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Examining the Role of English and Spanish Academic Vocabulary on English Reading Comprehension of English Learner Bilingual Students

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ABSTRACT OF THE DISSERTATION

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It is well-documented that there is a strong relationship between vocabulary and reading comprehension in school-age children. Limited vocabulary knowledge can impact a student's reading achievement, as may be the case for school-age English Learners (ELs). This study aims to analyze the role of vocabulary in predicting reading comprehension outcomes of English/Spanish emergent bilingual EL students. Secondary data analysis was conducted using a subset of longitudinal data collected as part of a federally funded grant. Analyses included two cohorts of elementary school students in dual immersion programs and examined their performance on vocabulary measures in English and Spanish and reading achievement in English. During the first wave of data collection, students were in first grade (n=63; Cohort 1) and third grade (n=61; Cohort 3). Descriptive statistics, correlations, and group means were examined for the differences in vocabulary and reading achievement between time points within each cohort of students.

Hierarchical linear regressions reported the amount of variance that expressive and receptive vocabulary in English and Spanish contributed as predictors of English reading comprehension among each cohort of emergent bilingual students. Findings and implications are discussed.

Keywords: English learners, bilingual students, expressive vocabulary, receptive vocabulary, reading comprehension

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Emergent bilingual (EB) students or more commonly referred to as English learners (ELs) represent approximately 19% of total enrollment in California public schools and 10% in public schools across the nation (U.S. Department of Education, National Center for Education Statistics [NCES], 2022). Although they are heterogeneous and complex groups of students, when grouped into a single category of EL at the state and federal level, they continuously perform poorer than their monolingual or English-only speaking counterparts across standardized tests (e.g., Fry, 2008; Hemphill & Vanneman, 2011; NCES, 2020). While research over the past several decades has greatly improved reading instruction practices, ELs continue to underachieve in reading (Orosco & O'Connor, 2011). This likely is due to a myriad of factors, such as native language proficiency (L1), prior exposure to the secondary language (L2), ecological considerations, and previous educational experiences, among other potential factors.

Learning to read is a complex process, given all the potential confounding variables to consider, particularly for ELs. Research has consistently demonstrated that the academic difficulties experienced by EL students are often the result of linguistic deficits such as limited English proficiency (Betts et al., 2009). English proficiency encompasses many linguistic skills, such as expressive and receptive language and reading and writing abilities. Similar to the outcomes of EL students, students of disadvantaged backgrounds who have limited vocabulary also demonstrate academic difficulties, particularly in reading comprehension (Chall et al., 1990). As such,

vocabulary has long been identified as essential in achieving reading success and developing reading skills from third grade and beyond (Biemiller, 2003).

Determining English Language Proficiency and Impact of EL Status

The No Child Left Behind (NCLB) Act of 2001 required states to assess the English Language Proficiency of students classified as ELs (three categories; initial fluent English proficient, limited English proficient, or reclassified fluent English proficient). This requirement for assessment structured a system of accountability wherein states, districts, and schools were responsible for student growth for a group of students that had previously been exempt from testing and "lost in the educational system" (National Clearinghouse for English Language Acquisition [NCELA], 2006). While this increased awareness and accountability appears ideal, ELs continue to lag academically compared to non-EL students. Research reviewing data from the National Assessment of Educational Progress (NAEP) noted that the achievement gap between EL students and their monolingual peers has remained consistent at a difference of nearly 40 points for over two decade (Echevarria, 2012). Specifically, within California, the achievement gap or significant difference in assessment scores on standardized tests between ELs and non-ELs exists in all core academic domains: reading, writing, mathematics, and science in both fourth and eighth grade (NAEP, 2022). Naturally, closing the achievement gap for EL students and their monolingual peers has been a long-standing goal for educators.

EL status can carry significant outcomes throughout a student's educational career. For example, continued EL status in secondary school likely impacts which

course students have access to. Secondary schools often place EL students in remedial courses that limit their opportunity to take rigorous courses until they are reclassified as fluent English proficient (R-FEP). Thus, ELs are less likely to enroll in advanced placement courses necessary for college preparedness (Callahan, 2005). Additionally, some long-term English learners (LTELs) who are EL students that have retained EL status for more than five years (ESSA, 2015) may require specialized support to improve their academic achievement and academic vocabulary (Shin, 2020). Nearly 46% of secondary EL students, grades 6-12, are LTELs (CDE, 2020). By the time EL students reach secondary school, a significant gap in academic achievement already exists, which continues to compound over time (Cook et al., 2011). LTELs often experience underachievement, low school engagement levels, high retention rates, and/or drop-out rates (e.g., Kim & Garcia, 2014; Harry & Klinger, 2006). Of concern is that the proportion of LTELs increases with each grade level (Shin, 2020). As such, while accurate identification and annual progress monitoring are federally mandated, educators must use such data effectively to inform instructional practices from the onset of EL status identification to mediate the diverse learning needs of EL students as early as possible. Currently, ELP state assessment practices do not yield such data cohesively or comparably. Nevertheless, an abundance of data collected within the classroom (e.g., criterion-referenced and norm-referenced measures) can supplement current ELP assessment practices to support understanding the diverse learning needs of EL students.

ELs consistently score below "proficiency" levels and behind that of monolingual native English-speaking peers on state assessments of reading achievement (NAEP,

2022). However, it is important to recognize that while learning to read, ELs are also presented with the dual challenge of concurrently developing linguistic proficiency in a second language (Townsend & Collins, 2009), which makes developing reading proficiency at the same rate as native English speakers an insurmountable challenge. Nevertheless, researchers have suggested that using evidence-based systematic and targeted instruction in the foundational components of early reading skills (Martinez, 2014) can provide poor readers, including English learners, with the skills to improve reading outcomes (Connor et al., 2014). For example, researchers recognized the importance of vocabulary development in acquiring reading skills, which has historically been an area of academic need in both EL students and those considered economically or socially disadvantaged (e.g., Betts et al., 2009; Biemiller, 2003; Chall et al., 1990).

Foundational Reading Skills

Learning how to read is critical during early elementary years as reading eventually becomes the vessel through which all learning occurs from mid-elementary through high school and post-secondary education. In addition to significantly impacting K-12 academic success, reading ability is also related to opportunities for vocational success and earning potential throughout adulthood (Lesnick et al., 2010). Basic reading skills are typically the focus of instruction during the early elementary years from kindergarten through third-grade students. Then from third to fourth grade, the focus of instruction transitions from teaching students *how to read* to teaching them *how to use their reading skills* to continue learning in math, science, history, and literature in subsequent years of schooling. It is at this time that students reading success is highly

determined by both word identification skills (i.e., decoding) and vocabulary, which are the major skills required for comprehension of learning material (Biemiller, 2003).

Literacy skills, regardless of language, during the initial years of elementary school have consistently been found to be strong predictors of both short-term and long-term reading achievement and overall academic success (Reese et al., 2000). Specifically, early literacy skills are correlated with the initial reading acquisition (i.e., decoding; Kainz & Vernon-Feagons, 2007), subsequent reading growth, and continued reading development throughout elementary school (e.g., Cunningham & Stanovich, 1997; Juel, 1988). However, when students struggle to master early literacy skills, such as phonemic awareness, decoding, and word identification skills, they are more likely to struggle with reading problems later in middle and high school. Researchers found that 75% of students identified with reading difficulties in third grade continue to present with reading difficulties in high school (e.g., Francis et al.,1996). Further of concern is that the National Reading Council (1998) reported that an individual that students are unlikely to graduate high school if they are not skilled readers by third grade. Needless to note, learning to read by third grade carries important implications for student academic success and later life outcomes.

Reading must be explicitly taught as it does not occur naturally (Moats, 1999). It is a lengthy and complex process that begins during early childhood before a child enters school through language acquisition and exposure within the home (Hart & Risley, 2003; Snow et al., 1998) and extends into formal instruction in the classroom (Moats, 1999). Researchers have identified five main areas of reading, colloquially referred to as the

"Big Five." The critical "Big Five" foundational reading skills reported in the National Reading Panel (NRP, 2000) are phonemic awareness, phonics, fluency, vocabulary, and comprehension. Snow and colleagues (1998) found that vocabulary development, phonological skills, and awareness of the alphabetic principle are all strong predictors of future reading proficiency.

