

**A VOCABULARY-ADDED READING INTERVENTION FOR ENGLISH LEARNERS
AT-RISK OF READING DIFFICULTIES**

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This study examined the added value of a vocabulary plus phonological awareness (vocab+) intervention against a phonological awareness (PA only) intervention only. The vocabulary intervention built networks among words through attention to morphological and semantic relationships. This supplementary classroom instruction augmented existing literacy curriculum in a 71 primarily Spanish-speaking English Learners (EL) in grade one, many at-risk of reading difficulty. Vocab+ lessons drew from expository text, and words were revisited throughout the program. The PA only group received a previously validated phonological awareness and decoding instruction with no vocabulary instruction. The treatment group (vocab+) spent 30% of the intervention on PA and decoding. Students demonstrated expected gains in vocabulary, while maintaining gains in phonological decoding equivalent to those of the PA only group. This study demonstrates initial justification for dedicating limited instructional minutes to vocabulary building in early literacy interventions while still dedicating a small portion of time to phonological awareness and decoding.

Extensive evidence supports the effectiveness of early phonological awareness (PA) and decoding interventions on improving reading outcomes for young children at risk for reading difficulty (e.g., Ehri et al., 2001; McCardle, Scarborough, & Catts, 2001). However, these interventions have traditionally focused on exclusively word level skills (e.g., PA, word recognition and decoding), sometimes at the expense of vocabulary knowledge, word learning strategies, or other higher order skills critical for comprehension. The long term outcome of this focus has led to students that are fluent readers, but are unable to master reading comprehension (Crosson & Lesaux, 2010). Vocabulary knowledge along with PA, decoding and fluency are essential for reading comprehension for all readers (Beck & McKeown, 1991; NIH, 2000; Snow, 2002; Verhoeven, 2000). Certain subgroups of students who are at-risk of reading disabilities, on average, lack breadth and depth of vocabulary knowledge in addition to having difficulties with basic word-level skills.

Disparities in Vocabulary Knowledge

As Stanovich (1986) noted 20 years ago and researchers continue to observe, there is a reciprocal relationship between volume of reading and vocabulary; i.e., the rich get richer and the poor get poorer. The difference in quantity of words known by students is large, increases over time, and is apparent even in very young children (Baker, Simmons, & Kame'enui, 1998). These children tend to develop *fewer word learning strategies* in addition to developing smaller funds of word knowledge (Baker, Simmons, & Kame'enui, 1995).

On average, children from lower income families are exposed to more restricted and less rich lexical input, a difference that has been associated with differences in later vocabulary knowledge and use, rate of vocabulary growth, and IQ (Hart & Risley, 1995). Likewise, English Learners (EL) typically enter school with smaller English vocabularies than their peers, and by fourth and fifth grade perform about

one standard deviation below their monolingual peers on all aspects of vocabulary knowledge and reading comprehension (McLaughlin et al., 2000). This gap remains constant over the course of a year – although students learn new vocabulary, the rate of acquisition is not fast enough to catch up and prevent or reduce reading difficulties (August, 2005; McLaughlin et al., 2000). This combination of influences, SES and English language proficiency, presents a significant challenge for educators, as EL tend to be concentrated in schools with high proportions of low-income, minority children, and lower levels of per-pupil expenditures (Donovan & Cross, 2002; Rumberger, Gandara, & Merino, 2006). We face the task of improving our ability to provide multi-faceted early reading intervention that will provide all students with an equal opportunity for successful development of literacy skills.

There is promising evidence that *early* support in vocabulary instruction can increase vocabulary knowledge and reading outcomes for EL (e.g. Gersten & Geva, 2003; McLaughlin et al., 2000), but it seems clear that the most vulnerable students (those who are struggling readers learning in a second language) have a twofold need: intensive instruction in PA and decoding skills, *and* intensive instruction in vocabulary and vocabulary learning skills. These needs require not only instructional efficacy, but also efficiency.

Theoretical Background of Intervention

This exploratory study was based on the importance of increasing word-learning strategies, above and beyond number of words learned. By teaching word learning strategies students learn *how* to learn new words, a skill that will continue to benefit them throughout their schooling. To achieve this meaning-making focus, the intervention focused on making structures of language explicit. This focus builds on and enhances metalinguistic awareness - recognizing and manipulating the structural features of language – skills that are often heightened in bilinguals (Bialystok, Majumder, & Martin, 2003). This explicit focus on language structure builds on the strengths of children who speak more than one language – an additive model.

