

Development of vocabulary knowledge and its relationship with reading comprehension among  
emergent bilingual children: An overview

C. Patrick Proctor

Rebecca Louick

Boston College

## Abstract

Vocabulary knowledge and development are crucial components of language and literacy, and have been studied and summarized in depth for monolingual populations. In the 21<sup>st</sup> century, researchers have considered the developmental nature and predictive role of vocabulary among children who speak languages at home that differ from those spoken at school (i.e., who are bilingual). In this chapter the authors present a thematic review of the literature with a focus on the development of vocabulary and its associations with reading comprehension among bilingual children from ages 4 through age 18. In the first section, we target the literature on vocabulary development. In the second section, we focus on the developmental nature of the associations between vocabulary development and reading comprehension. Intralinguistically, findings for vocabulary suggest that lower initial levels of vocabulary knowledge are associated with stronger growth trajectories, however, studies that compared bilinguals with monolinguals showed that these increased trajectories rarely eliminated language gaps. Among intralinguistic studies of vocabulary and reading, vocabulary was strongly associated with comprehension when comprehension was measured as a time-invariant outcome, but associations between vocabulary knowledge and reading growth were tenuous and variable. Cross-linguistically, associations were typically weak and suggest that vocabulary knowledge is not a domain of language that is robust to transfer.

## 1. Introduction

There is no question that vocabulary knowledge is a fundamental component of reading comprehension and its development. Studies dating back to the early 20<sup>th</sup> century demonstrate the correlational link between vocabulary and reading comprehension (Whipple 1925; Pearson, Hiebert, & Kamil 2007), and any 21<sup>st</sup> century researcher who seeks to articulate a model of reading comprehension must take into account processes of vocabulary knowledge as an essential predictor of reading performance. Indeed, Laufer (1997) makes the rather universal claim that “[n]o text comprehension is possible, either in one’s native language, or in a foreign language, without understanding the text’s vocabulary” (20).

However, the vast majority of what we know about vocabulary knowledge, its development, and its relationship with reading comprehension, derives from literature that has targeted predominantly monolingual populations, or from second language acquisition research among older learners of foreign languages (see, e.g., Coady & Huckin 1997; Meara 2009). As a field, far less is known about bilingual children<sup>1</sup>. While there is an emerging consensus on effective approaches for teaching vocabulary to bilingual learners (notably in English; see Baker et al. 2014; Graves, August, and Mancilla-Martinez 2013), it has only been in these recent years of the 21<sup>st</sup> century that researchers have begun to ask questions about the nature of vocabulary development and its relationship with reading comprehension among bilingual children.

While there do indeed exist robust models of bilingual education, notably in Europe, researchers of bilingual children tend to invoke a *grand narrative* (see Bloome, Carter, Christian, and Madrid 2008) that articulates the need for children to become proficient readers and writers

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<sup>1</sup> In this review, we use the term *bilingual* to capture a population of learners who speak a language at home that is typically not the language of schooling instruction. Other terms used in the research include *limited English proficient*, *English as an additional language*, *emergent bilingual*, *English learner*, *English language learner*, and *language minority*.

of the dominant social language (e.g., English, Dutch, Norwegian, German, per studies located for this literature review) in order to be successful actors in society. Be that as it may, researchers have a wider range of questions that might be asked with respect to vocabulary development and its relationship to reading comprehension when it comes to working with bilingual children. Notably, bilinguals, unlike their monolingual counterparts, speak a language that is typically different from that of the language of literacy instruction that occurs in schools. Thus, as a research community, we can ask a broader range of questions about vocabulary development and reading comprehension. Specifically, working with bilinguals expands the possibilities for research as follows:

- 1) Studies that focus on students from various home language backgrounds;
- 2) Studies that examine the development of vocabulary and/or reading solely in the language of schooling (L2 only);
- 3) Studies that include the development of vocabulary and/or reading in the home language for cross-linguistic analysis (L1-L2);
- 4) Studies that examine the development of bilinguals' reading and/or vocabulary in the language of schooling compared with a monolingual sample (Comparison).

Multiple language backgrounds, points of comparison with monolinguals, and the inclusion of the home language distinguish studies with bilingual children from those with exclusively monolingual populations.

Given these added complexities, we set out to review the literature on vocabulary and its relationship with reading comprehension among bilingual learners from the earliest exposures to schooling (around 4 years of age) through the end of secondary education (around 18 years of age). This review begins with a brief theoretical orientation to vocabulary knowledge, its

development, and its relationship with reading comprehension. We then describe a literature review process that include two components: Peer-reviewed studies of vocabulary development among bilingual learners and peer-reviewed studies that examine the developmental role of vocabulary in predicting reading comprehension.

## **2. Theoretical Orientations to Vocabulary and Reading Comprehension**

Vocabulary knowledge is complex, and its relationship with reading comprehension, while consistently strong among monolingual populations (see Pearson et al. 2007), is not so clearly understood. This is largely due to the fact that correlations reveal little about the processes through which vocabulary and reading comprehension affect one another.

### **2.1 Vocabulary Knowledge is a Large Problem Space**

Knowing a word's meaning is not as simple as it may seem, and putting it into context within a reading paradigm helps to articulate why. We know that learning to take graphic information and convert it to linguistic form (i.e., to *decode*) is a necessary, but insufficient dimension of the reading process. Depending on the orthography of a given language, the nature of decoding varies, but what characterizes decoding, particularly in alphabetic orthographies, is a finite set of sound-symbol relationships that are relatively easy to learn over shorter spans of developmental time (Paris 2005). As such, Snow and Kim (2007) suggest that decoding skills reside within a small *problem space*, one which, from an instructional perspective, is relatively easy to address. Indeed evidence from many reading studies with bilingual children has converged on the conclusion that, barring atypical development, bilinguals tend to perform on par with their monolingual counterparts with respect to decoding (Mancilla-Martinez and Lesaux 2010; Nakamoto, Lindsey, and Manis 2007; Roberts, Mohammed, and Vaughn 2010; Droop and Verhoeven 2003; Verhoeven 2000).

