions for EL learners, as well as all students, is crucial.

APPENDIX A

PARENT CONSENT FORM

UNLV
UNIVERSITY OF NEVADA LAS VEGAS

INFORMED CONSENT

Department of Special Education

TITLE OF STUDY: The Impact of Computer Based Intervention with and without Primary Language Support on Reading Skills of English Language Learners

INVESTIGATOR(S): Cathi Draper Rodriguez, Lori Navarrete and John Filler

CONTACT PHONE NUMBER: 702-895-1105

Purpose of the Study

Your child is invited to join in a research study. The purpose of this study is to determine the value of computer-based programs on the reading skills of English language learners.

Participants

You child is asked to join in the study because he or she is attending Tom Williams Elementary School, Spanish is spoken in your home, and has been identified by the school as an English language learner.

Procedures

If you allow your child to join in this study, your child will be asked to do the following: attend a session in the computer lab 3 times a week and use a computer based reading program. Your child will not miss teacher led teaching in the classroom because his or her teacher will be rotating the students through centers during this period of the day. The centers include small group teacher teaching, computer lab time, and independent work time.

Benefits of Participation

There may not be direct benefits to your child in this study. However, we hope to learn how computers can be used to help English language learners learn to read.

Risks of Participation

This study includes only minimal risks. These risks include fatigue, eye strain, and others finding out that your child is in this study.

Cost /Compensation

You will not need to pay for your child to join in this study. The study will take 12 hours of your child's time. Your child will not be paid for his or her time. The University of Nevada, Las Vegas may not provide payment or free medical care for an unanticipated injury received as a result of being in this research study.

Contact Information

If you have any questions or concerns about the study, you may contact Dr. John Filler (English) at 702 895-1105, Dr. Lori Navarrete (English or Spanish) at 702 895-2966 or Cathi Draper Rodriguez (English or Spanish). For questions regarding the rights of research subjects, any complaints or comments regarding how the study is being conducted you may contact **the UNLV Office for the Protection of Research Subjects at 702-895-2794.**

Voluntary Participation

Your child's being in this study is a choice. You may refuse to allow your child to join in this study or in any part of this study. You may take your child out of this study at any time without problems with the university or Tom Williams School. We would like you to ask questions about this study at the beginning or any time during the research study.

Confidentiality

All information gathered in this study will be kept completely private. No reference will be made in written or oral materials that could link you or your child to this study. All records will be stored in a locked facility at UNLV for at least 3 years after the end of the study. After the 3 years the information gathered will be destroyed.

Participant Consent:

I have read the above and agree to allow my child to join in this study. I am at least 18 years of age. A copy of this form has been given to me.

_____ _____

Signature of Parent Date

_____

Participant Name (Please Print)

Participant Note: Please do not sign this document if the Approval Stamp is missing or is expired.

UNLV
UNIVERSITY OF NEVADA LAS VEGAS

INFORME DE CONSENTIMIENTO

Departamento de Educación Especial

TITULO DEL ESTUDIO: El impacto de la intervención Basada en el uso de Computadora con ó sin Apoyo en la Lengua Primaria para el desarrollo de la Destreza en la Lectura de los estudiantes aprendiendo el Ingles

INVESTIGADORES: Cathi Draper Rodríguez, Lori Navarrete y John Filler

NUMERO TELEFONICO DE CONTACTO: 702-895-2966

Propósito del Estudio
Invitamos a su hijo(a) a formar parte en un estudio de investigación. Este estudio es para saber la efectividad de los programas que usan computadoras para enseñar como leer a los estudiantes aperendiendo Ingles.

Participantes
Queremos que su hijo esté en este estudio porque él o ella asiste a Escuela Elementaria Tom Williams y ha sido identificado(a) por su escuela como aprendiente del Ingles.

Procedimientos
Si Usted permite, formar parte, a su hijo(a) en este estudio, a su hijo(a) se le pedirá que haga lo siguiente: asistir a sesiones en el laboratorio de computadoras 3 veces a la semana y use un programa de lectura basado en el uso de computadoras. Su hijo no perderá las instructiones de su maestro(a) porqu esto se hará durante el periodo de centros.

Beneficios de participación
Puede que no tenga beneficios directos para su hijo al participar en este estudio. Sin embargo, nosotros esperamos aprender como las computadoras pueden ser utilizadas para ayudar a las personas aprendiendo Ingles a que aprendan a leer.

Riesgos de participación
El riesgo es mínimo en todos los estudios de esta investigación. Los riesgos incluyan cansancio físico, cansancio visual, y otros averiguen que su hijo(a) forma parte de este estudio.