Importance of language structure

Research has shown that when teachers highlight the smallest meaningful units of language structures (e.g., phonemes, graphemes, morphemes, and even semantic features), learners can make connections among words through various systems of language. A familiar example is phonemic awareness, a subcomponent of phonological awareness, or the ability to detect and manipulate speech sounds at the level of the phoneme, the smallest unit of spoken language. Altering a single phoneme can result in an entirely different word: bit/pit, top/mop, etc., and children build phonological representations of words through analogies, such as learning to segment *cat* into /c/ /a/ /t/ and building new words with the /at/ rime. The bulk of early reading interventions address PA because the ability to manipulate speech sounds at the phoneme level is highly predictive of early reading performance (Ehri et al., 2001). As students begin to learn letters in print, PA becomes tightly linked to phonics, that is, the understanding of connections between letters and sounds. As children move into decoding, instruction targets PA via phonics, emphasizing segmenting and blending of speech sounds while connecting them to print.

Using the same focus on explicit language structure, vocabulary plus PA intervention can provide students with the skills to make connections among word sounds, forms, and meanings. Making these connections is critical to understanding words, as word knowledge includes orthographic, phonological, and semantic representations (Rosenthal & Ehri, 2008). In this study, we build on the knowledge about PA and focus on two aspects of language structure for meaning making, morphological awareness and semantic relationships.

Morphological awareness

Morphological awareness (MA) is the ability to reflect on and manipulate morphemes and word formation rules (see Reed, 2008 for a review). Morphemes are the smallest meaningful units of a word – that is, a morpheme has meaning in and of itself, and a change in morpheme can alter the meaning of a word. They reflect the phonology (sound) and orthography (form) of a word. For example, consider the word *unintelligible*. By removing the morpheme *un-*, the meaning of the word is changed 180 degrees. This construct is clearly related to PA, vocabulary knowledge, and reading comprehension, and instruction in MA or word formation patterns facilitates growth in reading skills (Kuo & Anderson, 2006; Nagy, Berninger, Abbott, Vaughan, & Vermeulen, 2003; Nagy, Berninger, & Abbott, 2006).

Semantic relationships

Semantic relationship (SR) skills include recognizing and using knowledge about the relationships among words based on their meanings (as opposed to their phonological or orthographic forms; see Berends & Reitsma, 2006). This is achieved by focusing on semantic features of words, the minimal contrastive elements of meaning. In other words, this teaching draws attention to the most fundamental similarities and differences among word meanings in order to develop and strengthen semantic networks. This type of teaching requires teachers and students to go much deeper into their understanding of words, and talk about multiple meanings and connotations.

For example, teachers may use a semantic feature analysis to teach a group of related concepts by creating a matrix. On the left is a list of words that share some features but not others. Across the top are words that are features of the words on the left. In Figure 1, we see *camouflage* and *armor*. The most common image of camouflage is likely to be *drab*, and that of armor likely to be *bright*. However, true understanding of these two concepts includes the understanding that they may look different in different contexts, however they always offer *protection*. This exposure to word meanings, examples and non-examples and the subsequent cognitive operations that arise as a result of this input strengthen semantic networks, and children iteratively develop understanding of patterns in word meanings (Smith & Samuelson, 2003).

	drab	bright	blends	protection	covers	glistens
camouflage						
armor						
butterflies						

Figure 1. Example of Semantic Feature Analysis

Semantic relationships are often a component of multi-faceted vocabulary instruction in general classroom instruction, although not always explicitly categorized as such. In a narrower band of research, explicitly teaching students with learning disabilities (LD) how to actively process semantic relationships has been demonstrated to be an effective instructional method for increasing vocabulary and reading comprehension (Bos & Anders, 1990; Carnine & Carnine, 2004; Lovitt & Horton, 1994; e.g., Lubliner & Smetana, 2005). These methods included activities such as semantic feature analysis and concept mapping.

Older studies have focused on semantic relationships for EL and found similar results for EL students with LD (Bos, Allen, & Scanlon, 1989), and found greater impact on vocabulary than instruction in context clues (Margosein, Pascarella, & Pflaum, 1981). However, more recent intervention studies aimed at teaching vocabulary to EL typically instruct a number of components, including PA, vocabulary, fluency and word analysis, and these components are not usually well-specified (e.g., Carlo, August, & Snow, 2005; McLaughlin et al., 2000). Therefore while attention to semantic relationships may have been one component of these interventions or instructional packages, its role is unclear when so many other aspects of reading are addressed.