While educators address all "Big Five" reading skills based on recommendations from the science of reading research (NRP, 2000), explicit instruction in academic vocabulary has received a particular emphasis for EL students given that they tend to have less English vocabulary knowledge than their monolingual English-speaking peers (Geva et al., 2000). Biemiller (2005) found that any vocabulary gap during early school years persists through the remaining years of elementary school. Thus, a systematic and scientific approach to reading, including vocabulary, is necessary to prevent reading failure. In fact, Becker (1977) found that the declining rate of reading comprehension skills over time among disadvantaged students was most likely due to insufficient vocabulary knowledge. In regard to reading comprehension, Laflamme (1997) reported that vocabulary is the most important contributing factor to academic success.

Vocabulary and Reading Skills

Vocabulary skills indicate knowing the meaning and pronunciation of words in both oral and written forms. Vocabulary is divided into two main parts: expressive and receptive. Expressive vocabulary is the words we use to speak and communicate orally and in writing. Receptive vocabulary is the words one understands both through listening and when reading. Several studies have reported strong correlations between vocabulary

and reading comprehension (Beck et al., 1982; Biemiller, 2003). Some studies combined expressive and receptive language skills into a single vocabulary construct to examine the impact of vocabulary skills on reading comprehension. They found that when students were identified as "poor comprehenders" with poor vocabulary skillsets at age three to five, they exhibited similarly poor vocabulary and reading comprehension skills at age eight, approximately in third grade (Castro et al., 2011; Nation et al., 2010).

Studies have also found that receptive and expressive vocabulary influence early reading skills in unique ways as separate skill sets. For example, expressive vocabulary is influential in word identification skills (Wise et al., 2007), while receptive vocabulary influences reading comprehension (Diakidoy et al., 2005; Nation & Snowling, 2004). Biemiller (2001) also examined the two vocabulary skill sets separately and found a correlation of .81 in expressive vocabulary and reading comprehension and a correlation of .93 in receptive vocabulary and reading comprehension in elementary-age students. More recently, Ha (2021) reported that academic vocabulary knowledge, focusing on receptive vocabulary only, was strongly correlated with reading comprehension (r=.60) in a group of bilingual Vietnamese students learning English as a second language.

Vocabulary is a large part of the language acquisition process that contributes to understanding a language for interpersonal communication and academic achievement and comprehension of academic texts. Although reading comprehension is a complex cognitive process, vocabulary is foundational to understanding what one has read. Within the scope of reading theory, such as the Simple View of Reading (SVR), vocabulary and decoding contribute to learning how to read (Gough & Tunmer, 1986). A rich lexicon or

wide range of the vocabulary facilitates decoding and reading comprehension, providing ease in making sense of what one has read in the texts (Joseph, 2015). Research has found that vocabulary predicts listening comprehension, reading comprehension, and later educational outcomes (Kamil et al., 2008).

The importance of home and parental influence on early childhood vocabulary acquisition has been repeatedly verified (Tizard et al., 1972). Although most of a child's vocabulary acquisition before the third grade is largely impacted by interpersonal communication within the home, there is also strong evidence to document that vocabulary is not innate or fixed. Instead, environmental factors and school instruction contribute to vocabulary development (Beals, 1997; Biemiller, 2003; Weizman & Snow, 2001). However, ELs, in particular, are at risk for struggling with acquiring academic-specific vocabulary (Bailey, 2007; Cummins, 1979; Townsend & Chiappe, 2009) while they concurrently work towards developing English Language proficiency in schools.

Second Language Acquisition, Academic Vocabulary, and Achievement

Several factors can facilitate the development of English Language Proficiency, one of which is the length of time an individual is exposed to or has access to the language and culture (Cummins, 1979, 1980). Cummins identified two different types of language skills that are impacted by time for secondary language development – Basic Interpersonal Communication Skills (BICS) and Cognitive Academic Language Proficiency (CALP). BICS are the context-embedded, less cognitively demanding aspects of language that are utilized in social or informal settings and take approximately 2-3 years to develop. CALP is the more rigorous aspect of language necessary for students to

succeed in academic settings, such as content-specific vocabulary, and can take approximately 5-7 years to develop in an EL student.

Collier and Thomas (1989) examined the impacts of the time of arrival and years of schooling on English academic language proficiency. They found that second language proficiency occurs roughly within five to seven years of arrival when paired with formal academic instruction, as proposed by Cummins (1979). Still, they also reported that it depends on other factors such as the student's cognitive maturity, prior educational experiences, mastery of the first language, or participation in a bilingual program. From their findings, Collier and Thomas suggested that for the most successful academic outcomes, it is important to emphasize CALP in both the native language (L1) and the secondary language (L2), as is the case in dual language immersion and maintenance bilingual programs. For EL students, it is highly important that there is a strong emphasis on learning academic language in both their native and second language in their educational program. The rationale for this is that acquiring academic proficiency in one language should lend itself to transferring those skills to a second language as was also proposed by Proctor and colleagues (2006) with a cross-linguistic model.

Collier and Thomas (1989) concurrently found that in EL students in monolingual programs, where English is the sole language of instruction, CALP may take as long as 7 to 10 years to develop, and in some cases, CALP may never be achieved in the second language (Collier, 1989). This suggests that instructional programming, such as dual language immersion and bilingual programs, targeting the unique linguistic needs of ELs in both languages is critical in ensuring EL students have access to "high-level words"

(Chall & Dale, 1999). Such instructional programming will allow students to acquire larger breadths and depths of CALP vocabulary, which in turn can lead to greater success in reading comprehension (Biemiller, 2001).

Researchers have found complex yet concrete relationships between native language literacy and linguistic skills and second language proficiency and academic achievement (Clarke, 1980). For example, Mahon (2006) reported that English language proficiency and native language literacy skills (e.g., Spanish) accounted for 73% of the variance in their English reading test performance, specifically 53% of the variance in English reading scores could be accounted by the variance in Spanish scores. In older students, Lee and Schallert (1997) found that native language literacy accounted for 30% of the variance in second language reading skills. Recognizing that fostering native language proficiency is important in developing second language reading proficiency, many researchers have identified bilingual educational programs, where both L1 and L2 are concurrently fostered, as beneficial to ELs' academic achievement (Rolstad et al., 2005; Slavin & Cheung, 2005).

The Influence of Bilingual Proficiency and Bilingual Programs on ELs

Upon passage of Proposition 227 (1998), which mandated EL students receive English-only instruction in schools, many bilingual programs within California were discontinued. However, in 2016 when Proposition 58 came to fruition, which provided parents with a choice in multilingual instruction for their children, dual language immersion programs began to reemerge. Dual immersion, also known as two-way immersion programs, integrates language minority students (e.g., ELs) and language

majority students (e.g., English speakers) to develop their bilingualism and bi-literacy across two languages (Garcia & Kleifgen, 2018). In dual immersion programs, the selected model determines the amount of instructional time spent in the target or non-English language.

There is evidence to support the benefits of participation in a dual immersion program regardless of the model (Turnbull et al., 2001), wherein researchers have noted the many cognitive benefits of bilingualism. Some benefits of bilingualism include improved executive functioning, metacognition, learning capacity, and even a delay in the onset of Alzheimer's disease (Bialystok, 2011). Further, bilingualism has been shown to augment a child's development of metalinguistic awareness, which aids in learning how to read (Bialystok, 2011). Positive outcomes have been observed within longitudinal studies that reviewed student grade point averages (GPA) and enrollment in post-secondary schooling among Latinx students when compared to those in English-only or transitional bilingual programs (Lindholm-Leary & Hernandez, 2010; Thomas & Collier, 1997, 2002).

Initially, students participating in total immersion and dual immersion programs, during grades where students receive little to no formal instruction (i.e., kindergarten and first grade) in the foreign language, end up scoring significantly below grade level on tests of word knowledge and reading comprehension (Genesee, 1978). However, in the same study, after receiving one to two years of foreign language or English instruction, those students began to perform equally or at comparable levels to the native English monolingual speakers (Genesee, 1978). Similarly, Turnbull and colleagues (2001) found that students in two-way French-English immersion programs begin to score at the

"Expected" and "Exceeds Level Expectations" on reading achievement measures by the third and fourth grade, which is when they have reached equal instruction in both languages. It is posited that bilingual students with a balanced competency in both their native/dominant language and foreign/secondary language are the group of bilingual students that will most consistently outperform their monolingual and unbalanced bilingual peers on cognitive and academic measures (Cummins, 1981; Bialystok, 2001).

While the aforementioned research findings suggest positive outcomes of bilingualism and bilingual programs, most of the research compared fully bilingual participants to monolingual participants (Bialystok et al., 2014), meaning limited research exists on students developing bilingualism (i.e., emergent bilingual EL students) through dual-immersion experiences. Although some evidence supports immersion instruction and the metalinguistic advantages associated with bilingualism (Bialystok & Majumder, 1998), more research is necessary, particularly emphasizing academic vocabulary growth in both languages and their impacts on educational outcomes among EL students. The findings of this study may provide initial guidance for parents, especially when participating in a bilingual immersion program is a choice, to make informed decisions regarding their children's education.