Cost/Compensación
No cuesta nada para participar en este estudio. El estudio tomará 12 horas del tiempo de su hijo(a). Su hijo(a) no recibira pago por su tiempo. La Universidad de Nevada, Las Vegas tal vez no provea compensación ó cuidado medico por herida, no anticipada, sostenidas como resultado de la participación en este estudio de investigación.

Contacto para información
Si Usted tiene alguna pregunta ó preocupaciones acerca de este estudio, puede hablar con la Dra. Lori Navarrete, número telefónico 702-895-2966 o Cathi Draper Rodriguez, número telefónico 702-647-4064. Para preguntar acerca de los derechos del sujeto de investigación, cualquier queja ó comentarios sobre la manera en la cual el estudio está siendo conducido Usted puede ponerse en contacto con **la oficina para la protección del sujeto de UNLV al número 702-895-2794.**

Participación Voluntaria
La participación de su hijo(a) en este estudio es voluntaria. Usted puede rehusar a que su hijo(a) participe en este estudio o en cualquier parte del estudio. Usted puede retirar a su hijo(a) del estudio en cualquier momento sin que ello perjudique su relación con la Universidad o con la escuela Tom Williams. Se le exhora a que haga preguntas acerca de este estudio al comienzo, ó en cualquier momento durante la investigación del estudio.

Confidencialidad
La información en este estudio será mantenida en completa privado. No referencia será hecha en forma escrita ú oral la cual pueda ser relacionada con su hijo(a) y este estudio. Todos los archivos serán mantenido en un lugar bajo llave en un local en UNLV por lo menos por tres años. Después del periodo de archivo la información será destruida.

Consentimiento para la Participación
Yo he leido la información y estoy de acuerdo de permitir a mi hijo(a) s que participe en este estudio. Yo tengo al menos 18 años de edad. Una copia de esta forma me ha sido dada.

_____ _____
Firma del padre Fecha

_____
Nombre del participante (Por favor use letra de molde)

Nota al participante: Por favor no firme este documento si no tiene el Sello de aprobación ó si ha expirado.

APPENDIX B

CHILD ASSENT FORM

Child Assent Form

Dear

My name is Cathi Draper Rodriguez. I am a doctoral student from the Department of Special Education at UNLV. You are invited to be in a reading research project. I am running the project. You are chosen to be in this project because you speak Spanish at home. During this study, you will be asked to go into the computer lab to work with a computer program.

Being in this project is a choice. You don't have to join if you don't want to, and you are free to stop at anytime during the study. You should talk with your parents whether or not to join before signing this assent form. Your parents will be asked as well.

If you have any questions, please contact me at 647-4064. I would like to answer all of your questions. You may keep a copy of this assent form.

For questions regarding the rights of research subjects, you may contact the UNLV Office for the Protection of Research Subjects at 702 895-2794.

I have read this assent form and agree to join in this study. A copy of this form has been given to me.

_____ _____

Participant signature Date

_____ _____

Signature of Researcher Date

Forma del niño
de
interes de participación

Querido(a)

Mi nombre es Cathi Draper Rodriguez. Soy una estudiante del programa de Doctorado del departamento de Educación Especial en UNLV. Por este medio estás invitado(a) a participar en un projecto de investigación sobe lectura. Yo soy la investigadora de este projecto. Tú has sido elegido(a) para participar en este projecto porque hablas Español en casa. Durante este estudio, tal vez se te pida que vayas al laboratorio de computadora a trabajar con un programa de lectura.

Tu participación en este programa es voluntario. No tienes que participar si no quieres, y eres libre de salirte del programa en cualquier momento durante el estudio. Tu debes de conversar con tus padres si debes o no participar en el estudio antes de firmar esta forma de interés. Se le pedirá a tus padres que ellos también den su consentimiento por ti.

Si tienes alguna pregunta, por favor ponte en contacto conmigo al número 647-4064. Me gustaría contestarte todas tus preguntas. Tu puedes quedarte con una copia de esta forma de interés.

Para hacer preguntas relacionadas con los derechos del sujeto de investigación, puedes ponerte en contacto con la oficina de Protección del Sujeto de Investigación de UNLV al número 702-895-2794.

He leido esta forma de interés y estoy de acuerdo en participar en este estudio. Una copia me ha sido dada.