Purpose

The purpose of this study was to examine the effectiveness of a vocabulary plus PAD intervention, given the importance of both word- and text-level skills in early reading intervention. McMaster and her

colleagues (McMaster, Kung, Han, & Cao, 2008) have asked *whether general classroom instruction can be designed to meet the needs of many English Learners, such that more intensive interventions are necessary for only the most severely struggling students* (p. 195). Our approach then, was to design an intervention model that augmented existing classroom curriculum but took place in the classroom during regularly scheduled language arts instruction. Instruction was designed to facilitate independent word learning through focus on language structure.

Research questions

Given the same amount of instructional time, did students in the vocabulary plus condition (70% time on vocabulary and 30% time on PA and decoding) demonstrate greater gains on vocabulary and comparable gains on phonological decoding when compared to students who spent 100% of the supplementary intervention on PA and decoding (PAD condition)? Second, we were particularly interested in the effects on those students who were initially lowest performing on phonological decoding. In the vocabulary condition, do initially low performers show as much growth as their peers on those measures?

Method

Participants

The participating school was a Title I (i.e., high poverty, low achieving) southern California elementary school, and had been designated as Program Improvement Year 1 under the Federal *No Child Left Behind Act of 2001* (CA DOE, Feb. 14, 2007). Ninety-three percent of students were Hispanic or Latino/a, 61% were designated as English learners (ELs), and 86% received free or reduced-price lunch (compared to 25% ELs and 51% free or reduced-price lunch in California as a whole; CA DOE, April 30, 2007). The sampling frame comprised 97 first-grade students from five intact classrooms. English was the language of instruction. See Table 1 for participant information.

Sixty students were identified by the school as Limited English Proficient, with Spanish as their native language, and language information was not available for one student. The ten students identified by the school as monolingual English speakers (based on a home language survey, standardized test scores, and teacher reports) were distributed among conditions as follows: one in PAD and nine in vocab+. Analyses were conducted both with and without these students and exclusion of these students produced no differences in reliability of findings and negligible variation in effect sizes. No reliable pretest differences were found based on consideration of gender, instructional condition, or classroom.

Table 1. Participant Information

	<i>PAD</i>	<i>SR</i>	<i>MA</i>
<i>n</i>	18	26	27
% male	50	46	48
ELL status	94	77	89
NWF Pretest*	<i>M</i> = 35.06 <i>SD</i> = 17.91	<i>M</i> = 34.58 <i>SD</i> = 12.10	<i>M</i> = 39.78 <i>SD</i> = 14.62

* NWF = DIBELS Nonsense Word Fluency mean sounds per minute

Design

A repeated measures (pretest-posttest), three-group (PAD only, PAD-Plus MA, and PAD-Plus SR) design was employed that addressed threats to internal validity by controlling for initial levels of vocabulary knowledge and reading skill. Specifically, two different treatment conditions (vocab+ with semantic focus and vocab+ with morphological focus) were compared to a treatment-control condition (PAD only). Data was collected before and after the instructional period. A treatment-control group, rather than an attention-control group, was employed due to evidence that PA and decoding training is highly effective for improving word-level reading skills of EL (Gerber, et al., 2004; Leafstedt, Richards, & Gerber, 2004; Richards & Leafstedt, 2010); i.e., the PAD group served as a treatment-control.

Group assignment.

First, intact classrooms were randomly assigned to treatment (three Vocab+ classrooms) or treatment-control (two PAD classrooms) conditions. Second, students were rank-ordered within classroom on Nonsense Word Fluency pretest scores, a measure of phonological decoding (see Measures). This measure was selected due to its importance as a predictor of later reading performance (Schatschneider,

Fletcher, Francis, Carlson, & Foorman, 2004), including for EL (Vanderwood, Linklater, & Healy, 2008). Then, based on these rankings, students were grouped into approximately four similar-ability groups within each classroom, which allowed for direct instruction and other strategies appropriate for struggling readers (Swanson & Hoskyn, 1998). Finally, groups within the three Vocab+ classrooms were randomly assigned to Vocab+ semantic relations (SR) or Vocab+ morphological awareness (MA). Therefore, there were three classrooms, each with two Vocab+ -SR groups and two Vocab+-MA groups and two PAD classrooms.

After group assignment, one treatment-control classroom (PAD only) dropped out during the pre-test phase citing logistics and lack of teacher interest. Class composition and pre-intervention achievement characteristics of students in this classroom did not significantly differ, practically or statistically, from those of remaining students. Some data was missing for an additional six students, who also were not significantly different from those for whom complete data were available. Therefore, results are reported on a final sample of 71 students, with the PAD condition comprising 18 students from one classroom, and the PAD-plus conditions comprising 26 (SR) and 27 (MA) students spread across three classrooms.