There is, however, an inverse relationship between how constrained a literacy skill is, and the relative size of the problem space. Decoding is constrained and thus a relatively small problem space. Vocabulary, by contrast, is far less constrained, in part because it takes both expressive (through speaking and writing) and receptive (through listening and reading) forms. Further, while there is arguably a finite number of words for any given language, the range of any lexicon is vast, as evidenced by early vocabulary research documenting the English word learning demands that students encounter when they begin school (approximately 3,000 new words per year; Nagy and Anderson 1984). Thus, while decoding plays a fundamental role in predicting reading comprehension (i.e., in its absence, comprehension is impossible; Hoover and Gough 1990), vocabulary knowledge is far less constrained and a much larger problem space.

Simply knowing a lot of vocabulary words (i.e., breadth), however, is insufficient for facile text comprehension. How well one knows different words (i.e., depth) is also crucial, and perhaps the most comprehensive framework for understanding depth of vocabulary knowledge was articulated by Nagy and Scott (2000). In their conception, five distinct dimensions characterize vocabulary knowledge. First, the dimension of *incrementality* indicates that word meanings are not learned upon a single initial exposure, but rather that word knowledge becomes more in-depth as a function of each use or encounter with a given word, across various contexts. The second dimension, *polysemy*, recognizes that words “are inherently flexible” (Nagy and Scott 2000: 271) and thus have multiple meanings that vary across context and use. Third, *multidimensionality* represents the reality that word meanings vary depending on the nature of their contexts of use. For example, an eight-year-old girl might know how to identify sarcasm when she hears it from her brother, but when she goes to tell her mother about it, she notes that her brother had just “been sarcasm”. The fourth dimension is *interrelatedness* and refers to

conceptual networks that exist among various words (e.g., relatedness between *cat*, *meow*, *feline*, and *claws*). Finally, *heterogeneity* suggests that words have varying functions for different contexts, which has led some researchers to focus, for example, on the role of academic vocabulary as types of words most suitable for instruction in a schooling context (see, e.g., Kieffer and Stahl in press; Nagy and Townsend 2012).

## 2.2 Assessing Vocabulary

From a theoretical perspective, we conceptualize vocabulary knowledge as deep, encompassing at least five dimensions of complexity beyond simply knowing a single meaning for a word. Yet, in operationalizing vocabulary, literacy researchers often rely on discrete and decontextualized tasks that treat vocabulary as a construct separate from its role in reading comprehension (e.g., verbal analogies, synonymns/antonyms, picture naming or identification). While vocabulary skills are more often assessed receptively (Pearson et al. 2007), they are also assessed expressively, yet in either case, it is common that the items chosen for assessment are selective (as opposed to comprehensive), that is, a set of words chosen without explanation by the test designer. Items are selected likely under some presumption of Nagy and Scott's (2000) *interrelatedness* dimension of vocabulary knowledge. For example, if a student can say "ball" upon seeing a picture of a ball, then an assumption is made that the student is also likely to know other semantically related words that occur with a similar frequency (perhaps *bounce* or *roll*; see Read 2000 for a comprehensive overview of the *discrete-embedded*, *context-dependent* – *context-independent*, and *selective-comprehensive* continua as they apply to second language vocabulary learning).

Decisions to operationalize vocabulary in such a way are clearly related to a need for speed of assessment, both from a research and a diagnostic perspective. Further, these types of

assessments are far easier to standardize with a traditional norming sample of children, to whose performance the assessed student will be compared. Despite the practicality of such approaches, we are left wondering exactly what is being measured with such approaches to vocabulary assessment. Indeed, the approach treats vocabulary as a more constrained skill (like decoding), which may have the effect of de-emphasizing the size of the problem space with respect to instruction. Pearson et al. (2007) further caution that, in assessing bilingual children with such measures, the research and instructional communities ought to consider “special considerations” in assessing vocabulary.

### **2.3 Vocabulary and Reading Comprehension**

There is no question that vocabulary is associated with comprehension. We have ample evidence from cross-sectional studies among monolingual and bilingual populations to this end, yet we still lack a clear understanding about specifically how the relationship functions. Anderson and Freebody (1985) suggested three hypotheses as to why. The first is that learning new words improves comprehension (*instrumentalist*). Second, general verbal ability accounts for both vocabulary knowledge and comprehension performance (*verbal aptitude*). Finally, vocabulary and comprehension are influenced by how much one knows about a given topic or concept (*knowledge*).

Recent multi-component interventions conducted with bilingual populations in upper elementary and middle school have shown some success in affecting outcomes for both vocabulary learning and reading comprehension (for a review, see Lesaux, Kieffer, Kelley and Harris 2014). However, the interventions described in these studies tend to adopt instructional approaches that derive from all three hypotheses, which sheds little light on the specific drivers of the notable correlations between vocabulary and reading.



### 3. Purpose and Research Questions

We have established that vocabulary is a crucial dimension of reading comprehension, irrespective of the language in which one reads or one's language background. However, vocabulary theory is often at odds with its operationalization. Still, even with less-than-optimal indicators of vocabulary, a good deal of research indicates that vocabulary's associations with reading comprehension tend to be strong for both monolingual and bilingual populations. While the extant research with monolinguals is robust, associations between vocabulary and comprehension among bilingual populations have, until recently, been reported primarily through cross-sectional research. Thus, we know far less about the confluence of recent findings on bilinguals' vocabulary development as a point of exploration on its own, nor do we have a strong sense of how vocabulary contributes to the development of reading comprehension among bilingual populations. The purpose of this thematic literature review is to explore both of these dimensions and to identify trends in outcomes as well as future avenues for research. Given the uniqueness of bilingual populations to the study of vocabulary and reading comprehension, we sought to understand the nature of identified studies as well as to overview their findings. We asked two basic research questions:

1. What are the characteristics of each set of identified studies with respect to participants (language background and age/grade ranges) and analyses (intra- or cross-linguistic and comparative or non-comparative)?
2. Using the characteristics established in RQ1, what patterns emerge among findings from each set of identified studies?

To answer RQ 1, we made an initial pass through all identified studies and developed summary tables that provide basic information with respect to participants and types analyses (Tables 1

and 2), which serve as a descriptive overview. To answer RQ2, we took a qualitative, rather than a quantitative, approach, which makes our analyses intuitive and reliant on our judgments rather than on objective quantitative findings (Ford-Connors & Paratore 2014; Shanahan, 2010). We sought out patterns that emerged from the data, using the categories derived from RQ1 as start codes for employing a traditional grounded approach identifying trends and themes in the data (Miles and Huberman 1994).

