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While some English language learners (ELLs) are able to acquire English phonological awareness skills easily while learning the language, others may need direct instruction and remediation. This study involves five adolescent ELLs who received direct instruction of phonological awareness skills through the use of a computer-based program, *Earobics 1 for Adolescents and Adults*. After completing a phonological awareness pretest, students received computer-based instruction for 60 minutes per week for ten weeks or until they completed the program. Additionally, pre- and post-training reading scores were analyzed to determine if the training positively affected the test scores. The results of this study demonstrated that students who participated in the training increased their phonological awareness scores in all areas tested. *Earobics 1 for Adolescents and Adults* could be used as a tool in an integrated language program.

COMPUTER-BASED PHONOLOGICAL AWARENESS TRAINING FOR
ADOLESCENT ENGLISH LANGUAGE LEARNERS

by

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CHAPTER ONE: INTRODUCTION

Introduction

The primary goal of reading and writing is the comprehension and production of information and ideas (Gillon, 2004). As children learn to read, comprehension is the stage they need to reach in order to continue developing as readers and ultimately be able to read to learn (Hodson, Schommer-Aikins & Swanson, 2005). According to Hoover and Gough (2001), the ability to read and understand text depends on the ability to make meaning out of the spoken language, and the ability to recognize the written representations of those sounds in the form of letters and words. Grabe (2009) states that it is not possible to read efficiently without recognizing the words to be read and understanding the structural organization of those words. In other words, before and during the process of learning to read, children need to become aware of the relationship of spoken words and how those sounds relate to print (Armbruster, Lehr, & Osborn, 2003; Picard, 2002; Tomkins, 1998; Torgesen & Mathes, 2000).

The ability to hear, think about, and manipulate the individual sounds in oral language is phonological awareness (Tomkins, 1998; Torgesen & Mathes, 2000). It is the understanding that spoken words can be broken into smaller parts, that is, individual sounds (Gillon, 2004). Phonological awareness is a critical component of reading and writing, and it is a crucial predictor of beginning reading performance (Adams, 1990; Ehri & Nunes, 2002).

Phonological Awareness and Reading for Native English Speakers

How many sounds are in the word *cup*? What is a rhyme for *pan*? If the *t* in *cart* is removed, what is left? If a child can answer these questions, the child has phonological awareness; the knowledge and understanding of the spoken sounds in a language and how the sounds blend together to form syllables, words, phrases, and sentences (Robertson & Salter, 1997; Yopp & Yopp, 2000). Phonological awareness is an encompassing term that includes phonemic awareness (the knowledge that letters represent sounds), and the ability to identify and discriminate between those sounds (Birch, 2007).

The understanding that sounds in speech can be broken apart and blended together is necessary to make connections between speech and print. This idea that spoken language is made up of a sequence of sounds does not come naturally or easily to all people (Adams, Foorman, Lundberg, & Beeler, 1998; Robertson & Salter, 1997). Adolescents who have difficulty with reading and spelling often cannot make the conscious connection between oral language and print. The relationship between the sounds produced in words spoken aloud and the written letter or word is not clearly defined for them and often remains elusive without explicit instruction (Apel & Swank, 1999; Robertson & Salter, 1997). These adolescents could be beginning readers, struggling readers, or English language learners. They may struggle with basic reading skills including word identification, distinguishing syllables, blending sounds and words, and identifying sounds. These difficulties could mean they have insufficient English phonological awareness which could hinder their ability to accurately and efficiently

access text (Gillon, 2004). Unfortunately, these struggling readers may be overlooked in the classroom since reading assessment for students in upper grades generally begins with comprehension and not the awareness of sounds (Denton, Bryan, Wexler, Reed, & Vaughn, 2007). Secondary level students are expected to read fluently and comprehend the text efficiently. Their literacy skills are assessed from the “top-down” beginning with the most complex skills including analysis and interpretation of text (Chall, 1983; Denton et al., 2007). This is in contrast with the “bottom-up” model in which the lower level aspects of reading are taught first, such as letter sound correspondence, followed by letters, words, and then comprehension (Birch, 2007; Chall, 1983). Lower level does not mean easier or less complicated, but rather that as the lower level skills become automatic the high level skills become more accessible (Grabe, 2009).

Phonological Awareness and English Language Learners

The familiarity of English letters and sounds is necessary for English Language Learners (ELLs) so that their aural discrimination of sounds can be efficient and effortless. The ability to sound out words is an important skill for ELLs. If an ELL is able to sound out a new word from a text, the student can determine if the word is in his or her repertoire of words and if the meaning is already known. In order for students to sound out words they need to have a working knowledge of the sounds of the language and how those sounds function together, in other words, phonological awareness. The more automatic and efficient the lower level process skills become, then more attention and energy can be given to higher level processing which leads to faster reading and higher comprehension. (Birch, 2007; Grabe, 2009).

Many secondary level students who are learning English as a second language (ESL) find the reading and writing demands of middle and high school difficult, in part because they struggle to successfully make the speech-to-print connection in English while the typical classroom instruction does not focus on oral language proficiency skills (Denton et al., 2007; McQuiston, O'Shea & McCollin, 2008; Schwarz, 2006). Some students are able to learn and apply these skills independently. Other students are not able to advance their literacy skills because they need direct instruction in the early stages of reading development before they can move on (Birch, 2007).

Phonological strategies allow listeners of speech to recognize the sounds of the language (Birch, 2007). One challenge for ELLs is when listening to someone speak, there are generally no breaks or pauses between words or phonemes signaling to the listener where words begin and end; consequently the speech sounds as if it is one continuous utterance (Adams, 1990; Picard, 2002). For comprehension to occur the listener must make sense of the uninterrupted flow of words (Adams, 1990). Many ELLs struggle to differentiate words, letter patterns, and the relationship between letters and sounds when listening to English speech (Schwarz, 2006). Word to word and speaker to speaker, the sounds of phonemes, particularly vowels, can vary due to regional differences in speech and pronunciation making the differentiation between sounds even more difficult (Adams, et al., 1998). Learning about how the English sound system works is not a direct and simple process for many ELLs, but with instruction and remediation the process can become attainable and automatic (Birch, 2007; Ehri & Nunes, 2000; Gillon, 2004).

According to the International Reading Association (IRA) position statement, phonological awareness in English is a predictor of beginning reading success for language learners (*Phonemic awareness and the teaching of reading: A position statement*, 1998). To become better readers and writers, adolescent ELLs who are struggling with reading and writing may benefit from direct, explicit instruction that will enhance their phonological awareness. Instructional opportunities to develop and improve phonological awareness will further assist students in building fluency, developing vocabulary and enhancing comprehension (Ehri & Nunes, 2002; Hodson, Schommer-Aikins & Swanson, 2005; McQuiston, O'Shea & McCollin, 2008).

Academically Underperforming English Language Learners

English language learners have a multitude of experiences, differing educational backgrounds, and varying levels of English proficiency that they bring to school. For example, some ELLs have attended schools in the United States beginning with the primary grades, but have not developed the required academic literacy necessary for success in high school (Echevarria, Voyt & Short, 2008; Freeman & Freeman, 2008; Short & Fitzsimmons, 2007). Other ELLs enter the United States educational system for the first time during middle or high school. Though some of these adolescents may have advanced schooling experiences before entering school in the United States and may attain success rapidly, a great number of these adolescent ELLs have limited formal schooling and are below grade level in literacy skills in their native language. As students learn the English language, there are some who will struggle to understand, to speak, and to read successfully in English and consequently fall academically further behind their

peers (Echevarria, Voyt & Short, 2008; Francis, Rivera, Lesaux, Kieffer, & Rivera, 2006; Freeman & Freeman, 2008).

Adolescent ELLs attending middle and high school are expected to develop proficiency in the English language both socially and academically. In other words, students are learning conversational English skills at the same time they are learning the academic language of math, science, and social studies. These dual responsibilities frequently result in a struggle to meet the literacy demands of secondary school (Francis, et al., 2006; McQuiston, O'Shea, McCollin, 2008; Short & Fitzsimmons, 2007). Students are faced with the challenge of having less time than their peers to acquire the skills necessary to comprehend, read, and write academic English (Echevarria, Voyt & Short, 2008; Walqui, 2000). Since phonological awareness is a fundamental component of literacy, underperforming adolescent ELLs may benefit from training in phonological awareness to help them improve reading and writing skills in the content area classes (Birch, 2007; Freeman & Freeman, 2007; Grabe, 2009; Lane & Pullen, 2004).

Phonological Awareness Training Using Technology

Since students may not receive the instruction they need in a traditional classroom setting, one method for teaching phonemic/phonological awareness is through computer-based instruction. Technology has become a powerful tool in the classroom because it offers flexible types of auditory and visual material that reinforce teaching and learning (*Integrating literacy and technology in the curriculum*, 2002). Technology can be a valuable tool in presenting educational tasks such as phonemic awareness practice, vocabulary instruction, and comprehension strategies (Northeast and the Islands Regional

Technology in Education Consortium [NEIRTEC], 2004). The basis of this study is to address the speech-to-print connection for ELLs who are struggling with reading and writing in English with the goal of increasing English phonological awareness skills by means of a computer-based intervention.

Use of *Earobics 1 for Adolescents and Adults* as a Reading Intervention

The computer software that will be used for this study of a phonological awareness intervention is *Earobics 1 for Adolescents and Adults*. The program is part of a line of software that was designed by Cognitive Concepts and later purchased by Houghton Mifflin. *Earobics 1 for Adolescents and Adults* software is an interactive multisensory reading intervention program aimed at supporting at-risk learners, including students with low level reading skills and English language learners (Earobics, 1999). This specific program was chosen for this study because it was created for and meant to appeal to older learners rather than the elementary level programs, *Earobics Step 1* for ages 4-7 and *Earobics Step 2* for ages 7-10 (Strassman, 2001).