Table 2. Number of students in each instructional group

Vocab+ MA	Vocab+ SR	PAD	Total
27	26	18	71

Data Collection Procedures

Target vocabulary knowledge, phonological decoding, word reading, reading fluency, and comprehension were measured using a combination of standardized and experimental measures. Expressive One-Word Vocabulary was measured in English and Spanish, all other measures were in English only. The first author and trained research assistants administered assessments at school sites. Pre and post-test student performance was measured on target vocabulary knowledge, PA, and phonological decoding. Breadth of vocabulary knowledge was assessed only at pretest.

Measures

Breadth of vocabulary knowledge. The Peabody Picture Vocabulary Test-Revised (PPVT; Dunn & Dunn, 1981) was administered individually as an indicator of receptive vocabulary knowledge in English. Bilingual expressive vocabulary was measured with the Expressive One-Word Vocabulary Test (EOWVT), which requires students to verbally name pictured verbs and nouns in English or Spanish (Brownell, 2000). Both receptive and expressive measures were obtained only as baseline information to validate the target vocabulary knowledge test, as neither is sensitive to change over a short time period.

Target vocabulary knowledge (experimental). To measure knowledge of taught vocabulary words, the target vocabulary test (VOC) was administered in a group format at pretest and at posttest. Words tested were all taught to both MA and SR conditions. *Silly* (false) or *True* sentences were provided for each of the 56 vocabulary items. Then, the items were randomly ordered, and randomly assigned to true or false. For example, the target word *enemies* was randomly assigned to false, and its silly sentence was *Enemies are good friends*. An example of a true sentence for the target word *covers* was *A hat covers the top of my head*. Students circled a *thumbs up* for true or a *thumbs down* for false. Inter-item reliability for this measure at pretest was $\alpha = .75$ and at posttest was $\alpha = .84$. This measure correlated moderately with two standardized measures: Peabody Picture Vocabulary Test (Dunn & Dunn, 1997) and the Expressive One-Word Vocabulary Test (Brownell, 2000); in both cases, $r^2 = .68, p < .01$.

Phonological decoding. The Dynamic Indicators of Basic Early Literacy Skills (DIBELS, See Good, Simmons, Kame'enui, Kaminski, & Wallin, 2002) Nonsense Word Fluency (NWF; first grade) subtest measures the alphabetic principle and requires PA and phonics skills that are appropriate for screening first grade EL for reading difficulties (Gersten et al., 2007). In this task, students were presented with a probe sheet, and asked to read the sounds of the nonsense word or read the word (e.g., *jac*). Each correct sound was scored as a point, regardless of whether it was blended with the other sounds in the nonsense word or on its own. Total score was the number of correct sounds per minute.

Intervention Procedures

Students were instructed in small groups by trained undergraduate and graduate researchers. The push-in intervention was supplemental to their typical classroom instruction in reading and language arts. That is, a classroom-based intervention model in which instruction is delivered in the classroom rather than removing students for one-on-one or small group instruction. All groups received an average of 15

minutes of supplementary instruction per day, four days a week for eight weeks, for a total of 435 possible instructional minutes. On average, students received 26.3 days of instruction ($SD = 2.26$) across an 8-week period, and therefore an average of 394.5 minutes.

In all three conditions instructors were trained in the Core Intervention Model (Gerber et al 2004; Richards & Leafstedt, 2010). In this model instruction is fast-paced and systematically uses a fixed procedure for scaffolding with graduated prompts to ensure a high rate of correct response. The model has important similarities to direct instruction and strategy components that have proved effective for students who are at substantial risk for learning failure (e.g., Swanson & Hoskyn, 1998). CIM elicits a high density of responses, which create opportunities to provide reinforcement (social praise) and structured, corrective feedback. CIM has been previously implemented with high fidelity in several intervention studies (Gerber et al., 2004; Leafstedt, Richards, & Gerber, 2004; Richards, 2004; Solari & Gerber, 2008).

Treatment Fidelity

Due to the scripted nature of the lessons, fidelity for treatment content was highly regulated. To identify fidelity of CIM implementation, two measures of treatment fidelity were collected on 30% of intervention sessions. On average over the eight weeks of instruction, critical CIM components were implemented over 77% of the time, and there were on average 7.55 response opportunities per minute.