#### **4. Methods**

Our review of the literature was designed to capture two sets of studies. The first set were studies with bilingual children that focused on the nature of vocabulary development, with or without taking into account associations with reading comprehension. The second set were studies that assessed reading comprehension and also sought to understand the role of vocabulary knowledge in predicting comprehension. For the set of vocabulary development studies, an article was considered appropriate for consideration if the researcher(s) assessed what was called “vocabulary” using the same indicator(s) on at least two measurement occasions. For the set of vocabulary → reading comprehension studies, an article was considered appropriate for consideration if the researcher(s) assessed “reading comprehension” on at least one measurement occasion and also included an operationalized indicator of “vocabulary”. The study had to be developmental in some sense, which included early vocabulary performance or growth in vocabulary as it predicted growth in reading comprehension and/or later reading comprehension. Articles were excluded if: They were case studies; they did not report on bilingual learners between the ages of 4 and 18; they reported on the results of an intervention; the focus was on the impact of particular teacher or parental actions on student vocabulary.

We conducted an extensive database search using multiple descriptors to capture the broadest range of candidate studies, aggregating searches from *Proquest Education*, *PsycInfo*, and *ERIC* databases, and limiting our search to peer reviewed articles and book chapters published since 2000. To conduct the vocabulary search, we included the following terms (with number of results in parentheses): “vocabulary” and either “language minority” (882 results), “English as an additional language” (176 results), or “English language learner” (422 results). We also searched for “vocabulary development” with “bilingual” (1007 results) and “vocabulary growth” with “bilingual” (334 results).

In conducting the reading comprehension search, terms included “vocabulary development,” “reading comprehension,” and either “language minority” (169 results), “English as an additional language” (30 results), “English language learner” (158 results) or “bilingual” (399 results). Once all results had been cross-checked for repeated findings, we were left with a total of 289 candidate articles that were considered closely to see if they met the search criteria described above.

Once all articles had been reviewed, we were left with a total of 27 peer-reviewed articles that met all criteria for the vocabulary development section, and a total of 26 peer-reviewed articles that met all criteria for the vocabulary → reading comprehension section. These articles were then reviewed with the goal of answering the proposed research questions that guided the study.

## **5. Results**

Results are reported in two sections. The first summarizes findings from the vocabulary development studies, and the second reports on findings from the vocabulary → reading comprehension studies.

## 5.1 Vocabulary Development Studies

Of the 27 identified studies, Table 1 shows that 22 focused on English as the L2. Among the remaining studies, the L2s were Dutch (2), German (1), Greek (1) and Hebrew (1). A wide variety of home languages were represented across these studies. Fourteen included students who spoke Spanish at home and English at school (in 10 of these, Spanish was the only L1). Seven studies included Chinese-English bilinguals (including 4 with Cantonese speakers and 3 with Mandarin speakers); 2 included Turkish-Dutch bilinguals and 1 Turkish-German bilinguals. The remaining 5 studies targeted bilinguals with a variety of home languages, including Punjabi, Tamil, Portuguese, Gujerati, Albanian, and Russian, among others.

Fifteen studies began when children were ages typically associated with pre-kindergarten or kindergarten (i.e. 4.5 years). Five studies began in first grade (approximately age 6), 3 began in second grade, and one each began in fourth, fifth, and sixth grades. Eight studies reported data collected over two consecutive school years. Eleven studies targeted three consecutive school years, 2 covered four consecutive years, and 4 were five or more years in duration. One study assessed students in 2<sup>nd</sup> grade and again in 5<sup>th</sup> grade. The majority (16) were intralinguistic, focusing on reading and vocabulary in the L2 only while 11 studies considered cross-linguistic relationships. Sixteen studies compared a bilingual sample with a comparison group of monolinguals, though five of these used national norms instead of a sampled comparison group. Next, we describe four broad themes that emerged from the review.

INSERT TABLE 1 ABOUT HERE

### 5.1.1. *Relationship of L2 vocabulary level to L2 vocabulary growth rate.*

A good deal of intralinguistic research has focused on how beginning levels of vocabulary knowledge influence growth in vocabulary over time. Hammer, Lawrence and

colleagues reported mixed findings regarding Spanish-English bilinguals in U.S. Head Start programs. In their two studies (each lasting two years), students were identified as those who spoke English at home (Home English Communication, HEC) and those who spoke English only at school (School English Communication, SEC). Hammer, Lawrence, and Miccio (2008) reported that SEC students' English receptive vocabulary levels grew faster than those of HEC students; however, in a similar study, Davison, Hammer and Lawrence (2011) found that the English receptive vocabularies of HEC and SEC students grew at similar rates. In both studies, beginning vocabulary levels for SEC students were significantly lower than their HEC counterparts.

The majority of studies pursuing similar questions found that the less L2 vocabulary knowledge bilingual students had initially, the faster their L2 vocabulary grew. Sheng (2014) followed two groups of Mandarin-English bilingual children for 16 months (1 group beginning at 4 years old, the other at 6). The younger children, who had less English vocabulary knowledge, had faster receptive and expressive vocabulary growth rates than their older peers. Three other articles reported similar findings. Rojas and Iglesias (2013) followed a group of Spanish-speaking ELLs in the U.S. for three years (starting at age 5), measuring expressive vocabulary. Bilinguals who began at higher vocabulary levels tended to have slower rates of growth than peers who began with lower vocabulary. Similarly, in a study following Spanish-speaking students in the U.S. from age 4.5 to age 11, Mancilla-Martinez and Lesaux (2010, 2011) found that students who started out with higher English expressive vocabulary scores had significantly slower rates of growth than those starting out with lower scores.

