LSHSS

Research Article

The Relation Between Academic Word Use and Reading Comprehension for Students From Diverse Backgrounds

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Purpose: The aims of the current project were twofold: (a) to describe the use of academic words in written language samples by fifth-grade students and (b) to examine the predictive relation between academic word use in academic writing and reading comprehension.
Method: Investigators utilized written expository responses of 1,128 students in fifth grade who differed in English proficiency and language ability. The sample included 214 students who were English learners (ELs) and 144 students with identified language learning disabilities (LLD). Group differences in the use of academic words from the Coxhead word list were examined.
Results: ELs and students with LLD used academic words less frequently than their peers and demonstrated less variety in their academic word use. There was a significant relation between students' use of academic words and reading comprehension. Academic word use accounted for 16% of the variance in reading comprehension, which was not significantly different for ELs or students with LLD. The relation was moderated by economic advantage, with the strength of the relation being lower for students who were eligible for free/reduced lunch.
Conclusions: Findings support the need for additional research on ways to improve academic vocabulary skills to minimize achievement gaps. The relation between academic word use and reading comprehension warrants further consideration.

Academic language is increasingly recognized as an essential ingredient for success in schools and has received growing attention in language and literacy research (e.g., Lesaux et al., 2014; Pilgreen, 2006; Proctor et al., 2019; Schleppegrell & Colombi, 2002; Snow & Uccelli, 2009). The term *academic language*, which has an arguably nebulous definition, has appeared synonymously in the literature with *language of the schools* and *language that reflects schooling* (Schleppegrell, 2001), *scientific language* (Halliday & Martin, 1993), and *academic English* (Bailey, 2007; Scarcella, 2003). A few researchers (e.g., Snow & Uccelli, 2009) have converged on the definition by Scarcella (2003), which describes academic English as "a variety or register of English used in professional books and characterized by the linguistic features associated with academic disciplines" (p. 9). More recent research cites an expansion on the term *academic language* to include "a constellation of the high-utility language skills that correspond to linguistic features that are prevalent in academic language discourse across school content areas" (Uccelli et al., 2015, p. 338). There is general consensus that the use of academic language in academic texts becomes increasingly common in later elementary grades and middle school grades (Schleppegrell, 2004). As such, in order to understand and converse about academic content, academic language knowledge is essential for students' academic success as they progress through grades.

Given that academic language encompasses the sophisticated language variety used in school contexts, academic vocabulary has been a central feature in much of the research on academic language. The term *academic vocabulary* refers to words that are common to academic textbooks for school-age children (Coxhead, 2000). Academic vocabulary is perhaps the hallmark of academic language in addition to other advanced language components such as complex grammatical structures, discourse connectives, and abstract concepts (e.g., Bailey, 2007; Chamot & O'Malley, 1994). Characterized by an abstract and decontextualized nature, academic words are sometimes referred to as *sophisticated words* due to their tendency to be used in school-based contexts. Such words consist of general academic vocabulary

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that students encounter across multiple academic subjects, such as *contrast, draft, analyze,* and *resource,* as well as academic words that are domain specific or those that shift meaning within specific discipline use, such as *representation* in math and scientific contexts.

Role of Academic Vocabulary Knowledge in Reading Comprehension

In the last decade, there has been increased interest in academic vocabulary and its relative importance to language and literacy skills and broad academic achievement (e.g., Nagy & Townsend, 2012; Ogle et al., 2016; Townsend et al., 2012). There is a growing awareness of the importance of students' knowledge and use of academic language to support reading comprehension (Nagy & Townsend, 2012). Specifically, research has shown that knowledge of academic words predicts a significant amount of variance in academic achievement across multiple disciplines (Townsend et al., 2012). In one such study (Townsend et al., 2012), academic word knowledge accounted for 19%–34% of the variations observed in performance on achievement measures. Underlying relations are supported by a robust literature base substantiating connections between language comprehension, reading comprehension, and academic achievement (e.g., Foorman, Koon, et al., 2015).

Available studies provide promising evidence that knowledge of academic words aids in reading comprehension and supports students' ability to benefit from the curriculum (Nagy & Scott, 2000); however, there remain gaps in available research. Specifically, the study of academic vocabulary use in writing remains understudied. It is posited that the importance of academic vocabulary becomes critical in upper elementary grades as the academic texts place high demands on students' knowledge of academic language for reading comprehension (Fang et al., 2006). However, it is not clear from the literature if the significant relation between academic word knowledge and reading comprehension extends to measures of expressive academic word use. Furthermore, potential moderators of the relation between academic word use and reading comprehension have not been widely examined. It is possible that the relation is moderated by understudied factors (e.g., English proficiency, socioeconomic status).

Importance of Vocabulary in Writing

There is a robust literature base substantiating the importance of vocabulary as an essential dimension of writing and writing quality (e.g., Deno et al., 1982; Grobe, 1981; Wagner et al., 2011). Vocabulary skills are central to conveying a specific concept or idea (Flowers & Hayes, 1981; Scardamalia & Bereiter, 1987) and positively relate to children's writing productivity (Kim et al., 2011). Previous research indicates vocabulary use influences the writing process and writing quality for school-age children (Olinghouse & Leaird, 2009; Olinghouse & Wilson, 2013). Silverman et al. (2015), for example, found the language skills, including vocabulary, of both English learner (EL) and non-EL students contribute to their writing proficiency.