_____ _____

Firma del participante Fecha

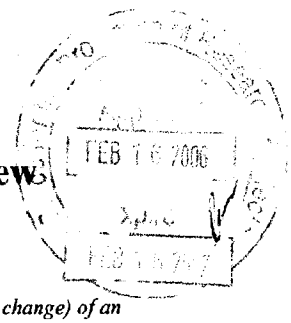
_____ _____

Firma de la Investigadora Fecha

APPENDIX C

UNLV IRB APPROVAL

UNLV
UNIVERSITY OF NEVADA LAS VEGAS



Social/Behavioral IRB – Full Board Review
Approval Notice

NOTICE TO ALL RESEARCHERS:

Please be aware that a protocol violation (e.g., failure to submit a modification for any change) of an IRB approved protocol may result in mandatory remedial education, additional audits, re-consenting subjects, researcher probation suspension of any research protocol at issue, suspension of additional existing research protocols, invalidation of all research conducted under the research protocol at issue, and further appropriate consequences as determined by the IRB and the Institutional Officer.

DATE: February 22, 2006

TO: **Dr. John Filler**, Special Education

FROM: Office for the Protection of Research Subjects

RE: Notification of IRB Action
Protocol Title: **The Impact of Computer Based Intervention With and Without Primary Language Support on Reading Skills of English Language Learners**
Protocol #: 0601-1868

This memorandum is notification that the project referenced above has been reviewed by the UNLV Social/Behavioral Institutional Review Board (IRB) as indicated in Federal regulatory statutes 45CFR46. The protocol has been reviewed and approved.

The protocol is approved for a period of one year from the date of IRB approval. The expiration date of this protocol is February 16, 2007. Work on the project may begin as soon as you receive written notification from the Office for the Protection of Research Subjects (OPRS).

PLEASE NOTE:
Attached to this approval notice is the **official Informed Consent/Assent (IC/IA) Form** for this study. The IC/IA contains an official approval stamp. Only copies of this official IC/IA form may be used when obtaining consent. Please keep the original for your records.

Should there be *any* change to the protocol, it will be necessary to submit a **Modification Form** through OPRS. No changes may be made to the existing protocol until modifications have been approved by the IRB.

Should the use of human subjects described in this protocol continue beyond February 16, 2007, it would be necessary to submit a **Continuing Review Request Form** *60 days* before the expiration date.

If you have questions or require any assistance, please contact the Office for the Protection of Research Subjects at OPRSHumanSubjects@unlv.edu or call 895-2794.

Office for the Protection of Research Subjects
4505 Maryland Parkway • Box 451037 • Las Vegas, Nevada 89154-1037
(702) 895-2794 • FAX: (702) 895-0805

APPENDIX D

APPROVAL FROM CCSD RESEARCH AND ACCOUNTABILITY OFFICE

Application Number 52-2006 Applicant Cathi Draper Rodriguez, UNLV

CCSD RESEARCH REVIEW
CONDITIONS OF APPROVAL

Congratulations! Your application to conduct research in the Clark County School District has been reviewed and approved. The final step in this process requires you to read and agree to the conditions set forth below. Your signature indicates your agreement to meet the conditions as indicated. Once this signed form is received in the Department of Research and Evaluation (Department), you may proceed with the research as approved.

1.0 Agreement to Follow Approved Plan for Research
The researcher agrees to conduct all research in accord with the plan set as detailed in the application.

2.0 Agreement to Request Modifications to Research Plan
The researcher agrees to request approval for any deviations from the plan through the Department of Research and Evaluation. This will be initiated by calling the Department and scheduling an appointment to discuss the request. The Director or Coordinator will provide guidance regarding the specific steps to be taken to receive approval for a modification, depending upon the nature and scope of the requested deviation. The administrator of the Department may require a new application or a modification of the original application.

3.0 Agreement to Request Data Not Identified in Research Plan
The researcher understands and agrees that access to any additional data sets that were not approved in the original application must first be requested through and approved by the Department of Research and Evaluation. Like a request to modify the research plan, this will be initiated by calling the Department and scheduling an appointment to discuss the request. The Director or Coordinator will provide guidance regarding the specific steps to be taken to receive approval to access the additional data. The administrator of the Department will determine whether the request has merit in light of the original research design(s) and the nature of the data being requested. If the administrator determines that there is merit to the request, he/she will judge whether the request requires submission of a new application or if a modification of the original is needed.

4.0 Agreement to Secure Necessary Permissions from Supervisors
The researcher agrees to make all necessary arrangements for access to subjects through the supervisors of the offices/schools within which subjects are located.