### *5.1.2 Comparing Bilinguals' L2 Vocabulary Growth with Monolinguals*

Related to the above, a good deal of comparative work has examined the growth rates of bilingual learners with monolingual populations. Some of this work has documented bilinguals' L2 vocabulary growth outpacing their monolingual age-mates (Collins, O'Connor, Suárez-Orozco, Nieto-Castañon, and Toppelberg 2014; Golberg, Paradis and Crago 2008; Jackson, Schatschneider and Leacox 2014; Hemsley, Holm and Dodd 2013; Kieffer and Lesaux 2012; Lawrence 2012; Schwartz and Katzir 2011; Simos, Sideridis, Mouzaki, Chatzidaki, and Tzeveleki 2014), while other work finds no significant differences in rates of growth (Hutchinson et al. 2012; Jean and Geva 2009; Limbird et al. 2014; Kieffer & Vukovic 2013). In all cases, however, bilingual children begin with significantly lower levels of vocabulary.

Working with 5-year-old Canadian students who spoke a variety of home languages, Golberg and colleagues (2008) found that students' English receptive vocabulary growth rate was fast enough to nearly meet monolingual norms by the end of the two-year study. Jackson et al. (2014) followed preschool-age, Spanish-speaking ELLs through second grade, assessing receptive vocabulary in both English and Spanish. Students' English receptive vocabulary increased rapidly enough to lessen the gap between their scores, and those of monolingual peers. Collins et al. (2014) reported similar findings among the Spanish-speaking ELLs they followed from kindergarten to second grade. However, other studies revealed less emphatic results. Schwartz and Katzir (2011) compared the Hebrew vocabulary growth rates of Russian-Hebrew bilinguals with a group of monolingual, Hebrew-speaking peers. Charting growth from the beginning of second through the third grade, bilingual students outpaced their monolingual peers, however, the degree to which the initial gap lessened depended on type of vocabulary measured. Russian speakers demonstrated persistent lags in L2 receptive vocabulary, but their expressive vocabulary grew more quickly and ultimately closed the gap with their monolingual peers.

Assessing the expressive and receptive vocabulary of emerging bilinguals with L1 Samoan and monolingual English speakers in Australia, Hemsley et al. (2013) found “progressively less difference” (814) between scores of the two groups during their first 18 months of school (starting at a mean age of 4.9 years). Similarly, during a 2-year study period beginning in the second grade, Simos and colleagues (2014) found that students with L1 Albanian and L2 Greek started out with receptive language scores 1 standard deviation (SD) lower than their L1 Greek peers, but narrowed that difference to .64 SD points by the end of the study.

Similar results have been obtained in the middle grades. Kieffer and Lesaux (2012) followed Spanish-speaking language-minority (LM) learners from ages 10-13, comparing their vocabulary growth rates to national norms. Among their sample, the average growth rate over the entire study period was faster than that of the average monolingual speaker from one grade level to the next ( $d = 0.57$ ). Lawrence (2012) looked at the impact of “summer setback” (1113) on the vocabulary development of bilingual and monolingual sixth and seventh graders, finding that bilingual students had steeper receptive vocabulary growth rates during the school year than did peers who spoke only English at home.

However, four studies, with comparably diverse samples, reported that the L2 vocabulary starting points (like the studies above) were significantly lower for bilinguals than for monolinguals, however, growth rates were statistically comparable between the groups. Limbird et al. (2014) followed Turkish-German bilingual and German monolingual children from grades 1 to 3 in Germany, and found comparable expressive German vocabulary growth patterns. Kieffer and Vukovic (2013) worked with a group of English-speaking students in the U.S. from Grade 1 to Grade 4, finding parallel growth trajectories for bilinguals and monolinguals, with monolinguals significantly above bilinguals (both groups performed significantly below national

norms). In England, Hutchinson et al. (2003) reported comparable findings of parallel growth and unequal starting points for a composite measure of receptive and expressive vocabulary. Repeated measures ANOVAs revealed effects of group and time, but not group X time interactions from the second through fourth years of school. Finally, Jean and Geva (2009) assessed the receptive and expressive vocabularies of bilingual and monolingual students in Canada for two years, starting in grade 5. Again, bilingual students displayed consistently lower vocabulary scores than the monolingual group, both with comparable rates of vocabulary growth.

### *5.1.3 How Vocabulary Grows Over Time for Bilinguals*

Among two groups of Mandarin-English bilingual children over two years (the younger cohort from the ages of 3 to 5, the older from the ages of 6 to 8), Sheng, Lu and Kan (2011) found that children demonstrated rapid growth in English, but not Mandarin. Similarly, Pendergast et al. (2015) found that, among Spanish-English bilingual students, Spanish language skills did not change during the pre-K year, while English vocabulary skills grew considerably.

Given such quick L2 growth rates for younger children, researchers have also investigated questions about whether or not L2 vocabulary growth rates change as children get older. Some research reports that L2 vocabulary growth rates start out at a given slope but decelerate over time (Farnia and Geva 2011; Goldberg et al. 2008; Mancilla-Martinez and Lesaux 2011). Mancilla-Martinez and Lesaux (2011) reported a curvilinear growth trajectory in both English and Spanish expressive vocabulary from ages 4.5 through 11. The deceleration rate was the same in both languages, but the vocabulary growth rate began deceleration at age 10 in English, and age 8 in Spanish. Measuring receptive vocabulary, Farnia and Geva (2011) had similar results in their 6-year study beginning at age 6. English vocabulary growth rates began to level off in the upper elementary years, though this plateau was not unique to bilingual students.



Indeed, deceleration was slower for bilinguals than for monolinguals. Goldberg et al. (2008) also found deceleration in expressive L2 vocabulary following students from ages 5 through 7.

By contrast, four studies reported linear vocabulary growth rates for bilingual children during periods of study. Rojas and Iglesias (2013) found that the English expressive vocabulary of five-year-old Spanish-speaking ELLs grew at a consistent rate over the three-year study period. Kieffer and Lesaux (2012) found linear growth in English receptive vocabulary among Spanish-English bilinguals from ages 10-13. Kieffer and Vukovic (2013) reported linear receptive vocabulary growth among their sample of bilingual learners from grades 1 to 4. Finally, while Golberg et al. (2008) found that expressive vocabulary growth decelerated over time, they also reported that English receptive vocabulary growth was linear.