STATEMENT OF THE PROBLEM

Despite increased accountability and targeted assessment for intervention practices for EL students' academic success, the achievement gap between monolingual English-speaking and EL students continues to persist across all core academic subjects on national standardized tests (NAEP, 2022). Recently, Johnson (2022) examined EL students' achievement and academic growth and compared those scores to a group of non-EL students from kindergarten to fourth grade, documenting consistently lower test scores in EL students. Johnson explained that when all students are assessed in English, such as on high-stakes state testing, ELs still developing their English proficiency will undoubtedly perform lower than non-ELs or native English speakers.

Despite subtle progress and positive trends in decoding and phonological processing during early elementary age, EL students are pressed with the challenge of understanding more complex texts and tend to struggle with reading comprehension tasks in the upper elementary grade, such as in third grade and beyond (Farnia & Geva, 2013; Lesaux & Kieffer, 2010; Li et al., 2021). These challenges persist throughout the educational achievement of EL students. For example, EL students in third grade identified with reading difficulties were found to be at greater risk for poor academic outcomes throughout the remainder of their academic journey, such as a higher risk of dropping out of high school, particularly when paired with limited resources and poverty (Hernandez, 2011). Thus, it is important to understand the factors that predict reading outcomes in EL students and the differences that may occur across the early and the later

elementary years, often indicated as stages of learning to read and reading to learn, respectively.

Many previous studies have identified early literacy skills as strong predictors of later reading comprehension outcomes. As one of the early literacy skills, vocabulary has been consistently found to be strongly related to reading outcomes. For example, longitudinal studies have documented persistent vocabulary deficits in students who struggle with reading comprehension (Clarke et al., 2010; Elwer et al., 2013). Specifically, students identified as "poor comprehenders" struggle with inferring the meaning of words from context clues (Cain et al., 2004). These findings are consistent across both EL students and monolingual English speakers (Cain & Oakhill, 2011). The risk increases for those students whose native language is not English, given that EL students' vocabulary knowledge is typically much less extensive than that of their native English-speaking peers (Bialystok et al., 2005; Geva et al., 2000).

However, few studies have examined the development of English and Spanish academic vocabularies among EL students in a dual language immersion program and how English and Spanish academic vocabularies predict their reading comprehension in English over time. While some literature exists, it needs to be updated and replicated to correctly reflect the development and learning of EL students in the current bilingual programs. The renewed interest and increase in multilingual public-school programs dictate updated data examining the impact of student vocabulary on reading outcomes in bilingual EL students.

This study aims to examine bilingual vocabulary skills as predictors of later reading comprehension among EL students. Specifically, this study examined L1 (Spanish) and L2 (English) expressive and receptive academic vocabulary as unique contributors to English reading comprehension outcomes among two cohorts of elementary-age students. Students in Cohort 1 were in first grade (lower elementary), and those in Cohort 3 were in third grade (upper elementary) during year one of data collection were followed over three years. These cohorts of students were selected to examine bilingual academic vocabulary in two groups that differed based on the developmental stages of learning (i.e., learning how to read during early elementary age and reading to learn in upper elementary age students). In addition to examining the vocabulary and reading skills across lower and upper elementary students, the unique contributions of Spanish academic vocabulary to reading comprehension will be examined in each cohort to examine if native language proficiency improves the prediction of reading achievement in later grades.

CURRENT STUDY

This study seeks to extend findings from previous research studies documenting the role of vocabulary in the development of reading comprehension (Muter et al., 2004; Oullette & Beers, 2010; Quinn et al., 2015; Vellutino et al., 2007; Verhoeven & Van Leeuwe, 2008). Academic expressive and receptive vocabulary in both English and Spanish were examined for their distinct contributions to English reading comprehension of emergent bilingual EL elementary students receiving formal academic instruction in both languages. The following research questions were developed considering the effect of vocabulary development in both languages on reading achievement while also considering the developmental progression of reading in younger and older elementary students (Chall, 1983). Unlike many previous studies, the current study examines expressive and receptive vocabulary in both the student's native language and their secondary language, recognizing that dual language learning and subsequent vocabulary development is complex and should be comprehensive. Typically, vocabulary as a predictor of reading achievement has been evaluated by a single measure, such as the number of words one understands in a specific language (e.g., receptive vocabulary). However, research has long documented the importance of both components of expressive language to be correlated with reading comprehension (Curtis, 1987). As such, results from this study, focusing on bilingual vocabulary skills can provide updated data to support comprehensive vocabulary development in both a student's L1 and L2 to promote reading achievement in EL students.

Research Question 1a: What are the means and correlations of English/Spanish vocabulary variables (i.e., English expressive, English receptive, Spanish expressive, and Spanish receptive) and English reading comprehension for students in Cohort 1 across different time points?

Hypothesis 1a: It is hypothesized that there will be an increase in vocabulary mean scores in both languages and English reading achievement scores across time points for students in Cohort 1. In regard to correlations, there will be significant relationships between vocabulary in both languages at T1 and English reading achievement at T3.

Research Question 1b: What are the means, correlations of English/Spanish vocabulary (i.e., English expressive, English receptive, Spanish expressive and Spanish receptive) and reading comprehension for third grade students in Cohort 3 across different timepoints?

Hypothesis 1b: It is hypothesized that there will be an increase in vocabulary mean scores in both languages and English reading achievement mean scores across timepoints for students in Cohort 3. In regards to correlations, there will be a significant relationship between vocabulary in both languages at T1 and English reading achievement at T3.

Research Question 2a: Are there group mean differences in vocabulary or reading comprehension for the effect of time in Cohort 1?

Hypothesis 2a: The effect of time will be significant across the three times points. The mean differences will be significant and higher for vocabulary and reading comprehension at later time points.

Research Question 2b: Are there group mean differences in vocabulary or reading comprehension for the effect of time in Cohort 3?

Hypothesis 2a: The effect of time will be significant across the three times points. The mean differences will be significant and higher for vocabulary and reading comprehension at later time points.

Research Question 3a: Do English vocabulary skills from first grade predict English reading comprehension in third grade among Cohort 1students after controlling for gender and age as covariates?

Hypothesis 3a: There will be a significant relationship between English academic vocabulary scores in first grade and English reading comprehension scores in third grade.

Research Question 3b: Do Spanish vocabulary skills from first grade predict English reading comprehension in third grade among Cohort 1 students above and beyond the covariates and English vocabulary?

Hypothesis 3b: Spanish vocabulary scores in first grade will contribute significant unique variance to the model predicting English reading comprehension in third grade above and beyond gender, age, and English vocabulary.

Research Question 4a: Do English Vocabulary skills from third grade predict English reading comprehension in fifth grade among Cohort 3 students after controlling for gender and age as covariates?

Hypothesis 4a: There will be a significant relationship between English vocabulary scores in third grade and English reading comprehension scores in fifth grade.

Research Question 4b: Do Spanish Vocabulary skills predict English reading comprehension in fifth grade among Cohort 3 students after controlling for gender and age as covariates and English Vocabulary?

Hypothesis 4b: Spanish vocabulary scores in third grade will contribute significant unique variance to the model predicting English reading comprehension in fifth grade above and beyond the covariates of gender and age and English vocabulary.

METHOD

Participants and Procedures

This study conducted a secondary data analysis utilizing a subset of longitudinal data from a grant funded by the National Science Foundation entitled Math Problem Solving and Working Memory Growth in English Language Learners (1660828). The data were collected over a three-year period from 2017 to 2020. The purpose of the NSF grant was to accurately identify learning difficulties in math and the underlying processes to develop targeted interventions. Data for the NSF grant were collected from two large dual-immersion elementary schools in the southwestern United States, where English and Spanish were the two languages of instruction. A cohort-sequential design followed emergent bilingual students over three testing waves. Students were enrolled in one of three cohorts during the first year of the study. Of the 437 students tested across the two schools during the first wave, 200 were in first grade (cohort 1), 129 were in second grade (cohort 2), and 116 were in third grade (cohort 3). Students from Cohort 1 and Cohort 3 were selected for analysis in the present study to examine the relationships between vocabulary and reading comprehension among lower (learning to read) and upper (reading to learn) elementary students. Cohort 1 students were in first grade during the first wave of testing and third grade during the third wave. Cohort 3 students were in third grade during the first wave of testing and fifth grade during the third wave.