Earobics 1 for Adolescents and Adults software has two versions: the Home Version and the Specialist/Clinician Version. The Specialist/Clinician Version will be used for the study because it allows for more users and it has a data tracking and reporting feature. Both versions of the software include six instructional activities: Memory Matrix (auditory attention), Sound Check (phoneme identification and discrimination; sound-symbol correspondence), Get Rhythm (syllable and phoneme segmentation), Connectivity (blending word parts; auditory discrimination), Rhyme Time (identifying sound patterns; sequence recall), and Same/Different (vowel and consonant

discrimination). Appendix A contains a table of the skills and objectives followed by descriptions of each of the activities. Each activity consists of several tasks that are grouped into beginning, intermediate, and advanced levels. The producers of the program claim that *Earobics 1 for Adolescents and Adults* delivers systematic and explicit instruction that changes to the student's instructional level by providing the student with differentiated instruction and leveled learning activities (Earobics, 2007).

It is important that ELLs are provided with opportunities to develop skills in English phonological awareness as a precursor to developing reading skills (Lesaux & Geva, 2006; Short & Fitzsimmons, 2007). *Earobics 1 for Adolescents and Adults* was chosen for this study because the producers claim that it improves a student's ability to hear subtle differences between sounds, recognize sound patterns, and segment words into syllables and phonemes (phonological awareness). The program was also chosen because of the claim that it is a teaching tool for ELLs since it provides oral directions in multiple languages and multiple opportunities for practice and support (Earobics, 1999).

Role of the Researcher

My role as the researcher was as the teacher in a secondary level ELL classroom. My participation was minimal during the actual treatment, limited to giving instructions, clarifying the instructions as needed, and assisting with computer issues as they occurred. Though I had an assistant available for interpreting, I administered the questionnaire, the surveys, the pretest and posttests, and I collected and analyzed the data.

Background of the Researcher

My interest in pursuing this study actually began several years ago as I made the transition from teaching elementary ELLs to teaching adolescent ELLs. My first teaching license is in elementary education with an emphasis in teaching reading to primary elementary students. My background in the teaching of reading includes teaching the sounds of the letters and how they function together. After a few years of teaching, I decided to go back to school to earn my English as a Second Language License for grades K-12. I began teaching English to kindergarten, first, and second grade ELLs. Again, there was considerable focus on the sounds of letters and the manipulation of the sounds for acquiring beginning reading skills. Later in my teaching career I received my Reading License for K-12. During this time I began teaching secondary ELLs. As I mentioned, my interest grew as I made this transition. I found that there was very little academic opportunity for adolescents to learn basic reading skills, including the sounds of the letters, blends, and rhymes. At the secondary level, emphasis is placed on vocabulary and reading comprehension in content area classes. Students are expected to already have mastered the skills associated with letters, sounds, and sound patterns. Many of my students struggled with reading basic vocabulary, even though their oral language was more advanced. I began to teach phonological awareness skills to those students and noticed positive changes over the months. I have experience teaching phonological awareness skills to beginning readers of all ages and have witnessed how students' awareness of reading and writing skills grow as a result. My bias in this study is that I am an advocate of teaching phonological awareness skills to beginning readers.

While working with students in grades seven through twelve over the last several years, I have informally noticed language learners asking me how to correctly pronounce a word or a sound, or wanting to know the difference between two words that they think sound the same. The students tell me that they struggle to hear the differences in words. They often get confused by what teachers and other students say because they struggle to distinguish the sounds in the words. For example, one student told a teacher “I’m dumb” and everyone laughed. He did not understand why that was funny. He was really trying to say “I’m done,” but he thought the ending sound was with the letter “m.” When my students try to take notes in content area classes they often write words incorrectly because they misinterpret the sounds. A teacher told the class to write the heading “Parts of Speech” on their papers. A student wrote only the letter “R” and then looked at me in confusion. He told me all he heard by itself was /r/. In a writing assignment another student wrote the words, “My brother was sad. He had a fever.” I asked why her brother was sad. She explained and I learned that her brother was sick. She failed to notice the differences in the endings of the words so she wrote the incorrect word.

Witnessing my students’ daily struggles at a basic literary level is where my interest began with phonological awareness. Because one of my goals in teaching English as a Second Language is to give students the reading and writing tools they need to succeed in school, at the onset of this study I hoped to find out if phonological awareness training would benefit my students by increasing their phonological awareness skills and in turn advance their reading skills. I wanted to know if an intervention of computer-based phonological awareness training in English for secondary level ELLs would affect

their phonological awareness and reading skills in English. This study monitored and recorded the phonological awareness training process, presented in English, through a computer-based program for a small group of adolescent English language learners.

The results of the study may be of interest to ESL teachers, classroom teachers, school administrators, and parents as they plan instruction or interventions for struggling readers, specifically English language learners. The results helped facilitate my own lesson planning for ELLs who are struggling readers as I gained insight into how phonological awareness training could be incorporated into the plans. Finally, the results of the study may benefit teachers and administrators as they research effective instructional support materials for ELLs.

Research reports of phonological awareness intervention have mostly focused on studies with first language learners and native English speaking students in primary grades (Grabe, 2009; Lesaux & Geva, 2006; Schuele & Boudreau, 2008). A large gap exists in research for adolescent English language learners and the importance of phonological awareness in reading acquisition (Grabe, 2009; Hodson, Schommer-Aikins & Swanson, 2005; Klump, 2006; Schwarz, 2006). My hope is that this study can be used as a starting point for further research into reading intervention strategies for older students who are learning English. Research suggests that phonological awareness is crucial for learning to read for all learners (Grabe, 2009; Picard, 2002; Yopp & Yopp, 2000). Even beyond elementary school, teaching phonological awareness to struggling readers can result in improved performance on phonological awareness and decoding tasks (Hodson, Schommer-Aikins, & Swanson, 2005; Schwarz, 2006).

Guiding Questions

The developers of *Earobics 1 for Adolescents and Adults* claim that the program develops phonological awareness skills for struggling readers, including ELLs (Earobics, 2007). The purpose of this study is to answer these guiding questions: Do adolescent ELLs who participate in the *Earobics 1 for Adolescents and Adults* program improve phonological awareness skills? Do students show greater improvement in some areas of phonological awareness than in other areas as a result of participation in the *Earobics 1 for Adolescents and Adults* program? Is there a relationship between the students' phonological awareness skills and post-intervention reading test scores?

Capstone Overview

Chapter one introduces the study by defining the purpose and the need for the research. The context of the study was introduced, as was the role, the background, and the bias of the researcher. In Chapter Two a review of the literature pertaining to phonological awareness studies is provided. Chapter Three includes a description of the research design and methodology for this study. Chapter Four is a presentation of the data collected and results of this study. Chapter Five contains the limitations and implications of the study, recommendations for further research, and my reflections about the knowledge gained during the course of this study.

CHAPTER TWO: LITERATURE REVIEW

Introduction

The goal of this chapter is to define phonological awareness and establish how it relates to the development of reading for both native and non-native English speakers. The literature review summarizes the results of studies that explore phonological awareness and its relationship with reading acquisition. Included are studies that address the use of computer based technology to enhance phonological awareness skills. This chapter begins with an overview of phonological awareness and reading instruction followed by the affects of phonological awareness for English language learners.

Learning the English language is a complex process for all individuals regardless of age and native language (Yopp & Stapleton, 2008). It is a lifelong developmental process (Gillon, 2004; Tompkins, 1998). In addition, reading in English is an intricate system of skills and knowledge, with each part of the system working together and enhancing one another (Adams, 1990). Although there is disagreement among researchers on the best method for reading instruction, one component that emerges from the research as an essential basis for literacy is phonological awareness (Robertson & Salter, 1997; Torgesen & Mathes, 2000; Yopp & Stapleton, 2008). While it should be viewed as only one part of the system, phonological awareness is critical for beginning readers (Yopp & Yopp, 2000). Phonological awareness can be developed through direct and explicit instruction, and doing so significantly facilitates and accelerates a student's reading and writing proficiency (Adams, Foorman, Lundburg, & Beeler, 1998; Lane &

Pullen, 2004; McQuiston, O'Shea & McCollin, 2008; Schuele & Boudreau, 2008; Yopp & Stapleton, 2008).

The purpose of this study is to examine the effects of individual direct instruction by means of a commercial computer program in phonological awareness for secondary English language learners. The questions I hope to answer include: Do adolescent ELLs who participate in the *Earobics I for Adolescents and Adults* program improve phonological awareness skills? Do students show greater improvement in some areas of phonological awareness than in other areas as a result of participation in the *Earobics I for Adolescents and Adults* program? Is there a relationship between the students' phonological awareness skills and post-intervention reading test scores?

Phonological Awareness in English

Phonological awareness is the awareness of the components and structure of spoken language (Denton, et al., 2007; Yopp & Yopp, 2000). It is the awareness that words can be broken down into smaller units (Ehri & Nunes, 2002; Gillon, 2004; *Phonemic awareness and the teaching of reading: A position statement*, 1998; Yopp & Yopp, 2000). Phonological awareness skills are auditory-based tasks characterized by rhyming, combining and segmenting words into parts or syllables, as well as adding, deleting, and substituting phonemes in words, and recognizing the position of a phoneme in a word (Picard, 2002; Yopp & Yopp, 2000). Phonological awareness tasks do not involve print but instead require students to analyze, make judgments about, or manipulate sounds in spoken words (Gillon, 2004; *Phonemic awareness and the teaching of reading: A position statement*, 1998; Schuele & Boudreau, 2008).

A phoneme is the smallest meaningful unit of sound. Phonemes combine to form words (Erhi & Nunes, 2002). Individual phonemes are represented with the International Phonetic Alphabet (IPA). For example, the letters *m-a-t*, stand for /m/ /æ/ /t/. Graphemes are the symbols (letters) that represent the sounds in language (m-a-t). Phonemic awareness refers to an understanding of phonemes, and students who are phonemically aware are able to recognize and identify individual sounds in speech (Erhi & Nunes, 2002; Yopp & Yopp, 2000). Phonemic awareness is one of the components of phonological awareness. It is the ability to manipulate phonemes in words through various tasks: detect, match, blend, and segment phonemes (Gillon, 2004; Lane & Pullen, 2004). Phonemic awareness is different from phonics, which is the method of teaching the relationship between sounds and letters (Gillon, 2004).

Research and related literature frequently use the terms phonological awareness and phonemic awareness interchangeably, but for the purposes of this paper I will use phonological awareness since it is the encompassing term that includes not only phonemic awareness, but also syllables, onsets-rimes, and beginning and ending sounds, which are included in this study (Gillon, 2004; *Phonemic awareness and the teaching of reading: A position statement*, 1998; Schuele & Boudreau, 2008; Sensenbaugh, 1996; Yopp & Yopp, 2000). Gillon (2004) describes phonological awareness in terms of syllable awareness, onset-rime awareness, and phoneme awareness.