There is a lack of pattern in the data with respect to whether one type of vocabulary knowledge is more likely to decelerate versus another. Golberg et al. (2008) argued that deceleration in their study “was most likely an artifact of our measure and not indicative of the general trend in ESL expressive vocabulary development” (56). Rojas and Iglesias (2013) further argued that “methodological differences across studies of ELLs’ language growth... make it difficult to compare findings across studies” (642). Despite inconclusive findings with respect to L2 vocabulary growth rates among bilingual learners, one inescapable conclusion from the combined studies is that starting points of vocabulary knowledge are almost universally lower for bilingual learners as compared with their monolingual counterparts (or national norms).

#### *5.1.4 Associations between L1 Vocabulary and L2 Vocabulary Growth*

There were L1-L2 studies, spanning various age groups and first languages, that investigated possible relationships between students’ L1 vocabulary (starting points and/or growth rates), and L2 vocabulary growth rate. Two studies of Spanish-English bilinguals

(Jackson et al., 2014; Pendergast, Bingham, and Patton-Terry, 2015) found that students were able to transfer their Spanish language skills to English vocabulary development. Pendergast et al. (2015) reported this finding in a study of vocabulary growth during the Pre-K year; Jackson et al. (2014) followed Spanish-English bilinguals from pre-kindergarten to second grade, and found that students with stronger Spanish receptive vocabulary in pre-kindergarten demonstrated greater growth in English receptive vocabulary. Also working with Spanish-English bilinguals, this time following them from kindergarten to second grade, Collins et al. (2014) proposed a series of dual language profiles based on the students' language competencies in both L1 and L2. They found that students who were in the limited proficiency group for both languages in kindergarten were most likely to remain in that group in second grade, or to move to the borderline group (meaning that their vocabulary improved, but not enough to be within 1 standard deviation of the monolingual norm). However, when the researchers considered whether students had changed dual language profiles by second grade or remained in the one they had belonged to before, those students who were proficient only in either English or Spanish in kindergarten were most likely to become dual-language proficient by the end of second grade. Hemsley et al. (2013) reported vocabulary acquisition of four word types in Samoan-English bilinguals: cognates, matched nouns, phrasal nouns, and holonyms. Students had the most difficulty acquiring L2 phrasal nouns and holonyms, which the researchers deemed to be the most conceptually and phonologically different between languages. However, L2 cognates and matched nouns were more easily acquired, prompting Hemsley et al. (2013) to argue that the degree to which L1 knowledge impacts L2 growth depends upon the type of word being learned. Specifically, "words that require a conceptual shift from L1 take longer to consolidate and strengthen within the L2 lexicon" (799).

## 5.2 Vocabulary → Reading Comprehension Studies

Table 2 shows that 26 studies were identified for this section, and of those, 22 were studies focused on L2 English. Two studies targeted L2 Dutch, with 1 L2 German, and 1 L2 Norwegian. A wide variety of home languages were represented across these studies, but fully 15 studies targeted students who spoke Spanish in the home and English at school. Chinese-English bilinguals were the focus of 2 studies (one in Hong Kong, Li et al. 2012; the other in Canada, Lam et al., 2012), Turkish-German and Urdu-Norwegian bilinguals were subjects in 2 others. The remaining 7 studies focused on bilingual samples with a variety of home languages (Arabic, Cantonese, French, Gujarati, Moroccan, Portuguese, Tamil, and Turkish, among others).

INSERT TABLE 2 ABOUT HERE

Most all studies were conducted at the elementary school levels. Seven studies began when children were enrolled in Pre-kindergarten or Kindergarten (Mancilla-Martinez and Lesaux, 2010 reported ages beginning at 4.5 years), 8 beginning in the first grade, 5 beginning in second grade (Li et al. 2012 reported ages, beginning at 8 years), 3 beginning in third grade, and 2 beginning in fourth grade. One study, which used a cohort sequential design, included students beginning in second, third, and fourth grade (Silverman et al. 2015). Two studies (Neufeld et al. 2006; Proctor et al. 2012) reported on data collected over a single school year. Eight studies targeted two consecutive school years, 8 covered three consecutive years, 5 worked with students over four years, 3 studies ranged more than five years in duration (Kieffer 2012; Mancilla-Martinez and Lesaux 2010; Nakamoto et al. 2007). Fourteen studies focused on reading and vocabulary in the L2, while twelve, in some form or another, targeted cross-linguistic relationships. Sixteen of the studies compared a bilingual sample with a comparison group of monolinguals, though two of these (Lesaux et al. 2010 and Mancilla-Martinez and Lesaux 2010)

used national norms as a point of comparison, and one (Nakamoto et al. 2012) followed 3 groups of Spanish-English bilinguals who were enrolled in 3 different instructional programs.

### *5.2.1 Associations between vocabulary and static reading comprehension*

Not surprisingly, virtually all studies reviewed reported strong intralinguistic associations between early vocabulary knowledge and later reading comprehension. Only 3 studies did not find such associations. Lam et al. (2012) worked with two cohorts of Chinese-English bilingual children in kindergarten ( $n = 46$ ) and first grade ( $n = 34$ ), testing the children in English only at two time points spaced one year apart (in first and second grades) on a measure of receptive vocabulary, alongside controls that included time 1 reading comprehension, word reading, phonological awareness, and derivational and compound morphological awareness. For the younger cohort, time 1 word reading emerged as the only significant predictor of reading comprehension while for the older cohort, time 1 reading comprehension and derivational morphological awareness were significant predictors of later reading comprehension.

While Li et al. (2012) did find that English receptive vocabulary at age 8 was a significant predictor of English reading comprehension at age 10 net other predictors in their model (SES, phonological awareness, RAN, word reading and vocabulary in Chinese and English word reading and vocabulary), the authors conversely found that Chinese vocabulary was not associated with Chinese reading comprehension, which gave way to Chinese word reading and English reading (positive associations) and English word reading (negative) serving as significant predictors. Manis et al. (2004) worked with 251 Spanish-English bilinguals in Kindergarten through second grade. The authors found that vocabulary knowledge (a composite variable combined with a sentence recall task), measured in kindergarten (Spanish) and first grade (English) significantly predicted second grade reading comprehension within languages,

English vocabulary only accounted for 2 percent of variation in English reading as compared with 11.2 percent of variation in Spanish reading explained by Spanish vocabulary.