Measures and Research Procedures

As part of the larger grant-funded study, students were administered a battery of cognitive, working memory, language, and academic achievement measures in English and Spanish by trained bilingual graduate students. Instructions were provided in the same language as the measure. For each testing wave, students participated in two individual testing sessions, each lasting approximately thirty to sixty minutes. The presentation order of all Spanish and English measures was counterbalanced across all participants.

As previously noted, this study only included the English and Spanish vocabulary measures and English reading achievement variables. Additional measures collected as part of the larger NSF study, however not included in the present analysis, include standardized rating scales that measure executive functioning (Conners Teacher Rating Scale [CTRS]), working memory (working memory rating scale [WMRS]), the Raven's progressive matrices, math achievement measures, classroom observations, and experimental measures of working memory that were administered in class-wide format.

Vocabulary

An expressive and receptive vocabulary measures were administered in English and Spanish. *The Expressive One-Word Picture Vocabulary Test-Spanish and Bilingual Edition* (EOWPVT-SBE; Brownell, 2001) is a measure that assesses expressive vocabulary in English and Spanish in students. Children are presented with a testing easel containing a picture of an item and then asked to identify the item verbally. Raw scores are reported as standard scores (mean=100; SD=15).

The Peabody Picture Vocabulary Test-Revised (PPVT-R; Dunn & Dunn, 1981) is a standardized assessment that measures receptive vocabulary in English. An examiner presented a testing easel containing four pictures to a child, points to a target word, and asks the student to select the picture that best matches the target word. Raw scores are converted to standard scores based on the age norms (mean =100; SD=15).

The *Test de Vocabulario en Imágenes Peabody (TVIP; Dunn et al., 1986)* is the standardized assessment developed based on PPVT-R to measure receptive vocabulary in Spanish. The TVIP consists of 125 translated items to measure Spanish speaking bilingual students' receptive vocabulary. Similar to the PPVT-R, an examiner presents a testing easel containing four pictures, points to a target word in Spanish, and then asks the student to select the picture that best matches the word read aloud. Raw scores are reported as standard scores (mean=100; SD=15).

Reading Achievement

The reading achievement subtests consist of decoding and comprehension tasks administered in English and Spanish. *Letter-Word Identification* is a reading decoding task from the Woodcock-Muñoz Language Survey (WMLS-R; Woodcock et al., 2005). Children are presented with a list of increasingly difficult words to decode in English and Spanish. *Passage Comprehension* is a reading comprehension subtest from the WMLS-R. In these tasks, students first read through a passage that contains a missing word; they are then asked to fill in the blank space with an appropriate word based on their comprehension of the text.

Data Analysis

Statistical data analyses included descriptive statistics, correlations, repeated measures ANOVA, and hierarchical linear regressions using the Statistical Package for Social Sciences (SPSS) version 28.0. A preliminary examination of the data included screening the distribution of observations, means, standard deviations, range, skewness, kurtosis, outliers, and missing values of all manifest variables from the first wave of testing, or timepoint1, for each cohort.

First, this study examined correlations amongst the manifest variables to determine the relations between each independent variable and the dependent variable and to check for multicollinearity of variables. Then, repeated measures ANOVA were used to assess the passage of time as an effect on each of the variables. Repeated measure ANOVAs were used determine if there were any significant differences between the group means of each of the vocabulary measures and the group means of English reading comprehension scores across the different timepoints. Five separate repeated measures ANOVAs were tested, one for each of the manifest variables, each with three levels accounting for the three waves of data collection in each of the cohorts.

Last, hierarchical linear regression was conducted to evaluate the unique contributions of vocabulary predictors to reading comprehension above and beyond the covariates of age and gender. Hierarchical linear regression is a sequential process of entering predictor variables into the model wherein the researcher must first consider theory and the proposed hypotheses (Lewis, 2007) before selecting the order of entry for each set of variables. Hierarchical regression is an appropriate analysis procedure when

the variance on a dependent variable is explained by predictor variables correlated with each other (Pedhazur, 1997). The present study revealed that the predictor variables of expressive and receptive vocabulary in both English and Spanish were correlated with one another, which suggested that hierarchical linear regression was an appropriate data analysis tool. Further, hierarchical linear regression provides a useful method of analyzing the effect of a predictor variable after controlling for other variables. In this case, it was of interest to examine the predictors of English vocabulary and Spanish vocabulary separately as a way to identify any unique contributions of the discrete vocabulary skills.

Assumptions of independence, linearity, homoscedasticity, multicollinearity, and normality were tested before analysis for each of the two cohorts and were deemed acceptable overall. The assumption of independence was met for Cohort 1 as assessed by a Durbin-Watson statistic of 2.02. However, the assumption of independence was not met for Cohort 3 as assessed by a Durbin-Watson statistic of 1.32. Autocorrelation may occur in time series, suggesting that the residuals of a regression model are not independent of one another. Correlations, tolerance, and Variance Inflation Factor (VIF) values were examined to identify any potential multicollinearity issues. There were no issues related to collinearity in either Cohort 1 or Cohort 3 based on the tolerance and VIF values. The linear relationship between the predictor and dependent variables was confirmed by examining the scatterplots of studentized residuals and unstandardized predicted values. Similarly, homoscedasticity of residuals was assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. Lastly, in regard to

assumptions, the histogram of the standardized residuals appeared to be normally distributed. The normal Q-Q plot of the studentized residuals also yielded similar results of approximately normal distribution for both cohorts.

The hierarchical regression model was entered in a three-step process. The first step of the model controlled for the covariates of age and gender. The second step of the model controlled the covariate variables and entered the English vocabulary measures. The third step of the model included the covariates, English vocabulary measures, and added Spanish vocabulary. The order of entering the variables in the aforementioned steps were selected based on second language acquisition theory and language of instruction (Cummins, 1979). The measures of English vocabulary were entered to examine if English vocabulary skills in bilingual students contributed unique variance to English reading comprehension skills. Spanish vocabulary was entered second to examine if the addition of Spanish vocabulary in bilingual students contributed unique variance to the prediction of reading comprehension outcomes at T3 above and beyond the variance explained by the covariates and English vocabulary at T1.

RESULTS

This study examined the differences in English and Spanish expressive and receptive vocabulary scores within emergent bilingual EL students in an English-Spanish dual immersion program and the unique contributions of English and Spanish expressive and receptive vocabulary to reading comprehension across time.

Descriptive Analysis

During the first wave of testing, the sample size consisted of 124 students, 63 of whom were first graders in Cohort 1 and 61 were third graders in Cohort 3. However, only observations that were complete across the three points were included in the analyses, therefore the final sample size was smaller for both Cohort 1 (n=44) and Cohort 3 (n=45). Table 1 reports descriptive statistics and correlation coefficients among variables for Cohort 1, while Table 2 reports descriptive statistics and correlation coefficients for Cohort 3.

Cohort 1

For students in Cohort 1, it was hypothesized that there would be an increase in vocabulary mean scores in both languages and reading comprehension scores across time points. It was also hypothesized that there would be significant relationships between vocabulary in both languages at T1 and English reading comprehension at T3. This hypothesis for RQ1a was tested by obtaining means and correlations for the English expressive, English receptive, Spanish expressive, Spanish receptive, and English reading comprehension scores. As shown in Table 1, English expressive vocabulary means scores

increase over time from T1 (*M*=111.78) to T3 (*M*=114.75). Similarly, English receptive mean scores increase over time from T1 (*M*=98.02) to T3 (*M*=99.70). Spanish expressive vocabulary scores also increase over time from T1 (*M*=68.52) to T3 (*M*=73.54). However, neither Spanish receptive nor English reading comprehension scores increased over time.

Noteworthy from Table 1 are the strong correlations of vocabulary within language. For example, there are strong relations between English expressive vocabulary and English receptive vocabulary across T1 (r=.52), T2(r=.74) and T3 (r=.65). Similarly, there are moderate to strong correlations between Spanish expressive vocabulary and Spanish receptive vocabulary across T1 (r=.41), T2 (r=.59) and T3 (r=.50). There were no significant cross-language (i.e., Spanish to English) expressive and receptive vocabulary relationships. Instead, only within language significant relationships were observed. However, the relationship of reading comprehension across time, was strong from T1 to T2 (r=.70) and T2 to T3 (r=.77).