The English Alphabetic Principle

As beginning readers interact with the English language through speaking, writing, and reading, they need to have an understanding of the letters of the alphabet, the

sounds those letters represent, and how the letters can be combined to form words. This is called the alphabetic principle (Adams, 1990; Denton, et al., 2007; Yopp & Yopp, 2000). This knowledge of letter-sound relationships correlate strongly with early literacy development (Ehri & Nunes, 2002; Tompkins, 1998). Users of an alphabetic system record the smallest units of sounds of their language in the printed form of letters (Yopp & Yopp, 2000). English is an alphabetic system, meaning that letters in words represent sounds in oral language (Freeman & Freeman, 2007).

The English alphabetic principle poses challenges for language learners. First, because English writing is not a purely phonetic system, there is not a true one-to-one correspondence between sounds and spellings. For example, /sh/ is one phoneme but two letters, and *sign* has a silent letter. Another challenge for ELLs is that phonemes are co-articulated. Co-articulation makes speech fluent, but it also means that phonemes are not always distinguishable in normal speech patterns. For example, in the word *fly*, the phonemes blend together and overlap so that there is a single burst rather than three separate sounds (Freeman & Freeman, 2007; Gillon, 2004).

Tasks and Components for Phonological Awareness

Students who have developed phonological awareness can focus on and manipulate units of sound in the spoken language. Tasks that have been used to assess phonological awareness include rhyming (Do the words *mouse* and *house* rhyme?), counting syllables (How many syllables are in *apple*?), phoneme comparison or matching (Do the words *fight* and *friend* have the same beginning sound?), phoneme isolation (What is the first/middle/last sound in *big*?), phoneme segmentation (What sounds do

you hear in the word *hot*?), phoneme blending (/s/-/æ/ /-t/ What word did I say?), and phoneme deletion (What word could be left if /k/ was taken away from *cat*?). Students may also be asked to repeat words or and sentences (Repeat this sentence *He likes riding his bike.*) (Gillon, 2004; Picard, 2002; Yopp & Yopp, 2000).

Anthony & Francis (2005) present phonological awareness patterns of development in the following sequence: detection of syllables, followed by onset-rime, and finally individual phonemes. Children generally can detect similar sounding words before they can manipulate sounds within words. Finally, the skill of blending phonological information is more readily acquired than segmenting phonological information. See Table 2.1 for the terms, definitions, and additional examples addressing the phonological awareness components discussed in this paper.

Table 2.1: Components of Phonological Awareness

Term	Definition	Example
Sound-symbol (letter) correspondence	phoneme and the representing symbol	What is the first letter in snake?
Rhyme	Identify and verbalize rhyming words	What two words rhyme? cat, hat, run
Syllable	units of speech that consist of at least a vowel, but usually other sounds before or after the vowel as well	How many syllables are in the word <i>television</i> ?
Syllable Segmenting	breaking a word into parts by tapping or counting	Count the parts of the word <i>trac-tor</i> , <i>sun-shine</i>
Syllable Blending	listening to a sequence of units of sound and blending them to form a word	Put the parts together to make a word <i>flow-er</i> , <i>rain-bow</i>
Phoneme Isolation/ Identification	identify the sounds at the beginning, middle, or end of the word; recognizing sounds	What is the beginning sound in the word <i>dog</i> ?
Phoneme Segmentation	breaking a word into its sounds by tapping out or counting the sounds	How many sounds are in the word <i>dog</i> ?
Phoneme Blending	listening to a sequence of separately spoken sounds and blending them to form a word	What word do these sounds make? <i>/d/ /o/ /g/</i>
Phoneme Substitution	substituting one phoneme for another at the beginning, middle, or end of a word	What is the new word? Change the <i>/o/</i> to <i>/i/</i> .
Phoneme Deletion	stating the word that remains when a phoneme is removed	What is smile without the <i>/s/</i> ?

Compiled from Ehri & Nunes, 2002; Robertson & Salter, 1997; Tompkins, 1998; Torgeson & Mathes, 2000; Yopp & Yopp, 2000.

Phonological Awareness Instruction

The ability to attend to and manipulate phonemes has been an excellent predictor of reading success through twelfth grade for students who speak English as a first language (Adams, 1990; Lane & Pullen, 2004). The most effective phonological awareness instruction is explicit, deliberate, and purposeful (McQuiston, O’Shea & McCollin, 2008). Instruction is most effective, especially for older students, when conducted in small groups with an emphasis on phoneme identification, and blending and segmentation skills (Gillon, 2004; Lane & Pullen, 2004; Yopp & Yopp, 2000). The emphasis should be placed on activities that focus on sounds in spoken language. The development of phonological awareness requires experience with oral language which, in turn, promotes linguistic awareness (Adams, 1990; Birch, 2008). Both native English speakers and ELLs who have been exposed to a vast range of language and reading experiences may, in fact, develop phonological awareness in English independently; however, some students need explicit instruction to make the language connections (Grabe, 2009; Lane & Pullen, 2004).

ELLs and Phonological Awareness Instruction

Children and adult English language learners benefit from the foundations of literacy regardless of their age and their language experiences. Since development of phonological awareness can be a challenge for some beginning readers, it is important to teach the basic components of reading which include phonological awareness (Adams, 1990; Freeman & Freeman, 2007; Hodson, Schommer-Aikins & Swanson, 2005; Short & Fitzsimmons, 2007). If students are literate in their first language, the knowledge may

transfer to the English language so the amount and intensity of instruction could be less than if students are not literate in their first language (Short & Fitzsimmons, 2007).

For ELLs, a critical foundation of learning a language is the ability to hear and manipulate the sounds and sound patterns in that spoken language (Freeman & Freeman, 2007). In a research study funded by Texas Center for the Advancement of Literacy and Learning, Schwarz (2006) found that in a test group of twenty-nine adult English language learners, twenty-one students had difficulty perceiving individual sounds of English when asked to repeat sentences orally. The purpose of this task was to measure the participants' ability to discriminate the sounds and patterns in words. The finding was that the adult ELLs had difficulty hearing the critical differences in the sounds of words and individual letters, which impacted meaning and consequently impaired comprehension. When participants were not able to distinguish the sounds and repeat the words, their ability to recall information also decreased. The second most missed item was rhyme production in which students are asked to say a word that rhymes with the given word. The low scores were either due to the inability to produce a correct response or students did not understand the task. The task that showed the greatest gains was deletion in which students are asked to remove one unit of sound from a word and say the new word. The research suggested that students who could not discriminate the sounds and patterns of words were not as efficient retaining accurate language information on which to build fluent oral language.

While little research has been done pertaining to adolescent and adult ELLs, several studies affirm the teaching of phonological awareness skills as a reading

intervention for both primary students and adults who are ELLs (Hodson, Schommer-Aikins & Swanson, 2005; Yopp & Stapleton, 2008). A study by Hodson, Schommer-Aikins & Swanson (2005) involving thirty-one seventh grade students with low reading skills and low levels of phonological awareness in English, demonstrated the benefits of providing phonological awareness training to ELLs.

The study took place in a junior high where English is the second language for most of the student population. The seventh grade participants, most of which had acquired English as a second language, were placed into one of three courses based on reading test scores. Students who tested at or above the sixth grade reading level were placed into a class focusing on reading comprehension. Students who tested at about the fifth grade reading level were placed into a class that focused on reading skills, fluency, and reading comprehension. Students who tested at or below fourth grade were tested further to determine their current level of phonological awareness. These students were placed into a class that emphasized phonological awareness skills. The phonological awareness class was the treatment group. The control group included the students who were waiting for the classes to start the following semester. The treatment group received systematic and explicit instruction in phonological awareness skills for 45 minutes per day for 12 weeks. Classes were taught in English by speech assistants in small group settings. Lesson plans included phoneme segmentation, manipulation, and blending skills using pseudo words and real words. The pretest of phonological awareness, word attack, word identification, word comprehension, and passage comprehension showed that group abilities were similar in all areas except word attack at the beginning of the semester.

After the 12 weeks of instruction in phonological awareness, students were tested again. Post intervention performance of the treatment group was then compared to the control group. The results of this study indicated that the direct and explicit instruction in phonological awareness improved the phonological awareness skills of the treatment group. The researchers concluded that seventh grade low ability readers, including bilingual students who have English as a second language, can benefit from direct, systematic phonological awareness instruction.

In another study, Wicklund (2004), a classroom teacher, conducted six weeks of action research focusing on the effects of scaffolding phonological awareness training for English language learners in kindergarten after she had observed that ELLs in her class struggled with phonemic/phonological awareness skills. After a pretest to determine their current level of phonemic/phonological awareness, eleven ELLs were given direct instruction in the areas of rhyming, segmenting words into syllables, identifying sounds at the beginning/middle/end of words, segmenting and blending phonemes. The areas of instruction coincided directly with the areas of testing. After analyzing the posttest results, Wicklund found that gains were made in all areas with detecting rhymes and matching initial sounds having the greatest gains, while the least gains were made in counting phonemes. Wicklund concluded that phonemic/phonological awareness training was beneficial for the English language learners in her class because it increased their English phonological awareness skills. Wicklund suggests that the training may be beneficial for all ELLs.

Phonological Awareness Training Software: *Earobics 1 for Adolescents and Adults*

Earobics 1 for Adolescents and Adults software is an interactive reading intervention computer program aimed at supporting students with low level reading skills (Earobics, 1999; Earobics, 2007). Specifically, the software addresses components of phonological awareness in a sequence that scaffolds instruction. The program has six activities, each with multiple tasks that the students are to complete. Within each task there are three levels: beginning, intermediate and advanced. Skills that are addressed in the software include sound-symbol correspondence, phoneme discrimination, syllables, blending phonemes and syllables, rhyming, and vowel sounds. These skills correlate with the tasks characteristic of phonological awareness (Appendix B) (Adams, Foorman, Lundberg & Beeler, 1998; Gillon, 2004; Lane & Pullen, 2004; Picard, 2002; Robertson & Salter, 1997; Tompkins, 1998; Yopp & Yopp, 2000)

Detailed research specific to the *Earobics* line of software was difficult to obtain. Jan Wasowicz, president of Creative Concepts, states in the forward to the user's manual that the software was developed by a team of literacy and language specialists, and that the program is based on years of research (Earobics, 2007). Research specific to the benefits of *Earobics 1 for Adolescents and Adults* was not readily accessible at this time; however, studies for the elementary version of the software have been conducted. Reviews agree that students in elementary school show some gains in phonological awareness skills when systematically using the software; but the reviews are mixed about the actual statistical significance of the increase in phonological awareness due to the use of the program (Jamison, Pokorni & Worthington, 2004; Rehmann, 2005; Vallith, 2002).