Cross-linguistically, a good number of studies have investigated whether early vocabulary knowledge in one language predicts reading comprehension in another (Gottardo and Mueller, 2009; Kieffer 2012; Lesaux et al. 2010; Li et al. 2012; Lindsey et al. 2003; Mancilla-Martinez and Lesaux 2010; Manis et al., 2004; Nakamoto et al. 2008; Nakamoto et al. 2012; Proctor et al. 2012). Many of these studies simply report null cross-linguistic relationships (Gottardo and Mueller, 2009; Lesaux et al. 2010; Lindsey et al. 2003; Mancilla-Martinez and Lesaux 2010; Nakamoto et al. 2012; Proctor et al. 2012), however a few have noted some L1 – L2 relationships.

Kieffer (2012) found that kindergarten vocabulary knowledge (a composite variable derived from expressive vocabulary, listening comprehension, and story retelling) was a significant predictor of third grade English reading comprehension, but proved non-significant once kindergarten English vocabulary knowledge was entered into the predictive model. Li et al. (2012) found that, controlling for age 8 Chinese reading comprehension and receptive vocabulary knowledge, Chinese expressive vocabulary at age 8 was a significant predictor of age 10 English reading comprehension. Manis et al. (2004) found that Spanish vocabulary knowledge (composite score using expressive vocabulary and sentence recall) in kindergarten had a direct relationship with second grade English reading, and explained 2 percent additional variance. No effects of English vocabulary on Spanish reading were detected. Finally, Nakamoto et al. (2008) determined that third grade Spanish vocabulary knowledge (latent construct with expressive vocabulary, listening comprehension, and sentence recall) did not directly predict 6<sup>th</sup> grade English reading comprehension, but that for stronger English decoders, Spanish

vocabulary did explain a small (1%) but significant percentage of variance in English reading. Thus, while effects have been detected in cross-linguistic studies, they tend to be modest at best, and suggest that L1 vocabulary is more likely to predict L2 reading, while L2 vocabulary was not shown to be associated with L1 reading comprehension in the 5 studies which investigated that question (Li et al. 2012; Lindsey et al. 2003; Manis et al. 2004; Nakamoto et al. 2008, 2012).

### *5.2.2 Associations between vocabulary and growth in reading comprehension*

Other intra- and cross-linguistic studies have addressed the role of early vocabulary knowledge as it predicts growth in reading comprehension (Farnia and Geva 2013; Fitzgerald, Amendum, Relyea and Garcia 2015; Kieffer 2012; Lervag and Aukrust 2010; Nakamoto et al. 2007; Neufeld et al. 2006; Proctor et al. 2012; Silverman et al. 2015). Intralinguistic studies of reading comprehension growth are notable in that they are less common and findings are variable. In two studies, vocabulary knowledge emerged as a negative predictor of comprehension (Nakamoto et al. 2007, Silverman et al. 2015). Nakamoto et al. (2007) found that lower vocabulary scores were associated with stronger initial linear growth in first through fourth grade, but then also with higher rates of deceleration in fifth and sixth grade. Studying the reading comprehension growth rates of ELLs with L1 Spanish and L2 English, Silverman et al. (2015) found that students whose vocabulary breadth scores were lower in second grade outpaced their peers in terms of comprehension growth over the course of the two-year study.

By contrast, Lervag and Aukrust (2010) found that vocabulary showed a positive association with linear reading comprehension growth among a sample of 288 Norwegian students, 90 of whom were Urdu-Norwegian bilinguals in second through third grade. Farnia and Geva (2013) worked with 400 bilingual (multiple language backgrounds) and 153 English-speaking students in grades 1 – 6 in Canada. They found that vocabulary knowledge was only

significant in its interaction with syntactic knowledge as it predicted linear rates of growth in comprehension (though not quadratic growth, which characterized the nature of comprehension change over time). The effect was compounded, such that higher vocabulary and syntax begat stronger comprehension outcomes over time. In three other studies, however, early vocabulary performance was not associated with reading growth (Fitzgerald et al. 2015; Kieffer 2012; Neufeld et al. 2006; Proctor et al. 2012).

Cross-linguistically, studies are rarer still, with only two addressing issues of L1 (Spanish) vocabulary predicting L2 (English) reading comprehension growth, and both with null results. Kieffer (2012) examined the role of kindergarten vocabulary (a composite score, described previously) on third through eighth grade comprehension growth among 295 bilingual children while Proctor et al. (2012) examined the role of expressive Spanish vocabulary as it predicted Fall – Spring English reading comprehension change over one academic year for a group of 129 second, third, and fourth grade students. While associations were positive, neither study revealed significant relationships.

### *5.2.3 Is vocabulary knowledge more important for bilingual learners?*

A recurrent theme among some comparative studies is the finding (and thus the broader contention) that vocabulary knowledge is “more relevant in the prediction of bilinguals’ than monolinguals’ reading comprehension” (Limbird et al. 2014: 951; Droop and Verhoeven 2003; Verhoeven, 2000). Other comparative research provides both confirmatory and some contradictory evidence for this contention.

Burgoyne et al. (2011), in an English-language study, worked with 78 students, 39 of whom were monolingual, and 39 who were bilingual (multiple language backgrounds: 2) in their third and fourth years of schooling. The authors gathered both expressive and receptive measures

of vocabulary growth from Year 3 to Year 4, and assessed the effects of reading accuracy, listening comprehension, and vocabulary knowledge. Hierarchical regression modeling, with Year 3 variables predicting Year 4 reading comprehension indicated that, for monolinguals, listening comprehension was a significant predictor reading while vocabulary was not. By contrast, vocabulary was the salient predictor of reading comprehension for the bilingual group. Hutchinson et al. (2003) recorded similar findings with a comparable sample of bilingual and monolingual learners, in which expressive vocabulary was a significant predictor among bilinguals of year 4 reading comprehension ( $B = .3, p = .02$ ), controlling for year 2 reading comprehension. Such was not the case for the monolinguals ( $B = -.05, p = .69$ ). Relatedly, Kieffer and Vukovic (2013), in their comparative study with 1<sup>st</sup> through third grade students noted increasing correlations between expressive vocabulary and reading over time, from .12 in 1<sup>st</sup> grade to .43 in 4<sup>th</sup> grade for monolinguals. However, for bilinguals, correlations remained consistent across all grades (.49, .50, .40, .41).