In examining vocabulary and reading comprehension, a small effect was found between T1 English receptive vocabulary and T1 English reading comprehension (r=.31), whereas T1 English receptive vocabulary was found to have a medium effect relationship to English reading comprehension at T3 (r=.45). In regard to T1 English expressive vocabulary, a significant relationship was not found to T1 reading comprehension (r=.27), however a medium to large effect was found between T1 English expressive to both T2 reading comprehension (r=.51) and T3 reading comprehension (r=.45).

In examining the relationships across time, it appears that English expressive language is correlated to later reading comprehension, whereas the relationship between receptive language and reading comprehension is strongest with the concurrent year of reading comprehension scores. Also, for Cohort 1, neither Spanish expressive vocabulary nor Spanish receptive vocabulary yielded significant relationships to English reading comprehension at any of the timepoints. As such, the Spanish vocabulary variables did not yield positive associations to T3 reading comprehension, as predicted by Hypothesis 1a. Interestingly, negative relationships were observed between English and Spanish vocabulary skills across time points (e.g., English expressive at T1 and Spanish receptive vocabulary at T3). For the lower elementary students in Cohort 1, English vocabulary skills had the strongest relationship with later reading skills, while Spanish skills do not appear to have a significant relationship with later performance on reading achievement measures.

Cohort 3

For students in Cohort 3, it was also hypothesized that there would be an increase in vocabulary mean scores in both languages and reading comprehension scores across timepoints. It was predicted that there would also be significant relationships between vocabulary in both languages at T1 and English reading comprehension at T3. This hypothesis was also tested by obtaining means and correlations for all manifest variables. As seen in Table 2, English expressive vocabulary means scores increase over time from T1 (M=108.84) to T3 (M=113.17). Similarly, Spanish expressive mean scores increase over time from T1 (M=73.53) to T3 (M=77.62). Spanish receptive vocabulary scores also

increase over time from T1 (*M*=90.03) to T3 (*M*=98.20). However, neither English receptive vocabulary nor English reading comprehension scores increased over time, as was hypothesized.

In Table 2, a similar pattern of correlations among Cohort 3 and Cohort 1 students are observed. However, the within-language vocabulary relationship of English expressive vocabulary and English receptive vocabulary across T1 (r=.38), T2 (r=.55) and T3 (r=.55) is less in strength. Also, there is a moderate relationship between English expressive vocabulary and English reading comprehension. However, the relationship is inconsistent across time points. For example, the relationship of T1 English expressive vocabulary to later reading comprehension is moderate to weak, although still considered significant at T2 and T3 (r=.46, r=.34). Instead, the same year relationship of English expressive vocabulary and reading comprehension is strongest (r=.52). There is also a weak relationship between English receptive vocabulary at T1 on English reading comprehension at T3 (r=.31). No significant relationships were found between Spanish vocabulary skills and English reading comprehension, which corresponds to the Cohort 1 correlations. This relationship also refutes the hypothesis that vocabulary skills from both languages are significant in English reading outcomes for students in bilingual programs. It is evident that the relationship between English vocabulary and English reading comprehension is stronger during the early elementary years of school in comparison to the upper grade years of elementary.

Repeated Measures ANOVA

To address the research question 2, repeated measures analysis of variance (ANOVA) were conducted to assess the effect of the passage of time on each of the manifest variables. Specifically, the repeated measure ANOVA statistic tested if there were significant differences between the means of the three levels, or timepoints, of each English and Spanish vocabulary variable and English reading comprehension.

Cohort 1

Table 3 provides the group means, standard deviations, and F-value for all manifest variables of students in Cohort 1 across the three time points. Overall, for students in Cohort 1, both English expressive and receptive vocabulary group mean scores increased over time. While only Spanish expressive vocabulary scores increased over time, both Spanish receptive vocabulary and English reading comprehension group mean scores decreased over time.

English expressive vocabulary scores increased from T1 (M=113.15, SD=28.28) to T2 (M=120.05, SD=27.12), however decreased at T3 (M=115.56, SD=21.42). Mauchly's test of sphericity indicated that the assumption of sphericity had been violated, $x^2(2) = 8.29$, p=.016. Since sphericity was violated, Greenhouse-Geisser adjustments were made to correct the one-way repeated measure ANOVA for English expressive vocabulary, F (1.7, 86.5) =2.59, p=.08, which regardless indicated results were not statistically significant. English receptive vocabulary scores increased minimally across the three time points. Group mean scores ranged from 99.25 to 100.00 across the three timepoints. Mauchly's test of sphericity was met $x^2(2) = 1.79$, p=.40. However, results of

the repeated measure ANOVA indicated the effect of time was not statistically significant, F (2,100) = .07, p=.92.

Results for Spanish expressive vocabulary scores revealed statistically significant differences across the three time points, F (2, 100) = 3.76, MSE=88.58, p<.05, η^2=.07, a medium effect size. These findings demonstrate that Spanish expressive vocabulary scores increased from T1 when students were in first grade (M=69.47, SD=20.39) to T2 when students were in second grade (M=70.34, SD=17.91) and then again at T3 when students were in third grade (M=74.26, SD=15.77). The post hoc pairwise comparison using Bonferroni correction indicated that significant mean differences were present only in the pair of mean scores from T2 to T3 (p<.05).

Interestingly, English reading comprehension scores decreased over time. Mauchly's test of sphericity was violated, as such, Greenhouse-Geisser corrections were utilized. The results of the repeated measure ANOVA with adjustments indicated significant findings across the three time points of English reading comprehension, F (1.4, 72.5) = 10.55, MSE = 149.15, η^2=.17, a large effect size. Students performed highest on the measure of English reading comprehension when they were in first grade (M= 102.22, SD=19.95), followed by when they were in second grade (M=100.77, SD=12.41). Finally, the lowest scores were seen when students were in third grade (M=93.40, SD=16.40), albeit all three scores were still considered to be within the "average range" on the nationally normed sample of the WMLS (2005). A post hoc pairwise comparison using the Bonferroni correction showed a significant decrease in reading comprehension between T1 and T3 (p<.05) and between T2 and T3 (p<.001).

Overall, these trends in bilingual vocabulary skills suggest that students in Cohort 1 on average had stronger English vocabulary skills than their Spanish vocabulary skills. Also, although both English and Spanish vocabulary means increased over time, only Spanish expressive vocabulary means increased statistically significantly. Despite three of the four vocabulary scores showed increasing trends over time in Cohort 1 students, their reading comprehension skills did not improve significantly. In fact, the inverse relationship was found, such that student's English reading comprehension scores significantly decreased from first to third grade and also from second to third grade.

Cohort 3

Table 4 presents the group means, standard deviations, and F-value for all manifest variables from Cohort 3 across the three time points. Overall, for students in Cohort 3, English expressive, Spanish expressive, and Spanish receptive vocabulary scores increased over time. However, English receptive vocabulary and English reading comprehension scores decreased over time.

English expressive scores increased from T1 when students were in third grade (M=108.05, SD=16.60) to T2 when students were in fourth grade (M=111.96, SD= 19.75) to T3 when students were in fifth grade (M=112.77, SD=17.70). Mauchly's test of sphericity was met, and repeated measure ANOVA results were interpreted with sphericity assumed. The change in time did not yield statistically significant changes in English expressive vocabulary scores, F (2, 106) =1.85, p=.16. English receptive scores decreased from T1 (M=100.11, SD=14.40) to T2 (M=96.17, SD=11.83) to T3 (M=94.94, SD=11.83). The assumption of sphericity was met, as assessed by Mauchly's test of

sphericity. The change in time yielded statistically significant changes in English receptive vocabulary over time, $F(2, 108) = 5.68$, $p<.01$, $\eta^2=.09$, a medium effect.

Spanish expressive vocabulary scores increased from T1 (M=73.83, SD=17.70) to T3 (M=77.62, SD=13.32). However, there was a decrease from T1 to T2 (M=72.65, SD=17.70). Assumption of sphericity was met. The change in time elicited statistically significant changes in Spanish expressive vocabulary scores, F (2, 108) = 4.21, MSE=88.30, $p<.05$, $\eta^2=.07$, a medium effect. The post hoc pairwise comparison using Bonferroni correction revealed a significant difference between T2 and T3 ($p<.05$). Statistically significant results were also evident in the mean differences of Spanish receptive vocabulary scores across the three time points, F (2,96) =7.58, MSE=224.28, $p<.001$, $\eta^2=.14$, with a large effect size. When examining the pairwise comparisons, the changes in means were significant from time 1 to time 3 and from time 2 to time 3, indicating significant gains in Spanish receptive vocabulary in EL students from third to fifth grade.