5.0 Agreement to Maintain Confidentiality as Required by the District
The researcher agrees to maintain all data strictly confidential. He/she agrees to ensure that at no time and under no circumstances shall the identities of any subjects or the names of subject school sites or departments be made known to any person/entity outside of Research and Evaluation. Further, he/she will take all steps required to secure consent

and assent of subjects to their participation and to institute procedures to protect their identities from disclosure. This shall also apply to all reports made by the researcher. Any deviations from this agreement will be requested in writing through the Department.

6.0 Agreement to Use Data for Authorized Purposes Only
The researcher agrees that data collected for his/her research shall be used only for the purpose(s) set forth in the application. Any request for additional uses will be submitted to the Department in writing. Such requests will state the purpose, identify the audience(s), and describe in detail how the rights of subjects will be protected if the request is approved.

7.0 Agreement to Comply with CCSD Data Security Requirements
The researcher agrees to maintain data in a location that is secure as specified by the Department for a period of three years after the completion of the research. Further, the researcher agrees to keep the Department informed of the location of the data by completing and submitting the "CCSD Research Data File Location" form at least annually, or more frequently if requested to do so, to the Department.

8.0 Agreement to Report Progress and Findings to CCSD
The Researcher agrees to provide the Department with the following reports as appropriate:

- A final report of findings and conclusions within three months of the completion of the project,
- One copy of any dissertation, thesis, journal article, book, book chapter, evaluation report, or other document in which the findings and conclusions of the research are made public, and
- An annual progress update by May 31st of each year for projects that span more than one school year.
- Additional requirements as set forth on the attached page.

_____
Name of Applicant (Printed or typed)

_____
Signature of Applicant

_____
Date

_____
Signature of Director, Research and Accountability

APPENDIX E

GROUPING CHART

	Computer Instruction (*MathBlaster®* (Knowledge, 1993) or *Orchard Math Software* (Ohio, 2002)	English Instruction *Lexia Primary Reading Program* Intervention (Lexia, 2004)	Spanish Instruction *Lexia Primary Reading Program* Intervention (Lexia, 2004)
Control Group 1 (CG1)	X		
Experimental Group 1 (EG1)		X	
Experimental Group 2 (EG2)			X

APPENDIX F

SAMPLE LEXIA INSTRUCTIONS

ENGLISH AND SPANISH

Sounds to Letters

English Instructions

Words are made of sounds. The word CAT has three sounds.

C – A – T

Drag a token down for each sound you hear.

Watch me.

Now you try.

Fan

Spanish Instructions

Las palabras estan hechas de sonidos. La palabra CAT tiene tres sonidos.

C – A – T

Por cada sonido que escuchues arratras de abajo un objecto.

Observame.

Ahora te toca a ti.

Fan

Consonant Castle

English Instructions

Listen to the word and choose the letter that completes the word.

Watch me.

SET

Now you try.

SAD.

That's not quite right

Spanish Instructions

Escucha la palabra y escoje la letra que complete la palabra.

Obsérvame.

SET

Ahora te toca a ti.

SAD

Esa no es la respuesta. Trata otra vez.

Sight Word Search

English Instructions

This is the word THE. It has the letters

T – H – E the

Now let's have some fun.

See if you can find the word 'the' hidden in the pictures. There are five.

Click on each when you find it.

Spanish Instructions

Esta es la palabra THE. Tiene las letras

T – H – E (pronounced in English) the

Ahora vamos a divitirnos.

Veamos si puedes encontrar la palabra, THE.

Hay cinco escondidas en el cuadro.

Haz clic en cada una de ellas cuando las encuentres.

Short Vowel Bridge

English Instructions	**Spanish Instructions**
Click on the vowel you hear in the word.	Escoje la vocal para completer la palabra.
LID.	Obsérvame.
Watch me.	LID
Now you try.	Ahora te toca a ti.
HAT	HAT

Picture-Word Match

English Instructions	**Spanish Instructions**
Choose the picture that matches the word.	Escoje la figura que va de acuerdo con las palabras.
Watch me.	Obsérvame.
Now you try.	Ahora te toca a ti.
Good	Muy bien.

.

n

APPENDIX G

CLASSROOM INSTRUCTION CHECKLIST

Classroom Instruction Checklist

Teacher _____ Date _____

	Yes	No
Teacher has routine posted in the room.		
Students are in the correct group.		
Teacher teaches the same content to all groups during small group time.		
Students complete same activity during independent work time.		
Teacher rotates the groups at the correct time.		
Teacher uses same curriculum as other teachers.		

If any of the above answers is no, please comment on action taken to correct discrepancy:

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