In work with Turkish and Moroccan students learning to read in Dutch, Verhoeven (2000) and Droop and Verhoeven (2003) conducted studies in first and second grades, and in third and fourth grades, respectively. Verhoeven (2000) worked with 1154 children (959 monolingual, 195 bilingual), assessing receptive vocabulary at 4 time points (middle and end of Years 1 and 2), and reading comprehension at 3 time points (end year 1, mid and end year 2). Findings revealed that early receptive vocabulary was as a far stronger predictor of later reading comprehension for the bilingual group ( $B = .63$ ) than for the monolingual group ( $B = .43$ ). Droop and Verhoeven (2003) had similar findings among a group of students assessed at the beginning and end of grade 3, and at the end of grade 4. End of third grade vocabulary was significantly associated with fourth grade reading, but differentially as a function of language status (.19 for



monolinguals vs. .29 for bilinguals). Similar findings have been shown with Turkish-German bilinguals, in which Limbird et al. (2014) used latent variable structural equation modeling to show that word decoding and phonological awareness from second grade most strongly predicted third grade reading, with the path from vocabulary to comprehension emerging as significant only for the bilingual group.

Only two comparison studies described results where differences between groups were negligible (Lervag and Aukrust 2014; Neufeld et al. 2006). In only one instance were inverse results obtained (Geva and Farnia 2012) in which Grade 2 vocabulary predicted Grade 5 reading more strongly for the monolinguals ( $B = .22, p < .01$ ) than for bilinguals ( $B = .164, p < .01$ ). However, significance testing was undertaken only in two of the comparison studies (Limbird et al. 2014; Verhoeven 2000), in which structural equation modeling indicated that models of reading comprehension were better fitting when the bilingual and monolingual samples were separated for analysis.

## **6. Discussion**

In this review, we focused on developmental studies with bilingual populations that targeted: 1) vocabulary as an outcome; and 2) the developmental associations between vocabulary and reading comprehension. In general, our review suggests that there is a need for considerably more research in these domains, particularly among children learning L2s that are other than English. Indeed, of the 50 studies reviewed, 40 targeted English as the L2 outcome of interest. Thus, much like early studies of vocabulary and comprehension that targeted monolingual populations and generalized results to bilingual learners, the study of bilingual learners is English-dominant and more research is needed in non-English languages.

Also adding to the need for more research is the fact that findings are not entirely conclusive, particularly in the realm of vocabulary development. In general, results suggest that children who start with lower levels of vocabulary tend to grow at stronger rates than those with higher levels. However, when one disaggregates this analysis by language status (i.e., bilingual vs. monolingual) the picture is less clear. Even though it was almost universally true that bilinguals started out with lower levels of vocabulary as compared with their monolingual counterparts, it was not always the case that their trajectories of growth were steeper than those of their monolingual counterparts. In those cases where trajectories were different, it was rare for vocabulary gaps to be closed over time. This finding takes on added meaning when considering it in connection with the rather compelling finding that vocabulary may play a stronger role in predicting comprehension for bilingual populations. While our analysis reveals a trend, meta-analytic work is necessary to determine if vocabulary knowledge is, indeed, a stronger predictor of reading for bilingual learners. If so, it is imperative to consider ways by which to leverage vocabulary development for bilingual children in school settings.

Studies that specifically examined cross-linguistic effects were rare in the vocabulary group, and relatively common in the vocabulary → reading comprehension group of studies. In both cases, however, cross-linguistic findings were very small. This finding can be interpreted within the framework of the sizes of the problem spaces that vocabulary and comprehension occupy. Both vocabulary and comprehension represent large domains of learning, and given the size of these spaces, there is less likelihood of overlap across languages, particularly if the languages are not orthographically or etymologically related. For example, a Spanish-English bilingual may be able to make sense of the word *rapid* by noting its orthographic and phonological similarity with *rápido*. Cognates such as these represent one of the clearest

dimensions of vocabulary overlap, but are non-existent between, for example, Mandarin and Dutch. By contrast, cross-linguistic research has been most robustly documented with respect to smaller problem spaces, like decoding skills between orthographically comparable languages (see Bialystok, Luk, and Kwan 2005) and script-universal processes like fluency irrespective of orthography (see Pasquarella, Chen, Gottardo, and Geva in press). More detailed developmental research ought to consider dimensions of vocabulary as they are more and less robust to cross-linguistic transfer (e.g., Hemsley et al. 2013; see also Ordoñez, Carlo, Snow, and McLaughlin 2002). Work in this domain would go a long way toward addressing Pearson et al.'s (2007) suggestion of “special considerations” in assessing vocabulary among bilingual learners.

In conclusion, researchers in the 21<sup>st</sup> century have helped to build an emergent foundation on how vocabulary develops and its relationship to reading comprehension. However, much still remains to be learned, particularly given paradox between the vast linguistic heterogeneity of bilingual populations alongside the relative homogeneity of English outcomes being studied in the extant research.

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Table 1. *Overview of vocabulary growth studies, including languages spoken, age/grade levels, and presence of a monolingual comparison group.*