In regard to reading comprehension in Cohort 3, there were insignificant changes from third (M= 91.33, SD=14.95) to fifth grade (M=91.17, SD=15.36). Similar to Cohort 1, English reading comprehension scores remained within the "average range" across the three years of assessment, in relation to the normative sample (WMLS, 2005). The change over time was not statistically significant, F (2,96) =1.51, p=.22.

Overall, these vocabulary trends in Cohort 3 indicated that English vocabulary skills were higher than Spanish vocabulary skills for upper grade elementary students. Similar to the lower grade elementary students (Cohort 1), there was an improvement in

three out of the four bilingual vocabulary skills examined. English expressive, Spanish expressive, and Spanish receptive vocabulary skills increased, whereas there was a decline in English receptive vocabulary. Both groups of students, Cohorts 1 and 3, demonstrated positive growth trajectories in their bilingual vocabulary development. However, despite these gains in vocabulary skills, neither group exhibited significant growth in their English reading comprehension over time.

Hierarchical Linear Regressions on Reading Comprehension

Finally, to address research questions 3 and 4, a series of hierarchical linear regressions examined the contributions of English and Spanish academic expressive and receptive vocabulary skills at T1 to English reading comprehension at T3. The first step of the hierarchical regression model included gender and age as covariates. Previous studies and research have noted gender differences in reading comprehension, such that females typically perform better than males (Logan & Johnston, 2009). Similarly, the covariate of age was controlled also due to the documented developmental effects on reading comprehension (Kolic-Vehovec et al., 2010). The second step of the model included covariates and English expressive and receptive academic vocabulary at T1. The third step of the model included covariates, English expressive and receptive academic vocabulary at T1, and Spanish expressive and receptive academic vocabulary at T1. Analyses included two separate hierarchical linear regression models to examine the unique contributions of bilingual academic vocabulary at T1 to reading achievement at T3 among two cohorts. See Tables 5 and 6 for hierarchical regression results for Cohorts 1 and 3, respectively.

Predicting Reading Comprehension in Cohort 1

In the first step of hierarchical regression for Cohort 1, model 1 included gender (male = 0, female = 1) and age as covariates and was not statistically significant. The second model, which included covariates and English expressive and receptive vocabulary skills at T1, showed significant improvement from the first model, $F(2,47) = 4.11$, $p < .05$, $R^2=.29$. After the addition of T1 (first grade) English expressive and receptive academic vocabulary at Step 2, the model explained 29.7% of the variance in English reading comprehension performance at T3 (third grade) after controlling for covariates. However, results indicated no significant predictors of T3 reading comprehension. In the third model, Spanish expressive and receptive academic vocabulary at T1 were entered into the regression equation. Spanish expressive and receptive academic vocabulary at T1 explained additional 4% of the variance in reading comprehension at T3, $F(5, 45) = 3.14$, $p < .05$, demonstrating a statistically significant increase in variance compared to the step two model. In the final model, $F(6,37)=3.14$, $p<.05$, English expressive vocabulary at T1 (ß =.36) was the only significant predictor ($p<.05$) of T3 reading comprehension. However, adding Spanish academic vocabulary did not yield statistically significant increase in R^2 in Model 3.

Predicting Reading Comprehension in Cohort 3

A second series of regressions investigated bilingual vocabulary variables to predict reading comprehension for Cohort 3 students. In the first step of the model, gender (0=male, 1= female) and age were entered as covariates, which was not significant. In the second step of the model added English expressive and receptive

academic vocabulary skills at T1 into the equation. However, neither was significantly associated with reading comprehension at T3 (ß=.22, *p*=.18, and ß=.16, *p*=.32, respectively). Spanish expressive and receptive academic vocabulary at T1 were entered into the model in the third step, which also was not statistically significant. As such, neither English vocabulary nor Spanish vocabulary variables was significant factors when entered to the fixed order hierarchical regression model to predict reading comprehension in Cohort 3. The full model of gender, age, English vocabulary, and Spanish vocabulary to predict English reading comprehension at T3 was not statistically significant, F (5, 43) = 1.25, p= .301. Despite an increase in R^2 in step 2 and step 3 of the model, those changes were not statistically significant.

DISCUSSION

The present study examined cross-sectional and longitudinal relationships between English academic vocabulary, Spanish academic vocabulary, and English reading comprehension among lower and upper grade elementary school students. Findings from the descriptive statistics revealed general improvements in English expressive and Spanish expressive vocabulary over time in both Cohorts. As time passed, students improved in their bilingual expressive vocabulary skills, but showed declined performance on reading comprehension.

English and Spanish Vocabulary and Reading Comprehension Development

Research has demonstrated the strong relationship of vocabulary skills on reading comprehension (e.g., Biemiller, 2001). Literature also supports the developmental effects on reading comprehension (Kolic-Vehovec et al., 2010). This study sought to understand those developmental relationships of vocabulary and reading comprehension in English/Spanish EL students participating in a dual immersion program. The results of this study indicate that the changes in English expressive and receptive academic vocabulary over time for Cohort 1 were insignificant. Students generally showed improved English vocabulary scores, however without statistical significance. Contrarily, the changes in Spanish expressive vocabulary were statistically significant, indicating students that were initially in first grade in a bilingual program made positive growth in Spanish expressive vocabulary skills over time. The changes in English and Spanish vocabulary for students in Cohort 3 were similar to the changes shown in students in Cohort 1. While students continued to show improvements in both English and Spanish

expressive and Spanish receptive skills, the results were only significant for Spanish vocabulary skills. These findings indicate during early and upper elementary school, EL students participating in a bilingual program continue to make significant progress in their native language academic vocabulary.

Reading comprehension scores declined over time in both cohorts. Although EL reading underachievement has long been documented (NAEP, 2020; Echevarria, 2012), it was unexpected to find the decrease in reading achievement over time, particularly because this study hypothesized the effects of being in a bilingual program that provides core content academic instruction in both L1 and L2 academic language would yield positive outcomes. As such, the findings of this study did not demonstrate the benefits of both L1 and L2 academic vocabulary on ELs' achievement, as documented by other researchers (Proctor et al., 2006; Rolstad et al., 2005; Slavin & Cheung, 2005). These findings indicate that the development of English reading comprehension scores in EL students may not adhere to the developmental effect of reading comprehension across time. One possibility for the decline in reading scores over time may be the increasing complexity of text and academic vocabulary required to understand the higher-level texts. If this is the case, then a focus on targeted instruction on higher-level academic vocabulary is warranted to address the disparity in knowledge-specific vocabulary for comprehension.

For educators, these findings may suggest that growth in bilingual academic vocabulary may be slower than anticipated or desired for academic achievement of EL students during early and upper elementary. As Cummins (1979) noted the development

and acquisition of cognitive academic vocabulary for EL students may take 7 years or more. It is unknown if the limited growth in English and Spanish vocabulary contributes to reading comprehension outcomes such as was the case in the present study. However, the lack of growth in English reading comprehension is concerning, such that targeted intervention and supports are pertinent given that students showed decreased performance. While some studies have documented positive outcomes of EL students participating in bilingual programs, other studies have noted that EL students begin to fall behind in reading based off the normative sample at approximately third grade (Nakamoto et al., 2007) and can present with reading deficits as early as second grade (Verhoeven, 1990). Although the results of this study document reading comprehension scores to be consistently within the average range of the WMLS (2005) normative sample, the negative trajectory was not consistent with some previous findings of positive growth of literacy skills in bilingual programs (Garcia & Kleifgen, 2018). In order to prevent regression of skills, additional measures should be utilized to the capture the subtle growth in vocabulary and academic progress over time as well as response to interventions. Furthermore, tracking the progress of EL student's vocabulary scores and reading scores longitudinally over longer periods of time, than the three-year timespan of the current study, also seems warranted.

Predicting Reading Comprehension

To test the prediction of reading comprehension in lower elementary bilingual students (Cohort 1), a hierarchical multiple regression was conducted with three blocks of variables. The first block included age and gender, the second block added English

vocabulary as predictors, and the third block added Spanish vocabulary predictors. Overall, the results showed that first model was insignificant, but the second and third models were significant. Including English expressive and receptive vocabulary showed significant improvement from the first model. Overall, when adding in English vocabulary, the variables explained 25.8% of variance, with the final model accounting for a total of 33.7% of the variance. Previous studies have found inconsistent results in relation to a cross-linguistic model that suggests both L1 and L2 contribute to L2 reading comprehension. Lesaux and colleagues (2012) found that the association between Spanish oral vocabulary and English reading comprehension was weak, whereas Proctor and colleagues (2006) found the relationship to be significant. These findings indicate that for lower elementary age students, only English vocabulary contributed to the prediction of English reading comprehension. A cross-language association was not found between L1 vocabulary and L2 reading comprehension.