Jamison, Pokorni, & Worthington (2004), compared the effectiveness of three phonemic/phonological awareness training programs: *Earobics*, *Fast ForWord*, and LIPS. Participants were African American, Caucasian, Hispanic, Asian/Pacific Islander and American Indian. After a pretest, fifty-four students were randomly assigned to one of the programs and received one hour daily intervention for six weeks. Students were not given any other supplemental material during the training. A six week posttest was given to students. Both the *Earobics* and LIPS groups made gains in phonological awareness skills, and were more effective than *Fast ForWord*. None of the programs had a significant impact on student reading achievement.

An elementary school principal, Rehmann (2005), conducted a research project to determine if *Earobics step 1*, the elementary school version of the software, would be effective as instructional support for students in kindergarten and first grade in the acquisition of phonological awareness skills. Eighty kindergarten and first grade students from various ethnic and socioeconomic backgrounds were randomly selected to participate. Students were placed into either the experimental or control group. Students in the experimental group received instruction for 20 minutes per day in the computer lab. The comparison group had regular classroom instruction. Rehmann found that students did not make statistically significant gains in phonological awareness skills when using the *Earobics Step 1* software. Rehmann also found that the software did not make a significant difference for bilingual, special education, or Title 1 student populations.

A study by Vallith (2002), a doctoral student, affirmed the use of *Earobics Step 1* as being beneficial for phonological awareness instruction. Vallith began the study with the purpose of evaluating the efficacy of *Earobics Step 1* on emergent literacy skills. Thirty first-grade English speaking students with notably low reading skills attending public school in the suburb of Chicago were selected for this study. Students were randomly assigned to one of two groups, each using a computer-based learning program. The treatment group was assigned the *Earobics Step 1* software. The control group was assigned a math based computer program. The goal was to determine if students using *Earobics Step 1* made gains in the areas of phonological awareness, reading, and writing by comparing them to the control group who did not receive phonological awareness training. To determine their current phonological awareness skills level, students were given a pretest in the following areas: blending, deletion, sound matching, the recall of digits, spelling, word identification and word attack. After the ten-week treatment of using the assigned computer program 20 minutes each day, students were given a posttest to determine if the treatment impacted phonological awareness skills.

Vallith found that there was significant improvement between the phonological awareness pretest and posttest measures for the group who trained with the *Earobics Step 1* program. Significant increases were made in deletion, blending, and sound matching. The control group showed minimal gains in blending and deletion, but no significant improvements were made in this area. Vallith concluded that the training program was effective for improving the phonological awareness skills of deletion, blending, and sound matching for first grade English speaking students.

Conclusion

Phonological awareness is a literacy skill students need to possess to become more proficient at reading and writing. At the same time, the development of phonological awareness skills can be lengthy and challenging for some young adults (Adams, 1990; *Phonemic awareness and the teaching of reading: A position statement*, 1998). While there is a large gap in the research on the short and long term effects of phonological awareness training for ELLs, especially the relationship to reading comprehension, research shows that explicit phonological awareness instruction positively enhances phonological skills, in turn promoting the lower level processing skills of literacy acquisition (Grabe, 2009; Schwarz, 2006; Yopp & Stapleton, 2008; Wicklund, 2004; Hodson, Schommer-Aikins & Swanson, 2005). The purpose of this study is to determine if computer-based phonological awareness training, specifically *Earobics 1 for Adolescents and Adults*, enhances or impacts phonological awareness for adolescent ELL, and whether or not reading comprehension skills are affected as a result.

A review of the literature introduced phonological awareness, discussed the importance of phonological awareness in learning to read, drew attention to English language learners and beginning literacy, and discussed a computer program for phonological awareness training.

The next chapter describes the study in detail, including a description of the setting and participants, a discussion of the research methodology, and the data collection techniques.

CHAPTER THREE: METHODOLOGY

Introduction

The purpose of this study is to examine the effects of direct instruction of English phonological awareness by means of a commercial computer program on adolescent English language learners. The students in my classes are between the ages of 12 and 18, they speak a language other than English at home, and they receive academic instruction in English at school. Many of the students are struggling readers and consistently receive low reading test scores. At the onset of this study, I wanted to know the impact of using a computer-based phonological awareness training program, specifically *Earobics 1 for Adolescents and Adults*, as a reading intervention for these students. The questions that guided this study include: Do adolescent ELLs who participate in the *Earobics 1 for Adolescents and Adults* program improve phonological awareness skills? Do students show greater improvement in some areas of phonological awareness than in other areas as a result of participation in the *Earobics 1 for Adolescents and Adults* program? Is there a relationship between the students' phonological awareness skills and post-intervention reading test scores?

Research Paradigm

This study is qualitative research with the inclusion of the quantitative research element of collecting pretest and posttest scores for interpretation. Qualitative research is defined as a form of research that takes place in a natural setting and uses more than one method to interpret, understand, and explain what is being studied (Anderson, 1998;

McKay, 2006). Qualitative research is holistic and takes into account a variety of factors. There are a purposeful and limited number of participants. Data collection includes field notes, written documents, surveys, and interviews. Data is analyzed and interpreted using descriptive language, rather than being presented statistically (McKay, 2006).

The elements in this study include observation of a limited number of preselected participants, collection of more than one type of data, and a descriptive analysis of the data (McKay, 2006; Merriam, 1998). Additionally, there is flexibility in the testing and training process for accommodations that may be needed for English language learners.

The goal of the study was to discover if English phonological awareness training, specifically with the use of an individualized computer program, is beneficial for English language learners at the secondary level.

Data Collection

Setting

The setting for this study is a small suburban secondary school in the Midwest, where the students in grades seven through twelve are housed in the same building. The structure of the English as a Second Language (ESL) program differs between the junior and senior high. The students in grades nine through twelve are all in specifically scheduled ESL classes for language learners. The students in junior high, grades seven and eight, attend mainstream classes with ELL teacher support in the classroom. They also have a scheduled academic support class that gives students additional time and support for assignments and exams. The study actually took place in the academic

support ESL classroom during independent work time as well as after school so that students' schedules could be accommodated.

Participants

Due to scheduling conflicts and the availability of the students during and after the school day, a limited number of students were preselected for participation. Students were selected based on the criteria of speaking a primary language other than English at home, as well as receiving consistently low reading test scores. Students preselected for the study participated on a volunteer basis, and only those who returned a signed parental consent form were able to be a part of the study. All of the students who participated in the study speak Spanish as their first language. They ranged from grades seven through twelve and had been in the United States school system for various lengths of time.

Ten students returned their parental permission forms planning to take part in the study. Nine students completed the questionnaire, completed the pretesting, and began the computer program, but only five of those students completed all of the required components of the study including pretesting, completing the computer program, and post-testing.

The five students who participated in the study had high survival and conversational English skills. Two students were born in the United States and three were born in Mexico. Students' ages ranged from 12 to 16 (grades 7-11). All five students had previous formal schooling experiences but continue to struggle with academics in English. The students were not tested in Spanish to determine their native language literacy skills.

Questionnaire

In order to obtain demographic data about the participants, students were given an individually administered questionnaire asking for factual information about their home language, their age, the length of time they have lived in the United States, their educational background in their home country and in the United States, and any English instruction they received in their home country or the United States (Appendix C). The questionnaire was written in English with Spanish translations available since all of the participants and their parents are native Spanish speakers. If participants were unable to read the questionnaire, the questions could have been asked orally in English or in Spanish as necessary. All students were able to complete the questionnaire without Spanish translations.

Pretest and Posttest

All students who participated in the study were given an individually administered pretest to determine the level of phonological awareness before training. A posttest was given immediately following the training. The purpose of the tests was to determine if phonological awareness skills were influenced by the training software. The test used is the *Phonological Awareness and Reading Profile* published by LinguiSystems (2001). This test is a criterion-referenced test designed to diagnose deficits in phonological processing (Robertson & Salter, 1997). The tasks included in the test that help determine a student's level of phonological awareness are: rhyming (identify and verbalize rhyming words), segmentation (breaking words into parts), isolation (identify sounds at the beginning/middle/end of a word), deletion (stating a

word that remains when a phoneme is removed), blending (blending a sequence of sounds together), phoneme/grapheme identification (identify sounds and corresponding letters), and decoding nonsense words (converting print to speech). Substitution (substituting one phoneme for another at the beginning/middle/end of a word) is also a section of the test, however it was not included in the study since it was not part of the computer training.

Computer Program and Assessment

Students who participated in the study used *Earobics 1 for Adolescents and Adults* independently for 20-40 minutes per session. The minimal goal was to complete one task per session; however, students could continue if they chose to do so and if time permitted. The ultimate goal for each student was to successfully complete each of the six activities by the end of the ten weeks of training. Students were required to begin at the lowest level of instruction and then they were able to progress at their own pace through the intermediate and advanced levels of each game.

Earobics 1 for Adolescents and Adults has the feature of allowing the facilitator of the program to look at each student's profile, which includes an ongoing performance record that can be used as an assessment component. This allows the facilitator to see who is having difficulties with a specific task or level. This provides a means of identifying strengths and weaknesses of individual students in particular areas, as well as identifying patterns for the entire group. The records were printed and filed to track student progress throughout the training. In addition to the computer data printout, a participation and progress chart was kept for each student that included the activity and

the date of completion to cross-check with the computer records (Appendix D). The chart also functioned as a record for attendance.