Article	L1	L2	Ages/Grades	Languages	Comparison
Collins et al. (2014)	Spanish	English	K-2	L1-L2	No
Davison et al. (2011)	Spanish	English	Preschool-grade 1	L1-L2	No
Droop & Verhoeven (2003)	Turkish, Moroccan Arabic, Berber	Dutch	3 <sup>rd</sup> /4 <sup>th</sup> Grade	L2 only	Yes
Farnia & Geva (2011)	Punjabi, Tamil, Portuguese	English	Ages 6-11	L2 only	Yes
Geva & Farnia (2012)	Punjabi, Gujarati, Tamil, Cantonese, Portuguese, “other languages”	English	2 <sup>nd</sup> and 5 <sup>th</sup> Grades	L2 only	Yes
Golberg et al. (2008)	Korean, Mandarin, Cantonese, Spanish, Romanian, Arabic, Japanese, Farsi	English	Ages 5-7	L2 only	Yes <sup>a</sup>
Hammer et al. (2008)	Spanish	English	PreK-K	L1-L2	No
Hemsley et al. (2013)	Samoan	English	PreK-K	L1-L2	Yes
Hutchinson et al. (2003)	Gujerati, Urdu, Punjabi, Bengali, Pushto	English	Early to mid elementary	L2 only	Yes
Jackson et al. (2014)	Spanish	English	PreK- 2 <sup>nd</sup> Grade	L1-L2	No
Jean & Geva (2009)	Cantonese, Portuguese, Punjabi, Hindi, Gujarati, Urdu, Tamil, Sinhalese	English	Grades 5 – 7	L2 only	Yes
Kieffer & Lesaux (2012)	Spanish	English	Ages 10-13	L2 only	Yes <sup>a</sup>
Kieffer & Vukovic (2013)	Mostly Spanish (85%), some Arabic, French & Punjabi	English	Grades 1-4	L2 only	Yes
Lam et al. (2012)	Chinese	English	K – 2nd Grade	L2 only	No
Lawrence (2012)	Spanish, “other”	English	Grades 6 – 8	L2 only	Yes
Limbird et al. (2014)	Turkish	German	Grades 1 – 3	L2 only	Yes
Mancilla-Martinez & Lesaux (2010)	Spanish	English	Ages 4.5-11	L1-L2	Yes <sup>a</sup>
Mancilla-Martinez & Lesaux (2011)	Spanish	English	Ages 4.5-11	L1-L2	Yes <sup>a</sup>
Pendergast et al. (2015)	Spanish	English	Pre-K	L1-L2	No
Rojas & Iglesias (2013)	Spanish	English	Ages 5 – 8	L1-L2	No
Schwartz & Katzir (2012)	Russian	Hebrew	Ages 7 – 9	L2 only	Yes
Sheng, Lu, & Kan (2011)	Mandarin	English	Ages 3 – 8	L1-L2	No
Sheng (2014)	Mandarin	English	Ages 4 – 8	L1-L2	No
Simos et al. (2014)	Albanian	Greek	Grades 2-4	L2 only	Yes
Uccelli & Paez (2007)	Spanish	English	K to 1 <sup>st</sup> Grade	L1-L2	Yes <sup>a</sup>

Table 2. *Overview of vocabulary → reading comprehension studies, including languages spoken, age/grade levels, and presence of a monolingual comparison group.*

Article	L1	L2	Ages/Grades	Languages	Comparison
Burgoyne et al. (2011)	Punjabi, Urdu, Gujarati, Pushto, Bengali	English	3 <sup>rd</sup> – 4 <sup>th</sup> school years	L2 only	Yes
Carlisle et al. (1999)	Spanish	English	1 <sup>st</sup> – 3 <sup>rd</sup> Grades	L1-L2	No
Davison et al. (2011)	Spanish	English	Pre-K – 1 <sup>st</sup> Grade	L1-L2	Yes
Droop & Verhoeven	Turkish, Moroccan, Arabic, Berber	Dutch	3 <sup>rd</sup> – 4 <sup>th</sup> Grade	L2 only	Yes
Farnia & Geva (2013)	Gujarati, Tamil, Cantonese	English	4 <sup>th</sup> – 6 <sup>th</sup> Grade	L2 only	Yes
Fitzgerald et al. (2015)	Spanish	English	1 <sup>st</sup> – 3 <sup>rd</sup> Grades	L2 only	No
Geva & Farnia (2012)	Punjabi, Gujarati, Tamil, Cantonese, Portuguese, and “other languages”	English	2 <sup>nd</sup> and 5 <sup>th</sup> Grades	L2 only	Yes
Gottardo & Mueller	Spanish	English	1 <sup>st</sup> – 2 <sup>nd</sup> Grade	L1-L2	No
Hutchinson et al. (2003)	Gujerati, Urdu, Panjabi, Bengali, Pushto	English	2 <sup>nd</sup> – 4 <sup>th</sup> School Years	L2 only	Yes
Kieffer (2012)	Spanish	English	K – 8 <sup>th</sup> Grade	L1-L2	No
Kieffer & Vukovic (2013)	Mostly Spanish (85%), some Arabic, French & Punjabi	English	Grades 1-4	L2 only	Yes
Lam et al. (2012)	Chinese	English	K – 3 <sup>rd</sup> Grade	L2 only	No
Lervag & Aukrust (2010)	Urdu	Norwegian	Grades 2 – 3	L2 only	Yes
Lesaux et al. (2010)	Spanish	English	4 <sup>th</sup> – 5 <sup>th</sup> Grade	L1-L2	Yes <sup>a</sup>
Li et al. (2012)	Chinese	English	Ages 8 and 10	L1-L2	No
Limbird et al. (2014)	Turkish	German	1 <sup>st</sup> – 3 <sup>rd</sup> Grade	L2 only	Yes
Lindsey et al. (2003)	Spanish	English	K – 1 <sup>st</sup> Grade	L1-L2	No
Mancilla-Martinez & Lesaux (2010)	Spanish	English	Ages 4.5 – 11	L1-L2	Yes
Manis et al. (2004)	Spanish	English	K – 2 <sup>nd</sup> Grade	L1-L2	No
Nakamoto et al. (2007)	Spanish	English	1 <sup>st</sup> – 6 <sup>th</sup> Grade	L2 only	No
Nakamoto et al. (2008)	Spanish	English	3 <sup>rd</sup> – 6 <sup>th</sup> Grade	L1-L2	No
Nakamoto et al. (2012)	Spanish	English	K – 3 <sup>rd</sup> Grade	L1-L2	No <sup>b</sup>
Neufeld et al. (2006)	Spanish	English	1 <sup>st</sup> Grade	L2 only	Yes
Proctor et al. (2012)	Spanish	English	2 <sup>nd</sup> – 4 <sup>th</sup> Grade	L1-L2	Yes
Silverman et al. (2015)	Spanish	English	2 <sup>nd</sup> – 5 <sup>th</sup> Grade	L2 only	Yes
Verhoeven (2000)	Turkish, Arabic, “other”	Dutch	1 <sup>st</sup> – 2 <sup>nd</sup> Grade	L2 only	Yes

Note. <sup>a</sup> = Comparisons made with data obtained from a monolingual norming sample, rather than a monolingual sample selected for the study. <sup>b</sup> = all students were bilingual, but enrolled in 3 different language program models, which were compared with one another