Intervention Content

All instructional conditions shared the following features: frequency, duration and number of lessons; group size; expository passage read-aloud and instructional model (CIM). Each week, an expository passage was read aloud to students in all conditions. These passages were selected from first grade science texts that students were not exposed to outside of the intervention. Vocab-Plus vocabulary words were drawn directly from each week's passage and taught to students in the MA and SR conditions (see below).

All conditions included explicit instruction in phonological awareness and decoding, including phonics (PAD). However, the proportion of PAD varied between the PAD condition (100% PAD) and the Vocab+ conditions (70% vocabulary instruction, 30% PAD). Within the two vocabulary-added conditions, Vocab+ SR and Vocab+ MA, the specific vocabulary instructional methods differed. Table 3 illustrates the proportion of time spent on PA, decoding, and vocabulary the three conditions.

PAD Treatment-control Condition

The PAD condition was based on a previously validated intervention from *Project La Patera*, a 100% PA and decoding intervention that explicitly teaches identification, production, and manipulation of sounds in word- and sentence-level decoding (Gerber et al., 2004; Leafstedt, Richards, & Gerber, 2004). Phoneme sequences were introduced in order of complexity ranging from CVC to CCVCC. Sound and letter sequences were selected to preteach upcoming lessons in the school-adopted reading curriculum. The lessons increased in difficulty in terms of word complexity and by moving from identification to production to manipulation of sounds. Each lesson began with a short PA warm-up activity, such as a round-robin rhyming game and was followed by in-depth activities on PA and decoding, including decoding in the context of a sentence.

Vocabulary Plus PAD Conditions

In both Vocab+ conditions, the same warm-up activity was used as in the PAD condition. Then, students were introduced to vocabulary words selected from the expository text that was read aloud to all groups. Word selection was consistent across the two conditions, and based on Beck, McKeown and Kucan's tiers (2002). Tier II words, or those with relatively high frequency, high utility, and that are useful for understanding the text were selected. These words included nouns, verbs, adjectives, and adverbs and ranged from one to four syllables in length. The words included general words (e.g., sweet), topic specific words (e.g., soil), and cross-discipline academic words (e.g., usually).

Words were introduced in the same manner in both Vocab+ conditions. Pictures with labels were used throughout the lessons to remove the cognitive load of reading words and to provide a visual representation of the target words. Direct instruction in word meanings included the use of synonyms, antonyms, pictures, examples and non-examples, and definitional sentences. Instruction of target words was developed based on instructional research with monolingual, typically developing children (e.g.,

Beck & McKeown, 1991; Nagy & Scott, 2000), children with learning disabilities (see meta-analysis by Jitendra, 2004), and EL (e.g., Carlo et al., 2004; see Lesaux & Geva, 2006).

Table 3. Proportions and Content of Intervention Conditions

PAD	PAD-SR	PAD-MA
PAD (30 % of instructional time for all groups): fast paced, short activities on identifying and manipulating speech sounds; letter-sound correspondence; decoding		
Sequential instruction in PA: rime & onset detection, segmentation, and blending	Introduce review vocabulary words with examples, non-examples, & sentences	
Sequential instruction in decoding: letters, pseudowords, real words, & sentences	Relations among word meanings: Identifying, categorizing, & classifying semantic features	Morphological analysis: identifying & manipulating morphemes, esp. root words & affixes

The program provided multiple exposures in a wide variety of contexts, both within and across lessons. Specifically, words were revisited throughout the eight weeks, and embedded into later activities. Students had many opportunities to develop and demonstrate mastery by identifying and producing target words and their meanings. For example, in the *grab bag* activity, instructors tracked the words pulled from the grab bag to make sure that review words were being discussed as well as novel words. Each condition emphasized different aspects of the words.

Vocab+ semantic relations condition (Vocab+). This condition focused on meanings of words and their relationships among each other, that is, how meaning is organized within the lexicon. Students were taught to group words based on their meanings beginning with two categories that were presented by the instructor, using activities such as picture sorts. As students' understanding of relationships increased, they began to group and categorize target words according to relationships among their meanings. Once students demonstrated mastery in grouping, they moved on to comparing and contrasting concepts and words. Finally, students compared and contrasted semantic features of words, that is, minimal contrastive elements.

Semantic features are underlying properties of the word, and unlike morphemes not necessarily identifiable in the orthography or pronunciation. For example, *bushes* and *weeds* are both alive, have roots, need water to live, and share other similarities, but the primary feature differentiating them is a notion of wildness vs. domestication: one is usually planted and one grows wild, wherever a seed has spread. As new words were learned, students continued to review old words and make new connections. For example, in the semantic features activities, review words such as *soil* were used to describe the properties of new words *bushes* and *weeds*.