Document Analysis

Most students in the secondary school take the Measures of Academic Progress by Northwest Evaluation Association (NWEA MAP) reading test in the fall, winter, and spring to show academic growth in reading. This test is a computerized assessment aligned with state standards that provides school districts with individual students' progress scores. As students take the test, the questions adjust to their individual reading proficiency providing a question at the appropriate difficulty level. The MAP reading test has substrands in word recognition and vocabulary, reading comprehension, and literary response. Within the strand of word recognition and vocabulary, the phonological awareness skills assessed are sound-letter correspondence, beginning and ending sounds, phoneme identification, syllable counting, and syllable segmenting. Since the test increases in difficulty with correct answers, a student may not receive many questions pertaining to beginning reading skills.

Test scores for the fall and winter NWEA MAP reading test were recorded and analyzed for participating students before the training. When training was complete, the spring MAP scores were accessed through the testing website. The spring testing occurred two days after the computer training was complete. The scores from the fall, winter, and spring tests were compared for each of the participants to determine if reading test scores had increased.

Opinion Survey

Likert Scales are used for collecting opinions and attitudes using a scaled point system (Anderson, 1998). For an intervention to be effective it needs to be age appropriate, engaging, and be able to motivate students (Adams, 1990; Robertson & Salter, 2001). To determine students' opinions about the phonological training they received by means of the computer program, students took an anonymous survey using the Likert Scale (Appendix E). The survey was administered three times; the first week of the training, week five of the training, and at the end of the training. Questions on the survey include how much they understand, how much the program engages them, and if they feel it is a good use of time. The survey allows them to express their thoughts honestly without needing to use unknown vocabulary.

Observation Checklist and Notes

Observation and documentation of the study are in the form of an observation checklist, as well as notes that were kept by means of a descriptive journal. Field notes are a detailed and descriptive record of the research experience, a record of personal experiences, and a record of decisions made that affect the research process (Anderson, 1998). The study took place in a real-life school setting, and with that came many academic and social issues for high school students and their teachers. Issues that occurred included a student missing several training sessions, changes in a student's daily schedule, required testing by the school or other classroom teachers, and students losing interest in the program. Another feature of field notes is observing the behavior of people in the given setting (McKay, 2006). In this case, the behaviors of students during the

training were observed and recorded by means of a checklist that I completed as students worked on the computer. Statements on the checklist include: Begins working immediately, works independently, not focused on the task, restless and uninterested, complains verbally. Appendix F includes the checklist in its entirety. These observations were compared to the surveys with the purpose of checking for consistency with students' actions and opinions.

Procedure

Participants

Only students who returned a signed parental consent form were able to participate in the study. When students arrived at the pretesting area the first day, they were reminded of the purpose of the study. I explained that they would receive all test results and a description of what the results mean once the posttesting was complete. I reminded them that the information given to me is confidential and will not be shared, and their names would not be used for any purpose other than the study. Upon completion of the study, all personal student information was shredded.

Students were asked to complete a personal questionnaire including the factual information of age, native language, background education, the amount of English instruction they have received, and their length of time in the United States. All of the students were able to complete the questionnaire in English without Spanish translation.

As the researcher, I administered the phonological awareness skills pretest to determine current levels of phonological awareness. The assessment took approximately 40 minutes per student. There was approximately one week between the pretest and the

computer training program, which ensured that all students completed the pretest and computers were ready for use.

All participants received phonological awareness training using the interactive *Earobics I for Adolescents & Adults* program for a minimum of 60 minutes per week for a duration of ten weeks, or until the program was completed. Since the software and computers had to be shared, students communicated when they were available to use the computer and a daily schedule was created. As students completed the training, which consisted of completing all activities and all levels of the computer program, they were given the posttest. The results of the pretest and posttest were used to determine if growth was made in the areas of phonological awareness. To verify that gains were made by each student, the data provided for each participant by the built-in computer assessment component were printed and analyzed at end of the training.

Pretest and Posttest

The Phonological Awareness and Reading Profile (Salter & Robertson, 2001) was the test used for pretesting and post-testing. This profile was designed to assess the literacy skills of native English students who have difficulty with reading beyond the primary grades. It is a tool to track progress in phonological awareness (Robertson & Salter, 1997). The phonological awareness skills tested, which correlate directly with the skills taught on the *Earobics I for Adolescents & Adults* computer program, include: rhyming, segmentation, isolation, blending, deletion, and phoneme/grapheme identification. The skill of substitution is also a part of the *Phonological Awareness and*

Reading Profile, however this was not addressed in the *Earobics I for Adolescents & Adults* computer program, so this area was left out of the testing evaluation and results.

To determine a student's current level of phonological awareness, *The Phonological Awareness and Reading Profile* uses simple tasks in which students either receive a plus (+) for correct answers or a zero (0) for incorrect answers. Demonstrations are provided to begin each task to ensure that students understand what is asked of them. All instructions and responses are oral with each task having an average of seven questions. For the section of the test involving decoding pseudo words, I stressed to students that they would be reading words that are not real. ELLs may get confused when reading nonsense words and may try to remember and learn the combination of letters, which is not the goal of the assessment. The total testing time is approximately 30 to 40 minutes per student.

Computer Program

Due to limited computer availability in the school, I was only able to check out three laptops from the technology department. The laptops were housed in my classroom for the duration of the study. Each of the three laptops had a mouse for students who preferred to use them and headphones so that others in the room were not disturbed and individual progress remained confidential.

Before students began the program independently, I conducted a training session so students would know what was expected of them. Using the overhead projection system in the classroom, I logged onto the program as a guest, and then I started each of the activities and demonstrated all of the elements of the program. Knowing when to

click the mouse can be confusing if students are not clear about the directions because the icon disappears while the stimuli are being presented. I showed students that they had to wait until the icon appeared again before trying to click on the answer. I also had students listen to the directions at the beginning of each game, and then proceeded to show them what happens when both a correct response and an incorrect response are given. This training session was intended to make students more independent during the study and to clarify confusing aspects of the program.

The *Earobics 1 for Adolescents & Adults* program requires the CD to be in the computer at the time of use. Students were assigned a CD and laptop, and they had to use the same ones for each session in order for their progress to save and be accurate. Students told me each week when they would be available and I created a schedule of when they could use the computers. I was in the classroom when students used the program so their schedules and my schedule had to be coordinated. When students arrived to use the computer program, they logged into the program, chose an activity, and worked for a minimum of ten minutes or until the last round they were working on was complete. Students had to complete a round of ten or the information would not save to the computer. Students were able to see their progress in the form of a computer generated chart at the end of each session. I recorded and printed the progress for each student daily.

Data Analysis

To determine if phonological awareness growth was achieved, results from the pretest and posttest were compared and the percent of change was calculated.

Additionally, patterns of strengths and weaknesses in each of the skill areas were analyzed to determine if one area proved to be more difficult than the others. The question of whether or not phonological awareness training directly influenced reading scores was addressed by comparing the fall and winter NWEA MAP reading scores (pre-treatment) to the spring NWEA MAP reading scores (post-treatment).

The *Earobics I for Adolescents and Adults* software has a component called DataView, which provides performance profiles for each student (Earobics, 1999). The profile includes the type of task, the date completed, the variable affecting the task, the number of trials, and the cumulative score. Each day, the information provided on DataView for each student was printed for analysis. I looked at factors that could indicate a problem area, such as significant decreases in performance scores or an increase in the number of trials before getting the correct answer. DataView showed in which areas of phonological awareness the student struggled or the areas that were easily completed.

The opinion survey (Appendix E) was given to students at the end of the first week of training to gain an insight into the positive or negative feelings they had about the training. Students circled a face depicting how they felt about the program; happy face = 3, sad face = 2, face with tongue = 1. Results were compiled by averaging the results. The survey includes open ended questions asking students what was helpful and what was not helpful for them. Results were compiled to determine whether or not students felt the program was valuable for them and a good use of their time.

The Observation Checklist and Notes page (Appendix F) was used each time a student logged into a computer. I completed the checklist based on their behavior and

actions, and I noted any comments made or other observations related to the use of the computer program. For example, if there were technological difficulties or if a student complained aloud I made a note of it. The use of the checklist and notes were helpful for determining if students were engaged in the program or not committed to the study.

Verification of Data

The data collected was cross-checked for validation. The records from DataView, the opinion surveys, the observation checklist and the field notes were examined to ensure an accurate account of the study. Any inconsistencies in data were recorded and revisited. Throughout the study, all data was stored in a locked file cabinet in a locked classroom so that all information remained confidential.

At the end of each day, I recorded and charted students' progress in each of the six activities. Each day the information from DataView was printed for each student to ensure that records were not lost on the computer during the study. My records were then compared to the records from DataView. The student progress chart is shown in Appendix D.

The phonological awareness pretest and posttest additionally verifies whether or not phonological awareness skills improved, and more specifically, in what areas or tasks the greatest improvement was made (Robertson & Salter, 2001).

A survey using the Likert Scale was used to analyze the opinions of students during the training process including positive and negative feedback. These were compared to my own notes on how well students responded to and interacted with the program.

Observation records were kept throughout the study. Through the observation checklist and journal, the testing process was explained in descriptive form including any problems or issues that arose. Students' behaviors and actions were noted.

Limitations

A limitation for this study is that the *Phonological Awareness and Reading Profile* is for children ages eight to fourteen, and students given the assessment ranged in ages from twelve to nineteen. Unfortunately, there are few literacy tests available for young adults. This assessment does provide the information pertinent to the study and correlates with the skills taught by means of the computer program.

A limitation of the computer software is the necessity to use one CD for every student. Once the program is installed in the computer up to thirty student profiles can be saved on that computer. However, to operate the program the CD must be in the computer. This is inconvenient for a school setting where the goal is to reach as many students as possible at one time. Scheduling computer time to work around this limitation proved to be difficult as well.

Ethics

Participants' rights were protected for this study. Participants and their parents were informed in writing of the nature and purpose of the study. The letter was translated into the home language, and a signed consent form was returned and filed. Students and their parents were helped to understand the objective of the study and their roles throughout the study. Additionally, students and their parents were informed that they could terminate participation in the study at any time without consequence, that personal

information obtained during this study would be shredded upon completion of the study, and that all participants would remain anonymous and their identities protected.

Chapter Overview

This chapter describes the methodologies used in this study. First the rationale and description of the research paradigm were presented. Next, the data collection methods were explained. Finally, the procedure for the study discussed the participants, the testing and training procedures, and the limitations of the study. Chapter Four presents the data collected and a description of the results obtained.