In the hierarchical regression model for Cohort 3, the same three steps or blocks were followed. However, in the upper elementary students, the addition of gender, age, English vocabulary, and Spanish vocabulary did not yield statistically significant results. Given the insignificant findings, there likely needs to be more research understanding the unique needs of older bilingual students for improving their reading comprehension. As seen in previous research, long-term EL students struggle to gain English proficiency, particularly more so as time passes (Farnia & Geva, 2013; Leseaux & Kieffer, 2010; Li et al., 2021). While the upper grade students in this study (Cohort 3) were not much older than the lower elementary grade group of students, upper grade elementary students

might begin to be impacted by the gap in linguistic knowledge as seen in LTEL students (Cook et al., 2007). While the results were insignificant for Cohort 3 in predicting later reading comprehension, there might be some association with the limited growth or change in vocabulary scores over time. EL students were at risk for struggling to acquire academic specific vocabulary (Baily, 2007; Cummins, 1979; Townsend & Chiappe, 2009) as was seen in the results of the present study.

English expressive language at T1 was found to be a significant predictor of T3 reading comprehension in Cohort 1 (lower elementary) but not in Cohort 3 (upper grade students). One possible explanation could be that the reading comprehension passages for first grade students were less complex and required less vocabulary for comprehension. This would suggest that vocabulary skills may be more impactful during early elementary years. However, as texts become increasingly more complex throughout grades, such as in the case of the upper elementary students (Cohort 3), additional factors may contribute to the prediction of reading comprehension. Previous studies have found expressive vocabulary to be most influential in word identification (Wise et al., 2007) or decoding, again suggesting that expressive vocabulary is more important during the years a student is learning to read or decode, such as was the case in the present study. Again, suggesting that other factors may be stronger predictors to reading comprehension skills in older students. For example, some studies have found that the best predictor of L2 reading comprehension in EL students in high school are their L1 reading comprehension scores from elementary school (Sparks et al., 2008). L1 reading comprehension scores were not examined in the present study and likely could serve as a better predictor of English

reading comprehension skills in older students. However, future studies may also include early reading comprehension scores to further understand the differences in reading development of lower and upper elementary students.

English vocabulary alone was a significant factor in predicting reading comprehension students that were in the primary grades of elementary (first grade predicting third grade performance), whereas Spanish vocabulary did not contribute to the model in younger students. Neither of these sets of variables contributed significant variance in the upper grade elementary student's (third grade predicting fifth grade) reading comprehension, which refutes the hypotheses that bilingual vocabulary would contribute to reading achievement positively in both groups of students. While much of the research suggests that cross-language vocabulary development supports academic achievement in L2, there is some literature that notes a weak association between L1 vocabulary and L2 reading achievement (Lesaux et al., 2012).

Despite a natural growth and progression in vocabulary development in both languages for the emergent bilingual EL student participants in the present study, those vocabulary gains did not contribute significant unique variance to the prediction model. Perhaps, additional focus and targeted instruction on "high level words" (Chall & Dale, 1999) is necessary to address the limited vocabulary growth in both L1 and L2. That is to say that participation in a bilingual program may not be sufficient to meet the specific need of teaching academic vocabulary to EL students. Effective interventions targeting both breadth and depth of academic vocabulary are necessary to improve reading

comprehension in EL students, particularly for older students when the language and academic demands of school become more complex.

Lastly, of importance is to note that in each group of Cohorts, students likely had not reached Cognitive Academic Language Proficiency (CALP) levels at during T1 of the study (which was the timepoint used to predict reading achievement). The longitudinal timespan of the present is three years, however as has been previously discussed three years of L2 academic instruction does not provide enough time for students to acquire CALP (Collier & Thomas, 1989; Cummins, 1979). To better understand the predictive relationship between early vocabulary and later reading achievement, researchers should examine the relationship across a longer timespan similarly to the way Sparks and colleagues (2008) did documenting the changes from elementary school to high school.

LIMITATIONS

The present study acknowledges the importance of English expressive vocabulary in later reading comprehension performance but does not examine the relationship of bilingual vocabulary depth and breadth to other critical reading skills, such as phonemic awareness and decoding tasks. Recognizing that the widely researched simple view of reading (SVR; Gough & Tumner, 1986) and developmental nature of reading also consider decoding skills in addition to listening comprehension/oral vocabulary, it would be important to also consider bilingual vocabulary skillset and oral language skills within the theoretical framework of the simple view of reading. Although decoding skills are embedded into the task of reading for comprehension, the SVR separates decoding skills and language comprehension (i.e., vocabulary) in order to measure or predict reading

comprehension skills. Future studies should examine bilingual vocabulary development and bilingual decoding skills within the framework of the SVR in order to develop and foster strong reading comprehension for students in bilingual programs. Researchers note that more data beyond a reading comprehension score is necessary in order to provide effective intervention. Specifically examining decoding skills and vocabulary in isolation can help identify areas of need in to target reading instruction and intervention.

Considering the complexity of learning how to read and the perpetual achievement disparity between EL and non-EL students, it stands to reason that reading comprehension at the third or fifth-grade level likely is not as simple as deciphering the differences in English and Spanish vocabulary skillset. Instead, more background information, in regards to socio-economic status (SES) and home language environment, as measures of prior exposure to vocabulary depth and breadth (Hart & Risley, 1995) and phonemic awareness or decoding skills, is necessary to better understand the complex nature of reading comprehension development in emergent bilingual students. Information regarding, SES levels was not available for inclusion in the present analysis as a covariate. The addition of an SES variable is important when examining vocabulary differences among group knowing that there is a dearth of research documenting the importance of language exposure such that children from higher SES families are exposed to higher quality language and which impacts their development of vocabulary (Hart & Risley, 1979; Schwab & Lew-Williams, 2016).

Another limitation of this study is the lack of a control group for comparison. Regardless of the cohort, all students in this study were in a bilingual program, receiving

academic instruction in both their native language, Spanish and secondary language, English. To understand the impact of a bilingual program on EL students' vocabulary and reading comprehension skills, it would have been useful to have a control group of ELs not receiving formal academic instruction in both languages (i.e., those not in a bilingual program). It has long been established that early childhood experiences and exposure to language contribute to a student's lexicon or depth and breadth of vocabulary, and those students with more extensive lexicons tend to fair better in later life outcomes both academically and vocationally. Given that this study used a secondary data set that only included bilingual program students, a control group was not available to tease out the variation in early childhood language experiences.

CONCLUDING COMMENTS

In summary, the current study presented current data regarding bilingual vocabulary skill growth in two groups of elementary students. The results of the study provide data documenting the strength of relationships in early language skills in L1 and L2 over time. Despite Spanish being the student's native language, their vocabulary skill growth and trajectories in Spanish were inconsistent. Whereas, the vocabulary skillset and growth were more consistent in English. Bilingual students are a heterogeneous and complex group of students and although vocabulary plays a significant role in learning to read, it appears the relationship between vocabulary and reading comprehension in EL students is more complex particularly when considering the developmental changes of reading skills from lower elementary to upper elementary.

The present study examined the changes in English and Spanish vocabulary and English reading comprehension over time across three years and found that EL students just like native English speakers present with high intercorrelations within-language across expressive and receptive language longitudinally. Additionally, T1 reading comprehension scores are strongly correlated with later reading comprehension scores (i.e., T2 and T3). However, only the variables of English expressive variable in the younger group of students predicted reading comprehension. Vocabulary scores in either language did not predict reading comprehension in upper elementary students. Given the inconsistent results across lower and upper grade elementary students, further attention is warranted when examining the unique roles of expressive and receptive vocabulary in fostering reading comprehension skills among ELs.

While students in both cohorts of the study scored poorer on measures of Spanish expressive vocabulary, despite receiving formal academic instruction in Spanish, they still obtained average scores on English expressive, English receptive vocabulary and Spanish receptive skills. However, reading comprehension scores decreased over time. These findings suggest that the benefits of participation in a dual immersion or bilingual program may not immediately come to fruition. The benefits of bilingualism and dual language learning may take more than three years, as Cummins (1979) suggested, with CALP taking around 7 years to develop. As such, one possible implication is that assessment of EL students' academic oral vocabulary in either L1 or L2 over three years may not be sufficient to understand their development and impacts on reading comprehension. Instead, educators may consider using multiple measures of progress

monitoring data (e.g., curriculum-based measures) that focus on the student's current language and reading skillset in order to assess and target vocabulary and reading skills in a meaningful way within shorter timespans.