Vocab+ morphological awareness condition (Vocab+-MA).

The morphological condition also explicitly taught students to identify meaning, but it focused on meaning in the morphemes, that signal meaning through orthographic and phonological representations. It also addressed the word formation rules that allow those parts to make words. The MA condition addressed both derivational and inflectional forms. For example, students examined several forms of the root word *plant*: *plants*, *planter*, *planted*, *planting*. Activities like manipulation of suffixes to reflect pictures, and identifying suffixes and roots, illustrate the use of morphological awareness.

The MA instruction, like SR, followed a developmental sequence (see Kuo & Anderson, 2006). Students first learned to identify root words, and understand that words can be made up of multiple parts. Then, they were taught about inflectional (that indicate grammatical class) and derivational (that derive new words) suffixes. Finally, they practiced putting together roots and suffixes and identifying real words. All activities were designed to be engaging, such as the cubes game. In this activity, the instructor held two brightly colored cubes (approximately five inches), one with root words on each face, and the other with suffixes on each face. She would toss one cube to one student, the other to another student, and they

would put them together to form a word. Depending on the lesson's goal, the instructor might lead a discussion on the meaning of the word, demonstrate how changing the suffix altered the meaning, demonstrate how the same suffix changed the meaning of different root words in a similar manner, have the students break the word apart, or a combination of these approaches.

Results

The primary goal of this exploratory study was to investigate the effectiveness of an intervention that added PA and decoding to explicit vocabulary instruction without increasing instructional time. To test for main effects of instructional condition, and to examine results for higher risk students, analyses of variance (ANOVAs) were performed. No between-group differences were statistically significant, and standard deviations were large. Because this study was exploratory we continued by examining effect sizes between and within groups to direct future research.

Effect sizes were estimated by dividing standardized mean differences with pooled standard deviations (Cohen's d). Between group effect sizes were calculated to compare the magnitude of difference between groups. Repeated measures effect sizes were calculated to examine the magnitude of growth from pretest to posttest. When the effect size was repeated measures (i.e., pretest-posttest differences rather than posttest differences between groups) the coefficient d was multiplied by .632 to take into account the pretest-posttest correlation (Rosenthal, 1994). According to Cohen's (1988) very general guidelines an effect size of (.2) is small, (.5) is medium, and (.8) is large. In this study, a minimum effect size considered substantively important is greater than or equal to ($d = .25$), which corresponds to a ten percentile point difference between the percentile rank of the average student in one group (50th percentile) and the percentile rank of that average student in another group (*What Works Clearinghouse Intervention Rating Scheme*).

Instructional Condition Effects

Vocabulary. The correlation between pretest and posttest on VOC was ($r = .68$). To account for group differences at pretest and maximize power, an ANCOVA was performed with posttest vocabulary knowledge (VOC) as the outcome variable, pretest VOC as covariate, and instructional condition as the fixed factor. Mean differences between groups at posttest were large but not statistically reliable, $F(2, 67) = 2.263$, ($p = .112$). Although pretest mean differences were not statistically significant, they were sufficiently large to warrant protecting against their influence. Descriptive statistics are presented in Table 4.

Standardized mean differences between groups at posttest indicate that the average student in the MA group performed at the 74th percentile of the PAD group ($d = .64$), and the average student in the SR group performed at the 70th percentile of the PAD group ($d = .54$). Effects on target word vocabulary knowledge were much larger for both vocabulary-added groups than for the PAD group. Within group effect sizes from pretest to posttest were largest for MA ($d = .56$), then SR ($d = .28$), and negligible for PAD ($d = .04$).

Phonological decoding. The correlation between pretest and posttest NWF was $r = .55$ ($N = 71$). An ANOVA (instructional condition by NWF gain score) was conducted to examine between group differences. Gain scores were used for this analysis because there were no missing data at pretest or posttest. The results of the ANOVA did not show the anticipated main effect, $F(2, 68) = 1.02$, $p = .367$. For the PAD group, one Nonsense Word Fluency score was dropped due to administration error

Effect sizes comparing posttest means between groups indicate that the average student in the SR group performed at the 64th percentile of the PAD group ($d = .37$) and the average student in the MA group performed at the 66th percentile of the PAD group ($d = .44$). The within group effect sizes from pretest to posttest were largest for SR ($d = .49$), followed by MA ($d = .33$) and negligible for PAD ($d = .17$).