CHAPTER FOUR: RESULTS AND DISCUSSION

Introduction

This study took place in a small suburban secondary school with a small group of adolescents who speak English as a second language. The purpose of the study was to discover if a computer-based phonological awareness training program would increase students' phonological awareness as well as increase reading test scores. Data for the study was collected by means of a pretest and a posttest of phonological awareness skills, a computer training program, and NWEA MAP reading test results. Through the collection of these data, I sought to discover answers to the following questions: Do adolescent ELLs who participate in the *Earobics 1 for Adolescents and Adults* program improve phonological awareness skills? Do students show greater improvement in some areas of phonological awareness than in other areas as a result of participation in the *Earobics 1 for Adolescents and Adults* program? Is there a relationship between the students' phonological awareness skills and post-intervention reading test scores?

This chapter presents the results of the study beginning with a description of the participants. The results are presented in order of the guiding questions. A discussion of each of the data collection procedures follows. Finally, the results for this study are compared to other research.

Participants

Nine students began the study, which means they completed the questionnaire, took the phonological awareness pretest, and logged in at least 60 minutes of computer

training. For various individual reasons, four of the nine students chose not to continue the computer training. Students were allowed to terminate the study at any time without consequence, and both students and parents were aware of this choice before the study began. Table 4.1 gives the basic demographic information for the five students who participated in the phonological awareness training. This information is based on the questionnaire students took at the beginning of the study (Appendix C).

All of the students who participated in the study have a home language of Spanish. Of these students, two were born in the United States and attended school from Kindergarten through their current grade level. Three of the students were born in Mexico and attended school at grade level until moving to the United States where each continued onto the next grade level. These three students began school in the United States in grades 6, 7, and 8. All of the students in the study had previous formal schooling, and all of the students have functional oral English skills.

Table 4.1
Participant Demographics

Student	Age	Home Language	Birth Place	Grade to Begin Schooling in US	Previous Formal Schooling
A	12	Spanish	Mexico	6.5	yes
B	12	Spanish	USA	Preschool	yes
C	13	Spanish	USA	Kindergarten	yes
D	16	Spanish	Mexico	8	yes
E	15	Spanish	Mexico	7	yes

Test Measure Results

The results of the study are presented in order of the guiding questions, followed by a discussion of the observation and survey results. See Appendix G for a compilation of all results from the phonological awareness pretest and posttest.

Question 1: Do adolescent ELLs who participate in the *Earobics 1 for Adolescents and Adults* program improve phonological awareness skills?

The phonological awareness profile results are broken into subtest or components (rhyming, segmentation, isolation, deletion, blending, phoneme/grapheme identification, and decoding nonsense words) and then a total score is computed. The test had a possible cumulative score of 197. The median score for the phonological awareness pretest was 134. The median score for the posttest was 172. The percent of change for students' phonological awareness skills is an increase of 28.4%.

Comparing the total scores from the phonological awareness pretest and posttest for each student, all five of the students showed gains in phonological awareness with the largest gain being 46% and the smallest gain being 18%. None of the students had a percent decrease from pretest to posttest. The total scores for the phonological awareness pretest and posttest, along with the percent of change are shown in Table 4.2. The percent of questions answered correctly from pretest to posttest increased for all students. Table 4.3 shows the total percent of questions answered correctly with 100% being a score of 197. All of the participants had an increase in their phonological cumulative score from pretest to posttest. This demonstrates that the five students who participated in

the *Earobics I for Adolescents and Adults* program improved their phonological awareness skills.

Table 4.2
Phonological Awareness Scores: Pretest and Posttest Results

Student	Total Score Pretest	Total Score Posttest	% Change
A	125	152	22
B	151	178	18
C	153	182	19
D	119	170	43
E	121	177	46

Table 4.3
Phonological Awareness Scores: Percent of Correct Answers

Student	Percent Correct Pretest	Percent Correct Posttest
A	63	77
B	77	90
C	78	92
D	60	86
E	61	90

Question 2: Do students show greater improvement in some areas of phonological awareness than in other areas as a result of participation in the *Earobics I for Adolescents and Adults* program?

The components of phonological awareness that were measured include rhyming, segmentation, isolation, deletion, blending, phoneme/grapheme identification, and decoding nonsense words. The pretest and posttest median scores for all students for each of the components is shown in Table 4.4. The component that had the greatest percent change was identification of phonemes/graphemes with an increase of 38%, decoding with 32.1%, deletion with 25.5% and segmentation with 25%. The components that had the lowest percent change were rhyming with 9.5% and blending with 4.2%. Comparing the median scores for each of the seven components there was a percent increase, which suggests that overall students made gains in each of the areas. The median scores for each of the components of the phonological awareness pretest and posttest demonstrate that direct phonological awareness instruction by means of a computer-based training program may have a positive influence on increasing phonological awareness for adolescent ELLs, with some areas of phonological awareness improving more than other areas.

The pretest and posttest scores for each student were calculated for each of the seven components. Table 4.5 shows the percent of increase each student achieved for each component. Student A showed the most increase in the area of phoneme/grapheme identification, followed by decoding and segmentation. This student has zero percent increase for isolation, deletion, and blending due to a repeated score for the pretest and

posttest. Student B had the highest gain in deletion, followed by segmentation and phoneme/grapheme identification. The least amount of gain for Student B was rhyming and isolation. Student C had the highest percent gain in phoneme/grapheme identification. This student made slighter gains in decoding and rhyming. Student C made no gains in isolation and blending. Student D had a significant gain in decoding, followed by segmentation, deletion, and phoneme/grapheme identification. This student made no gains in blending. Student E had a high percent increase in phoneme/grapheme identification, with isolation next, followed by deletion. This student made gains in all areas. The examination of each component by student reveals that even though students may not have made gains in all areas, they made great improvements in other areas. Improvement in one area did not appear to affect the other areas of phonological awareness.

Table 4.4
Pretest and Posttest Median Scores for Each Component

Phonological Awareness Component	Phonological Awareness Pretest	Phonological Awareness Posttest	Percent Change
Rhyming	8.4	9.2	9.5
Segmentation	17.6	22.0	25.0
Isolation	10.8	12.6	16.7
Deletion	10.2	12.8	25.5
Blending	9.6	10.0	4.2
Phonemes/Graphemes Identification	51.0	70.4	38.0
Decoding	26.2	34.6	32.1

Table 4.5
Phonological Awareness Scores: Students' Percent Increase per Component

Student	A	B	C	D	E
Rhyming	13	0	11	29	13
Segmentation	20	26	10	47	23
Isolation	0	8	0	30	63
Deletion	0	36	8	40	50
Blending	0	11	0	0	11
Phoneme/Grapheme Identification	33	19	35	40	70
Decoding	29	16	16	83	37

Question 3: Is there a relationship between the students' phonological awareness skills and post-intervention reading test scores?

Phonological awareness training with the computer-based training program began after the winter NWEA MAP reading test and ended a few days before the spring NWEA MAP reading test. NWEA reports the test scores in the form of a RIT score. The median RIT score varies for each grade level, ranging from 217 for seventh grade reading to 227 for eleventh grade reading. According to the winter and spring comparisons of the NWEA MAP reading test, three of the five students' scores improved. However, three out of five students also show improvement in their scores from fall to winter (pre-training). In fact, all students had a score increase during the school year from fall to spring (Table 4.6). This would suggest that while phonological awareness skills may

have contributed to the increased reading scores, the scores may have been influenced by other factors such as familiarity with the testing format and questions or additional reading instruction in the mainstream class. Though students' scores increased from fall to spring, the NWEA median norms score indicates that all of the students are below the median after the spring test. These test results do not offer conclusive evidence that computer-based phonological awareness training by means of *Earobics I for Adolescents and Adults* enhances reading skills. Table 4.6 shows the Fall, Winter and Spring NWEA Reading scores for the five students who completed the training. Student D did not take the fall test, so data was not available (NA).

Table 4.6
NWEA MAP Reading Scores: Pre- and Post-Training Results

Student	Grade	Fall Reading Score	Winter Reading Score	Spring Reading Score	NWEA Median Scores
A	7	193	213	206	217
B	7	212	215	216	217
C	7	194	202	205	217
D	11	NA	209	205	227
E	9	198	195	202	222

Observation and Survey Results

Observation Checklist

The Observation Checklist demonstrated that the five students who completed the treatment consistently either asked to use the computer or arrived promptly after school

for their phonological awareness training session. These students began to work immediately, continued independently for the duration of the session, and completed two or more activities. Two students verbally complained more than two times that some of the tasks were too difficult; however, they would continue until they mastered the tasks which were shown by the progress chart. Four of the five students would tell me, in an excited manner, as soon as they completed an entire activity such as Memory Matrix.

The four students who started the treatment but did not complete it had commonalities as well. Three of the students would repeatedly say “It’s too hard.” All three of these students were more often than not distracted or not focused on the task. They would watch the clock, sigh aloud, gaze around the room rather than look at the computer screen, and attempt to talk to others in the room. Two students would roll their eyes when they sat at the computer. One student said it was too easy and “No, thank you.”

Opinion Survey

The Opinion Survey was given to students three times; the first week of the training, the middle of the training, and after the final day of training. The results showed that four of the five students who completed the training during independent work time or after school thought that the computer program was a good use of their time. A comparison of the survey results for the first week to the final week shows that the understanding of directions and vocabulary increased, but the thought that the games were entertaining decreased. Learning new things from the games and the use of time remained consistent from the first week to the last week. Although students reported that

the program helped them understand new words, the program was not helpful because some concepts were already known by the students. One student wrote that the game “was a little annoying.”

The students who did not complete the training were asked to complete a short survey with questions about why they decided not to finish the phonological awareness skill training (Appendix H). According to the survey the overall reasoning for not completing the training was lack of time. Students could not stay after school due to lack of transportation, participation in an extra-curricular activity, or too much homework. Students who were in the ESL class had homework and felt that their time would be better spent on completing assignments rather than the computer program. Of the four students, two said they liked the computer program. One of these students said it was to get better at pronunciation, and the other student said it was fun. Of the two students who did not like the computer program, one student thought the game was too babyish and the other thought it was not fun. All four students claimed they would have liked the computer program better if it included letters and words along with the sounds.