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Table 1

Descriptive Statistics and Correlations Cohort 1

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.E EV T1	1.00														
2.E EV T2	0.61**	1.00													
3.E EV T3	0.57**	0.77**	1.00												
4.E RV T1	0.53**	0.52**	0.53**	1.00											
5.E RV T2	0.64**	0.74**	0.60**	0.61**	1.00										
6.E RV T3	0.50**	0.73**	0.65**	0.58**	0.73**	1.00									
7.S EV T1	-0.20	-0.23	-0.22	-0.22	-0.09	-0.12	1.00								
8.S EV T2	-0.25	-0.24	-0.12	-0.26	-0.20	-0.20	0.71**	1.00							

Table 1 (continued)

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
9.S EV T3	-0.29*	-0.28	-0.25	-0.28*	-0.23	-0.21	0.72*	0.79**	1.00						
10.S RV T1	-0.03	0.05	0.08	0.29*	0.13	0.18	0.42**	0.53**	0.43**	1.00					
11.S RV T2	-0.31	-0.08	-0.14	-0.16	-0.05	-0.01	0.53**	0.60**	0.63**	0.48**	1.00				
12.S RV T3	-0.20	-0.00	-0.05	-0.14	0.04	0.06	0.52**	0.50**	0.54**	0.54**	0.58**	1.00			
13.E RC T1	0.27	0.48**	0.33*	0.31*	0.41**	0.42**	0.04	-0.11	0.06	0.18	0.10	0.25	1.00		
14.E RC T2	0.51**	0.58**	0.46**	0.48**	0.57*	0.65**	0.01	0.03	0.06	0.24	0.13	0.21	0.70**	1.00	
15.E RC T3	0.45**	0.62**	0.47**	0.45**	0.58**	0.67**	0.03	-0.07	0.18	0.09	0.10	0.20	0.50**	0.78**	1.00
M	111.78	118.69	114.75	98.02	98.31	99.70	68.52	70.22	73.54	88.73	90.51	87.54	99.79	99.15	93.00
SD	27.71	25.83	21.45	15.83	18.46	19.18	19.71	17.251	15.90	16.12	16.58	15.70	20.57	13.78	16.17
Min	55	55	74	67	67	59	59	55	55	55	55	59	59	55	55
Max	174	173	172	132	132	140	136	109	113	143	136	135	137	126	126

Note: E=English; S=Spanish; EV=Expressive Vocabulary; RV=Receptive Vocabulary; RC= Reading Comprehension; T1=time1; T2=time2; T3=time 3. *p<.05., **p<.01.

Table 2

Descriptive Statistics and Correlations Cohort 3

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.E EV T1	1.00														
2.E EV T2	0.45**	1.00													
3.E EV T3	0.29*	0.56**	1.00												
4.E RV T1	0.38**	0.38**	0.27**	1.00											
5.E RV T2	0.45**	0.56**	0.53**	0.66**	1.00										
6.E RV T3	0.43**	0.64**	0.56**	0.53**	0.68**	1.00									
7.S EV T1	-0.04	-0.17	-0.15	-0.02	-0.06	-0.14	1.00								
8.S EV T2	-0.16	-0.11	0.05	-0.04	-0.06	-0.07	0.71**	1.00							

Table 2 (continued)

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
9.S EV T3	-0.17	-0.19	-0.04	-0.15	-0.15	-0.07	0.69**	0.66**	1.00						
10.S RV T1	0.11	0.02	-0.03	-0.12	0.08	0.01	0.43**	0.21	0.27**	1.00					
11.S RV T2	-0.11	0.28*	0.15	0.17	0.34**	0.21	0.42**	0.42**	0.30**	0.31**	1.00				
12.S RV T3	-0.09	0.06	-0.04	0.17	0.17	0.08	0.40**	0.32**	0.28	0.37**	0.55**	1.00			
13.E RC T1	0.52**	0.50**	0.51*	0.32*	0.30*	0.37**	-0.09	-0.08	-0.25	0.04	0.10	0.06	1.00		
14. E RC T2	0.46**	0.45**	0.37**	0.26**	0.24	0.46**	0.14	-0.06	-0.12	0.24	0.15	0.34*	0.65**	1.00	
15.E RC T3	0.34**	0.39**	0.26	0.31**	0.21	0.36**	0.06	-0.20	-0.15	-0.04	0.25	0.31*	0.64**	0.70**	1.00
M	108.84	112.44	113.17	100.40	96.50	94.94	73.53	72.65	77.62	90.03	89.80	98.20	92.41	93.78	92.24
SD	16.76	20.00	17.77	14.70	14.31	11.83	18.04	17.70	13.32	18.28	22.43	19.40	15.33	15.04	15.15
Min	72	71	73	55	58	70	55	55	55	57	55	65	55	55	55
Max	156	153	142	134	128	118	119	119	119	126	143	146	119	118	118

Note: E=English; S=Spanish; EV=Expressive Vocabulary; RV=Receptive Vocabulary; RC= Reading Comprehension; T1=time1; T2=time2; T3=time 3. *p<.05., **p<.01.

Table 3

Means, Standard Deviations and Repeated Measures ANOVA for Cohort 1

Variable	Time 1		Time 2		Time 3		ANOVA		
	M	SD	M	SD	M	SD	*F*	*df*	η^2
Eng EV	113.15	28.28	120.05	27.12	115.56	21.42	2.59	1.7,86.5	.04
Eng RV	99.96	16.00	99.25	18.81	100.00	19.25	.07	2,100	.00
Spa EV	69.47	20.39	70.34	17.91	74.26	15.77	3.76*	2,100	.07
Spa RV	91.40	15.83	90.96	18.01	87.58	16.09	1.60	2,94	.03
Eng RC	102.22	19.95	100.77	12.41	93.40	16.08	10.55***	1.4,72.5	.17

Note: ANOVA= analysis of variance; EV=Expressive Vocabulary; RV= Receptive Vocabulary; RC= Reading Comprehension.

*p<.05., **p<.01., ***p<.001.

Table 4

Means, Standard Deviations and Repeated Measures ANOVA for Cohort 3

Variable	Time 1		Time 2		Time 3		ANOVA		
	M	SD	M	SD	M	SD	*F*	*df*	η^2
Eng EV	108.05	16.60	111.96	19.75	112.77	17.70	1.85	2,106	.03
Eng RV	100.11	14.40	96.17	14.46	94.94	11.83	5.68**	2,108	.09
Spa EV	73.83	17.70	72.65	13.32	77.62	13.32	4.21*	2,108	.07
Span RV	87.21	17.62	91.19	21.96	98.80	19.12	7.58***	2,96	.14
Eng RC	91.33	14.95	93.87	15.95	91.17	15.36	1.51	2,96	.03

Note: ANOVA= analysis of variance; EV= Expressive Vocabulary. RV= Receptive Vocabulary. RC= Reading Comprehension.

*p<.05. **p<.01. ***p<.001.

Table 5

Hierarchical Linear Regression Predicting Reading Comprehension at T3 for Cohort 1

Variables	Model 1		Model 2		Model 3	
	ß	**Sig.**	**ß**	**Sig.**	**ß**	**Sig.**
Step 1						
Gender	.07	.642	.02	.837	.08	.551
Age	.18	.241	.00	.985	-.08	.585
Step 2						
English Expressive			.28	.088	.36	.043
English Receptive			.32	.074	.30	.114
Step 3						
Spanish Expressive					.17	.332
Spanish Receptive					.09	.560
R^2	.039		.297		.337	
$\triangle R^2$	.039		.258		.041	
F	.829		4.11*		3.14*	
$\triangle F$	.829		7.14*		1.13	

Note. ß = *standardized coefficient; T3 for Cohort 1 is third grade; N=44*.
**p<.05*

Table 6

Hierarchical Linear Regression Predicting Reading Comprehension at T3 for Cohort 3

Variables	Model 1		Model 2		Model 3	
	ß	**Sig.**	**ß**	**Sig.**	**ß**	**Sig.**
Step 1						
Gender	.14	.362	.07	.652	.06	.683
Age	.22	.160	.20	.173	.21	.199
Step 2						
English Expressive			.22	.182	.21	.210
English Receptive			.16	.320	.16	.341
Step 3						
Spanish Expressive					.12	.506
Spanish Receptive					-.02	.909
R^2	.058		.154		.165	
$\triangle R^2$	.058		.096		.012	
F	1.29		1.81		1.25	
$\triangle F$	1.29		2.25		.264	

Note. ß = *standardized coefficient; T3 for Cohort 3 is fifth grade; N=45*.
**p<.05*.