Performance of Higher Risk Students

Students who were initially lowest-performing on NWF, improved more from pretest to posttest - regardless of instructional condition - than did their peers. The DIBELS benchmarks for performance on this task in mid-first grade are: fewer than 30 sounds per minute = *deficit*, 31-50 = *emerging* and greater than 50 = *established*. In this sample, the median NWF score at pretest was 35 sounds read correctly in one minute, and 40% of students scored at or below 30 sounds per minute. Therefore, the median was identified as the arbitrary cut point for defining higher and lower risk, with the knowledge that a few ($n = 7$) more students would be classified as higher risk by using this method than by using the DIBELS

benchmarks only. Overselecting higher risk students, rather than just using the DIBELS criteria, was done to reduce the possibility of false negatives. The mean was 25 for the higher risk group and 48 for the lower risk group.

Table 4. Descriptive data by instructional condition

	Pre			Post		
	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>
<i>Target Word Vocabulary</i>						
PAD	13	36.46	5.78	18	36.94	7.86
SR	23	37.83	6.81	24	41.17	7.89
MA	22	35.45	6.86	25	41.84	7.5
<i>Nonsense Word Fluency</i>						
PAD	18	35.06	17.91	18	40.33	20.95
SR	26	34.58	12.10	26	48.27	21.69
MA	27	39.78	14.62	27	50.56	25.37

The pre-post effect size for the higher risk students (regardless of instructional condition) was ($d = .69$) on NWF, compared to ($d = .26$) for the lower-risk group on the same task, suggesting much more growth. Among the higher risk students, the MA group had the largest effect size ($d = 1.01$) compared to SR ($d = .65$) and PAD ($d = .63$). In contrast, effect sizes were largest for lower risk students in the SR condition ($d = .47$) compared to MA ($d = .27$) and PAD ($d = -.07$). A Kruskal-Wallis test was performed comparing mean ranks on posttest NWF by instructional condition. A non-parametric test was used because of uneven group sizes. Higher risk student group differences comparing the three instructional conditions were not statistically significant $\chi^2(2) = 1.63, p = .443$ although mean rank was higher for MA (19.94) and SR (19.40) than for PAD (14.96). See Figure 2.

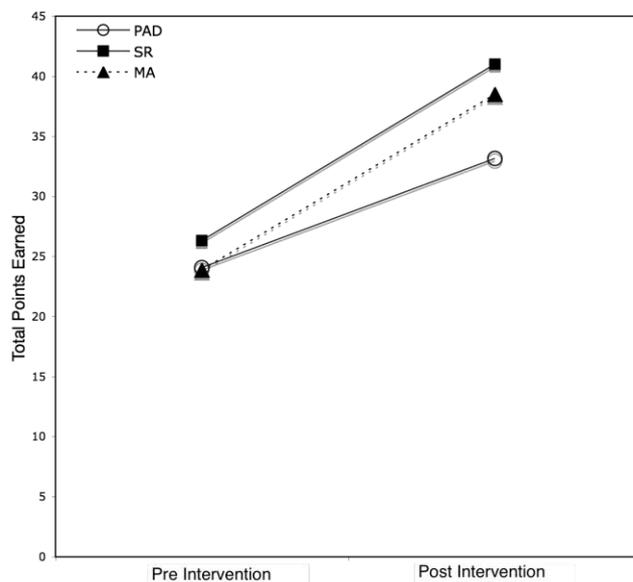


Figure 2. Higher risk student performance on NWF by instructional condition.

Discussion

The findings of this study indicate that a supplementary, explicit, intensive early literacy intervention focused on vocabulary development, PA and decoding can effect change in all three components. As anticipated, students who received vocabulary-plus instruction outperformed those who did not on a measure of target word vocabulary. More interesting, students who spent only 30% of instructional time

on phonological and decoding (PAD) skills and the remain 70% on vocabulary showed gains in PA, reading, and comprehension measures as great or greater than those of their peers who spent 100% of instructional time on PAD skills. Despite the lack of statistical significance, the magnitude of standardized mean differences was moderate to large for most outcome measures, suggesting that for this sample, vocabulary plus PAD instruction maximized instructional time and allowed students to make larger gains in reading skills than they would have in a PAD only intervention. Given that this study had a relatively small number of participants and unequal group sizes, these findings suggest that future research with a more powerful design is in order (see Ives, 2003 for discussion of statistical significance and effect sizes).