Discussion of Results

The results of this study indicate that direct computer-based phonological awareness instruction for adolescent ELLs increased phonological awareness skills for some students. Since the study group was very small, the findings are tentative and the results are not able to be generalized; however, the results correlate with other research that has been done. Finding 1: Adolescent ELLs who participated in the *Earobics 1 for Adolescents and Adults* program improved their phonological awareness skills as

measured by the *Phonological Awareness Profile* and DataView. Finding 2: Students showed greater improvement in some areas of phonological awareness than in other areas as a result of participation in the *Earobics 1 for Adolescents and Adults* program. Finding 3: A relationship between the students' phonological awareness skills and post-intervention reading test scores could not be accurately determined.

This study demonstrated that the students who completed the *Earobics 1 for Adolescents and Adults* program seemed to increase their phonological awareness skills based on a pretest and posttest measures. This is in agreement with the study done by Vallith (2002), who evaluated the efficacy of the elementary version of *Earobics Step 1* for thirty first grade students on phonological awareness skills, decoding, and spelling. The main outcome of this study was that children in the treatment group improved in phonological awareness skills following the treatment. Though the two programs are intended for different age groups and the tasks are designed accordingly, the performance goals of the programs are similar (Earobics, 1999). Vallith also found that neither the phonological awareness trained group nor the comparison group showed significant change in their ability to decode nonsense words. Students showed an increase in their decoding scores for real words; however this did not transfer to nonsense words.

Jamison, Pokorni, & Worthington (2004), compared the effectiveness of three interventions in the area of phonological/phonemic awareness, language and reading skills: *Fast ForWord*, *Earobics Step 2*, and *LiPS*. They found the *Earobics Step 2* trained group had significant gains in phonological awareness skills with the most significant

gain in the area of phoneme segmentation. No significant increases were noted for language and reading skills.

Contrary to the findings in this study, Rehmann (2005) found that kindergarten and first grade students who utilized *Earobics Step 1* software did not make significant gains on phonological awareness skills beyond the comparison group; therefore, the major findings of the study do not support *Earobics Step 1* as a meaningful enhancement to the classroom instruction on phonological awareness skills. However, the study indicated that nonsense word fluency had a moderate relationship with the *Earobics Step 1* software because pretest and posttest scores increased for this task. In addition to the test scores demonstrating that the software was not effective, the teachers who participated in the implementation of the intervention had negative feedback about the software. It appeared to be difficult for teachers to monitor and utilize effectively. Teachers expressed frustration at the focus of the different games, the time spent on printing reports, and the difficulty of interpreting the reports.

While some studies did not involve computer-based instruction, they investigated instruction of phonological awareness skills to enhance literacy. Hodson et al. (2005) concluded that the junior high students who participated in the phonological awareness skills treatment outperformed students in the control group. Most of the participants were non-native English speakers. The study indicated that direct instruction in phonological awareness resulted in improved the phonological awareness skills of seventh grade students.

A study of adult ELLs in the area of phonological awareness (Schwarz, 2006) showed two-thirds of a test group receiving low scores on sentence repetition. Students were not able to discriminate between certain sounds, which in turn interfered with their ability to correctly repeat what they heard. Rhyme production was the second problematic area. The task that had the greatest level of achievement was deletion.

Wicklund (2004) demonstrated that through strategic scaffolding of phonological awareness skills, kindergarten ELLs were able to make gains in all assessment areas which included detecting rhymes, counting syllables, matching initial sounds, comparing word lengths, and representing phonemes with letters. The greatest gains were in detecting rhymes and matching initial sounds, while the least gains were made in counting phonemes.

Chapter Overview

This chapter is a presentation of the results from the data collection. The results are then related to other research in the area of phonological awareness. In Chapter Five I summarize the study, discuss the limitations and implications of the study, and give suggestions for further research.

CHAPTER FIVE: CONCLUSION

In this study, I attempted to answer the questions: Do adolescent ELLs who participate in the *Earobics 1 for Adolescents and Adults* program improve phonological awareness skills? Do students show greater improvement in some areas of phonological awareness than in other areas as a result of participation in the *Earobics 1 for Adolescents and Adults* program? Is there a relationship between students' phonological awareness skills and post-intervention reading test scores? The topics addressed in this chapter include a summary of the study, the limitations of the study, implications for teachers and administrators, and suggestions for further research.

Summary

This study involved five adolescent ELLs who consistently received reading scores that were below the grade level median RIT scores according to the NWEA reading norms. According to research, phonological awareness instruction in English is a precursor to English literacy. On a voluntary basis, students received phonological awareness training via a computer-based intervention program called *Earobics 1 for Adolescents and Adults*. Based on pretest and posttest measures, all five of the students showed an increase in phonological awareness skills. The phonological awareness components that showed the greatest areas of improvement were segmentation, deletion, phoneme/grapheme identification, and decoding. The components that showed the smallest change was rhyming, isolation, and blending. Students also showed an increase in their scores for the NWEA MAP reading test from fall to spring, but not all of the

students increased their scores from winter to spring. It is inconclusive if the phonological awareness training had a direct impact on the reading scores.

Limitations and Implications

There were limitations for this study including technical and software concerns, testing results, and the setting for the study. A major limitation for this study was the technical problems with the laptops and the CDs. The first issue occurred when the study began. Computer space was limited and computer labs were not available for the amount of time required for the study, so the technology department allowed three laptops to be housed in my classroom for the duration of the study. Unfortunately, the building did not have wireless capabilities and the laptops were old. This caused the program loading time to take twenty minutes every morning. When students were on the computers, there were issues with the auditory feature of the program including the CD-ROM skipping sounds and words or omitting directions. To correct the issue the CD-ROM would have to be removed and started again causing the students to repeat that part of the program. Another technical drawback to the program was when accessing and printing the students' profiles, I had to retrieve each student's file and then go to each game for the corresponding data. With only five students this did not cause major problems; however, with a large group this would be very time consuming.

In the area of assessment, the NWEA reading test was not as conclusive and helpful as originally anticipated. Students' scores increased from fall to spring, but only some scores increased from winter to spring, which is when the training occurred. The results were not conclusive as to whether or not the phonological training directly

influenced reading scores or if other factors were involved. The question remains as to whether or not reading scores increased due to phonological awareness training or due to other factors.

Finally, a secondary school setting during normal school hours was not an ideal setting due to factors including students' busy schedules and their lack of time for extra work and the unpredictable daily schedule of school events. My advice for teachers and administrators would be to use a computer-based reading intervention such as *Earobics I for Adolescents and Adults* as an embedded part of the curriculum; for example, as a summer school component or with an adult education program. This would help eliminate the idea that it is extra work or an addition to other activities.

An implication of this study is that the phonological awareness skills of some adolescent ELLs can be enhanced through direct and explicit instruction. Computer-based interventions such as *Earobics I for Adolescents and Adults* can be effective and engaging for some students. Other students may require more personal small group instruction in a systematic format. Phonological awareness is a major component of early literacy, but it is only one component of the complex process of acquiring literacy, and the training of phonological awareness skills alone will not guarantee gains in reading assessment scores. Torgeson and Mathes (2000) state that phonological awareness interventions are most valuable as part of a reading curriculum and not as isolated instruction. The computer-based phonological awareness training (*Earobics I for Adolescents and Adults*) seemed to be beneficial for increasing phonological awareness skills independently; however, it is an isolated instructional tool unless other instructional

strategies are incorporated to make the program part of an inclusive reading curriculum. A program that incorporates phonological awareness, decoding, vocabulary, fluency, and comprehension in content area instruction would create the best educational opportunities for ELLs to learn to read and write English.

Another implication of this study is adolescents who require reading remediation at the phonemic level can benefit from phonological awareness instruction to enhance their literacy acquisition. However, it is important to keep in mind that not all ELLs who have low reading scores require intensive phonological awareness instruction. There are many sources of reading difficulties for ELLs including unfamiliarity with English syntax and vocabulary, insufficient background knowledge of a subject, lack of reading practice in English, trouble transferring first language literacy to English, or illiteracy in the native language. To effectively determine if a student has a solid foundation in phonological awareness skills, an assessment in the first language should be given prior to providing isolated interventions. A student who has phonological awareness in his or her first language may only need brief explanations and examples of how to transfer the skills to English. Some students may need more intensive explicit instruction in phonological awareness, in which case an integrated reading approach would be the most effective for ELLs.

Earobics 1 for Adolescents and Adults was chosen for the study because it appeared to meet the needs of my students. The results were mixed with positive and negative outcomes. Students who completed the program hoped that they would be able to understand, speak, and read English better. The students said they enjoyed the

program, but the survey results suggested that the program did not meet their expectations. The computer program has features that are beneficial for ELLs including repetition, immediate feedback, and oral and visual prompts. The program has the potential to hinder students with unfamiliar vocabulary, such as when blending compound words in one of the activities. Overall, the program was a success for the five ELLs who participated in the study. Since it was a small group the results cannot be generalized.

I am an advocate of phonological awareness instruction for ELLs. In my own classroom, I would use Earobics as an educational tool for students who need additional practice in certain areas of phonological awareness. I would not have students complete all of the activities, but would tailor the instruction to the students' literacy needs. To be the most effective the instruction needs to be an embedded part of a holistic approach to teaching reading.

Further Research

This study generated questions and ideas for further research. This study examined posttest scores immediately following training; therefore, the long term effects of the training program are not known. A follow-up test would help determine if the students who received the training maintained the phonological awareness skills long term.

Since the NWEA reading assessment component of this study was not conclusive, further research into the effectiveness of phonological awareness skills instruction

integrated into a reading curriculum, not as an isolated intervention, would demonstrate if phonological awareness training increases reading assessment scores.

Students' scores increased for the nonsense/pseudo word decoding section of the pre- and post-assessments. A future research topic could be how phonological awareness training affects decoding skills for secondary ELLs. I would be interested to find out if oral reading fluency scores for adolescent ELLs are influenced by phonological awareness instruction. It is possible that students' auditory skills increased during the computer training since the program required students to listen carefully and discriminate between sounds. Would an increase in decoding scores affect oral reading fluency?

While the number of studies involving ELLs and literacy are increasing, the studies involving ELL adolescents and English literacy are minimal. Any research with the goal of understanding English literacy for the adolescent ELL would be beneficial for teachers, administrators, and parents so that these students can reach, and go beyond, their educational goals.

Conclusion

The outcome of this study is that I have a wealth of knowledge about phonological awareness and how it can affect literacy acquisition for both native and non-native speakers of English. I plan to use this knowledge while planning lessons and working with ELLs as they acquire English literacy skills. I hope to share this insight with colleagues and administrators so they, too, can understand the importance of phonological awareness skills for students of all ages.

With so many adolescent ELLs struggling with reading skills it is imperative to give them the tools they need to further their education. Having low literacy skills has a direct impact on their achievement in other classes. To help students succeed in content area classes, to keep students in school, and to see them graduate, it is my job as an educator to prepare students for academic literacy by providing them with the building blocks of reading and writing.

APPENDIX A

Earobics 1 for Adolescents and Adults Skills, Objectives, and Descriptions

Earobics 1 for Adolescents and Adults

Skills and Objectives

ACTIVITY	SKILLS	OBJECTIVES	LEVELS OF INSTRUCTION
Memory Matrix	Auditory attention and short term sequential memory	Recall and sequence a series of sound effects, words, digits, and speech sounds.	38
Sound Check	Sound-symbol correspondence, phoneme discrimination, phoneme identification	Recognize the sounds for consonants and vowels, recognize the sound-symbol correspondence	74
Get Rhythm	Segmenting syllables and phonemes	Detect sound patterns and recognize the rhythm of segmenting syllables.	16
Connectivity	Blending word parts and auditory discrimination of sounds	Blend phonemes, syllables, and compound words	56
Rhyme Time	Identifying sound patterns, recall sequence of words	Identify rhyming and non-rhyming words	11
Same/Different	Vowel and consonant perception and discrimination	Discriminate sound and syllable patterns	114

Compiled from *Earobics 1 for Adolescents and Adults* instructional manual (Earobics, 2007)

Earobics 1 for Adolescents and Adults

Activity Descriptions

Memory Matrix

Memory Matrix begins with auditory memory involving pictures and sounds. First, a group of pictures is displayed with a sound and students must choose the picture that correlates with the sound. The task progresses to a series of sounds with a delayed visual. The student must recall the order of presentation. This concept repeats with one syllable words, digits, and finally speech sounds. During the syllable and digits level, a background noise is introduced to determine if students can concentrate on the task and ignore the noise. During early levels, visual cues prompt the student, but then as the student progresses through the levels the picture cues are removed.

Sound Check

Sound check begins with the recognition of long vowels and short vowels. A target vowel sound is given, such as the long A sound. Then a series of sounds is presented. Students decide if the sound is the same or different from the target sound. The student then clicks either on the box with the target letter, or the box with the target letter crossed out. A combination of visual and auditory forms of the target vowel is presented at the beginning of each new target sound. The game progresses through various sounds including vowels and consonants. The advanced level involves the recognition of the sounds within words. The task begins with sounds in isolation and progresses to sounds embedded in words and finally the position of the sound (beginning, middle, end). Sound

Check addresses phoneme discrimination and identification, phonological sequencing, and sound-symbol correspondence.

Get Rhythm

Get Rhythm begins with students counting drum beats and then reproducing them with the click of the mouse. The beginning level continues with counting speech sounds. The intermediate and advanced levels focus on segmenting syllables and phonemes in a word. The task becomes more challenging as the intervals between sounds become shorter. Get Rhythm focuses on sound patterns and segmentation of syllables and phonemes.

Connectivity

Connectivity begins with students listening to a compound word and then clicking on the correct picture of the word. The task progresses to blending two syllable words and three phoneme words, and finally the advanced level has students blending four phonemes into a word. Connectivity focuses on blending words into compound words and then syllables into words. This task instructs students to hear subtle differences in speech sounds.

Rhyme Time

Rhyme Time orally introduces students to three words of which two rhyme. Students click a bubble representing the word that does not rhyme. The words are not displayed, but instead blinking bubbles indicate the spoken words. The task progresses to five oral words with one that does not rhyme, followed by background noise with the same goal. The advanced level is the same concept, but students need to identify the

rhyming words. Rhyme Time addresses rhyming and non-rhyming words presented orally.

Same/Different

Same/Different has students discriminating vowel pairs followed by syllable patterns. The screen shows two boxes. In one box there are two identical blue squares. This represents sounds that are the same. In the second box there is one blue square and one red triangle. This represents sounds that are different. The student hears a target sound followed by a series of sounds, and then decides if the sound is the same or different by clicking on the appropriate box. The advanced level has students discriminating syllable patterns beginning with one syllable and progressing to four syllables. The goal of Same/Different is to teach students to discriminate between sounds.

APPENDIX B

Correlation of Phonological Awareness Skills, Assessment, and *Earobics* Activities

Correlation of Phonological Awareness Skills, Assessment, and *Earobics* Activities

Phonological Awareness Skill	Phonological Awareness Assessment Component	<i>Earobics</i> Activity
Sound-symbol correspondence	Identification	Memory Matrix Sound Check
Rhyme	Rhyming	Rhyme Time
Syllable	Segmentation Isolation	Get Rhythm Same/Different
Onset	Identification Isolation	Sound Check
Rime	Rhyming Isolation	Sound Check Rhyme Time
Syllable Segmenting	Segmentation	Get Rhythm
Syllable Blending	Blending	Connectivity
Phoneme Isolation	Isolation	Sound Check
Phoneme Segmentation	Segmentation	Get Rhythm Sound Check
Phoneme Blending	Blending	Connectivity

(Compiled from Earobics, 1999; Robertson & Salter, 1995)

APPENDIX C

Participant Questionnaire

What kind of English instruction did you receive? (Circle all that apply)

Basic vocabulary

Speaking simple sentences

Writing simple sentences

Writing complex sentences and essays

Reading short stories

Reading novels and textbooks

I don't remember

If you WERE born in the United States, answer the following questions:

What grade did you begin school? Preschool Kindergarten First

In what grades did you receive ESL? _____

APPENDIX D

Participation and Progress Chart

APPENDIX E

Opinion Survey

Opinion Survey

Circle the face that shows how you feel.

I understand the directions.



I understand the vocabulary.



The games are entertaining.



I learn new things from the games.



The games are a good use of my time.



Complete the sentences.

The computer program has helped me:

The computer program is not helpful because:

APPENDIX F

Observation Checklist

Observation Checklist

Date _____

- Asks to use the computer
- Begins working immediately
- Works independently for the duration of the session
- Completes two or more activities
- Not focused on the task for more than half of the session
- Requires directions explained more than one time
- Restless and uninterested in task
- Randomly clicks mouse or punches keys
- Talks to others
- Does not complete a round of ten (required for program to save progress)
- Complains verbally

Notes:

APPENDIX G

Phonological Awareness Pretest and Posttest Results

Phonological Awareness Pretest and Posttest Results

Student	# possible	A		B		C		D		E	
		pre	post								
Rhyming	10	8	9	10	10	9	10	7	9	8	9
Discrimination	5	5	5	5	5	5	5	5	5	5	5
Production	5	3	4	5	5	4	5	2	4	3	4
Segmentation	25	15	18	19	24	20	22	17	25	17	21
Sentences	5	3	5	5	5	3	5	5	5	5	5
Compound Words	5	5	4	5	5	5	5	5	5	5	5
Syllables	5	4	5	5	5	4	4	4	5	5	5
Phonemes	10	3	4	4	8	8	8	3	10	2	6
Isolation	15	9	9	13	14	14	14	10	13	8	13
Initial	5	4	5	5	5	5	5	4	5	5	5
Final	5	5	4	3	4	4	4	3	5	2	5
Medial	5	0	0	5	5	5	5	3	3	1	3
Deletion	15	10	10	11	15	12	13	10	14	8	12
Compounds/syllables	5	3	4	4	5	3	4	4	4	2	5
Phonemes	10	7	6	7	10	9	9	7	10	6	7
Blending	10	10	10	9	10	10	10	10	10	9	10
Compounds/syllables	5	5	5	5	5	5	5	5	5	5	5
Phonemes	5	5	5	4	5	5	5	5	5	4	5
Phoneme/Graphemes Identification	82	49	65	58	69	57	77	47	66	44	75
Consonants	21	13	18	18	18	17	21	16	18	15	20
Short Vowels	5	1	1	4	5	1	5	1	4	1	5
Long Vowels	5	4	5	3	5	4	5	5	5	5	5
Vowel Digraphs	5	2	2	4	3	1	3	1	5	2	3
Diphthongs	4	2	4	1	2	0	3	0	2	1	3
R-Controlled Vowels	5	4	4	2	5	1	4	1	2	1	4
Consonant Digraphs	4	3	4	2	3	4	4	3	3	1	4
Consonant Blends	33	20	27	24	28	29	32	20	27	18	31

Decoding	40		24	31	31	36	31	36	18	33	27	37
VC Words	5		2	1	2	4	3	5	4	5	3	5
CVC Words	5		2	3	5	5	4	5	1	3	4	4
Consonant Blends	5		1	4	3	4	3	4	4	4	2	5
CVCe Words	5		5	4	3	4	4	4	1	2	2	4
Vowel Digraphs	5		5	5	4	4	4	4	2	5	4	5
Diphthongs	5		3	5	4	5	4	5	1	5	3	4
R-Controlled Vowels	5		4	5	5	5	4	4	1	5	5	5
Consonant Digraphs	5		2	4	5	5	5	5	4	4	4	5
Total	197		125	152	151	178	153	182	119	170	121	177
% correct	100		63	77	77	90	78	92	60	86	61	90
% increase				22		18		19		43		46

APPENDIX H

Incomplete Training Survey

Incomplete Training Survey

1. Did you like the computer activities?
 - a. Yes
 - b. No

2. If yes, because
 - a. It was something to do
 - b. I want to get better at pronunciation
 - c. It was fun

3. If no, because
 - a. It was not fun
 - b. It was too hard to understand
 - c. I had too much homework
 - d. I did not have time
 - e. It was too babyish

4. I would like the games better if there were letters and words with the sounds.
 - a. Yes
 - b. No

5. I did not finish the computer program because...

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