The findings from this study provide additional support for the positive effect of vocabulary instruction and concomitant oral language exposure on vocabulary knowledge that has been demonstrated for EL (e.g., Carlo et al., 2004; McLaughlin et al., 2000, Solari & Gerber, 2008). Findings are also consistent with research indicating that ELs who receive code-based instructional intervention make gains in PA and decoding skills (e.g., Gerber et al., 2004; Linan-Thompson, Vaughn, Hickman-Davis, & Kouzekanani, 2003). Moreover, lowest performing students, those with a greater chance of reading difficulty compared to peers, were most likely to benefit from additional instruction, particularly in the MA condition.

PAD Performance as Measure of Efficiency

This study implemented previously validated instructional interventions that use the CIM to teach phonological awareness and decoding, but added a vocabulary component within the same amount of instructional time. Thus, performance on PA and decoding is perhaps the most fundamental measure of *efficiency* in this study. Therefore, to claim that the vocab+ model is an efficient use of classroom time the vocabulary-added instructional conditions needed to demonstrate gains on a measure of PA that were comparable to those of the PAD only group.

The findings support this conclusion, that is, all groups showed statistically reliable growth on the nonsense word fluency (NWF) from pretest to posttest, and students in the PAD-Plus group demonstrated greater average growth on the VOC measure. Furthermore, standardized mean differences (Cohen's *d* adjusted) on NWF were greater for the two vocabulary groups than for the PAD group, with the largest gain in the SR group. Also, initially low-performing students demonstrated the most growth in the vocabulary conditions, especially vocab+ MA.

When considering gains on NWF per instructional minute spent on PA and decoding skills, effects were more robust for the vocabulary-added conditions. On average, students received 394 minutes of instruction. For the PAD group, all of these minutes were by definition spent on PA and decoding instruction. For the SR and MA group, 30% of those minutes (118 minutes) were spent on these skills. The average gain on NWF per instructional minute for the PAD group after removing an outlier was .02 points, compared to .12 for SR and .09 for MA.

Implications of Findings for Practice

In the current study of a low SES primarily EL sample, even the initially lowest performing students demonstrated growth on vocabulary and on phonological decoding. We know that instruction in PA and phonics is necessary for struggling readers to make gains in word reading and reading fluency, but we also know that it is not sufficient to facilitate reading comprehension (see Catts, 2009). This work demonstrates initial support for teaching vocabulary skills side by side with PA and decoding before students struggle with comprehension is a promising practice for at risk readers. Furthermore, in the Vocab+ treatment conditions initial performance was less predictive of responsiveness than in the PAD condition, indicating that the vocabulary-added instruction improved, to a small degree, the trajectory of those of the most at-risk students. That is, students who are extremely low performing on word-level tasks not only benefit from higher order skill development, but may benefit even more than their higher performing peers.

Limitations and Future Research

This study points to integrating higher order language skills with direct instruction in word-level skills as a promising practice for first graders deemed at risk due to their individual or school factors. Moreover, future research should continue to explore the effects of vocabulary plus PAD intervention for the lowest performers in particular. Findings in this study should be interpreted with caution, and used primarily as guidance toward future research due to lack of statistically reliable findings. Sample size and variance

within the sample, including changes in variance between time points, may have led to statistically non-significant findings despite substantive mean differences in several cases. Specifically, because of attrition of one class, the control group was reduced from approximately 36 students to 18. The uneven cell sizes may have contributed to ambiguity in the results.

In addition, although classrooms were randomly assigned to treatment-control or treatment conditions, teacher effects may have influenced outcomes. Another issue is that perhaps the method of instruction (i.e., Core Intervention Model) was the most powerful component and it overwhelmed effects related to specific content being taught. All instructors were heavily coached throughout the eight weeks on the (CIM) behaviors, in particular with direct instruction and the staircase model of correction. Finally, the separation of SR and MA conditions was artificial, and in future work could be abandoned for a more cohesive model.

Future Research

The notion of instructional efficiency has been threaded throughout this discussion, and we argue that it is of paramount importance for children in schools with low resources and high needs, such as the participating school in this study. Teachers have limited time to provide the additional instruction many students need to become effective readers, finding an efficient method of delivering instruction that can effect change in PA, decoding and vocabulary has the potential to greatly impact students' reading abilities. Given the large effect sizes but low reliability of findings in this study, future research with larger sample sizes is clearly needed to measure the efficacy of the vocabulary-added instruction. In addition, more direct measures of efficiency, such as the ratio of time on task to growth in vocabulary, will be necessary to clarify the impact on efficiency as well as efficacy.

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