The findings of previous studies provide evidence for significant relations between vocabulary knowledge and writing quality; however, few studies have included measures of vocabulary specificity, academic language, or vocabulary sophistication in writing. Measures of vocabulary based on students' written responses have commonly focused on productivity (total number of words) and diversity of words used (e.g., Fey et al., 2004; Nelson & Van Meter, 2007; Wood et al., 2019). Although measures of vocabulary that capture vocabulary sophistication and specificity are desired, there is limited research in this area, specifically relating to academic word use.

One such study examined academic words specifically as a measure of students' written vocabulary. Researchers Olinghouse and Wilson (2013) compared vocabulary use and writing quality in writing samples from 105 fifth graders. The investigators examined the proportion of academic vocabulary words in addition to a variety of vocabulary measures. Although the authors found significant relationships between content words and vocabulary diversity to different writing genres, there was infrequent use of academic words in the writing samples. The authors reported that academic words comprised 1% of the students' vocabulary use. Results substantiated that vocabulary measures contribute to writing quality, although academic vocabulary specifically was not entered in the regression model.

Potential Influencing Factors on Academic Vocabulary Use

Despite the prevailing view that academic language is essential to writing, reading comprehension, and academic success, there is considerable variability in the rate that students acquire sophisticated or academic vocabulary (Beck et al., 2013). Substantial achievement gaps in acquisition of academic vocabulary knowledge remain (e.g., Townsend et al., 2012). Academic vocabulary is thought to be particularly challenging to acquire because academic words are often abstract words that are not highly salient in meaning. Academic vocabulary words often occur within academic language contexts that are generally associated with cognitively loaded tasks or informational texts densely packaged with content. Furthermore, not all students are likely to have gained experience or exposure to academic words in everyday communicative exchanges (Blachowicz & Fisher, 2000), making it difficult to comprehend the language of texts. Disparities in the frequency of exposure to academic words in print and/or oral language have been attributed to socioeconomic status, cultural context and print exposure, and time spent reading (e.g., Hart & Risley, 1995; Hoff, 2003).

Numerous factors potentially contribute to variability in students' academic word use and may moderate the relation between academic word use and reading comprehension. We highlight three potential factors: (a) socioeconomic/cultural context, (b) English proficiency, and (c) language-based

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disorders, which may influence acquisition of academic words and perhaps moderate the relation between academic word use and reading comprehension. The potential for socioeconomic and cultural context to influence the acquisition and use of academic vocabulary can be understood through the usage-based theory of language acquisition (Tomasello, 2009). Based on this theory, language learning is contingent on students receiving rich linguistic input, discerning the intentions of speakers, and making generalizations to create abstract linguistic constructions. Although the usage-based theory is generally applied to early language learning, the theory may be extended to the acquisition of academic words. The theory proposes that critical components of learning academic language include exposure, extracting the novel word from a longer utterance, connecting the word to a relevant aspect of shared experience, and mapping the form or pattern to the meaning. Applying this theory, binding academic word labels to the referent requires more than just exposure to the word for students to understand enough about the semantics to incorporate the word into their lexicon and use it expressively. The theory emphasizes the interaction between language input, social interactions, and cognitive processes that serve to make connections between exposure and meaningfulness. As such, it can be presumed that cultural context, perceived meaningfulness/relevance, and cognitive–linguistic ability play an important role in acquisition and generalized use of academic words.

Socioeconomic Influences

Given that students may experience differences in their word learning, gaps in the acquisition of academic vocabulary for students from disadvantaged backgrounds may warrant heightened attention for speech-language pathologists partnering with teachers to identify and address the needs of a diverse student population in inclusive educational settings. Students' acquisition of academic vocabulary and risk for underachievement may be influenced (and perpetuated) by a multitude of factors including both genetic language learning skill/propensity and students' environmental experience (Erbeli et al., 2018; Fletcher et al., 2018). As such, students from disadvantaged backgrounds may not have comparable experiences with academic words or equal connectedness to references to academic words in context. In addition to lower frequency of exposure, from a sociocultural perspective, it is possible that academic words may not be equally relevant to students from diverse sociocultural backgrounds.

English Proficiency

In particular, acquiring academic vocabulary words may be substantially more challenging for ELs (Ogle et al., 2016; Townsend et al., 2012) and students with language-based learning disabilities (LLD; Kan & Windsor, 2010; Steele & Watkins, 2010). ELs, as defined by the Institute of Education Sciences, include "students whose home language is not English and whose English language proficiency hinders their ability to meet expectations for students at their grade level." Findings of a study by Townsend et al. (2012) demonstrated significant differences in academic word knowledge between English-speaking monolinguals (n = 212) and students from linguistic minority backgrounds (125) in seventh grade. As Ogle et al. (2016) point out in their text on teaching academic vocabulary words, ELs may not have mastery of Tier 1 words, making it even more difficult to derive the meaning of academic words from exposures in school and texts. Furthermore, academic words are commonly morphologically complex in nature, which may also contribute to difficulties in acquisition.

Language-Based Disabilities

In addition to ELs, students with LLD have been known to have difficulty learning words from context (Steele & Watkins, 2010) and have demonstrated significantly lower novel word learning than age-matched peers in numerous studies (Kan & Windsor, 2010). Given that students with LLD often lack foundational vocabulary, learning academic words with abstract meanings may be substantially more challenging than for their typically developing peers. Based on findings of previous studies on word learning (e.g., McGregor et al., 2002), it would be expected that repeated exposures and explicit instruction may be required for students with LLD to make connections between academic words and their meanings in order to use them in academic contexts such as writing. Furthermore, the metalinguistic awareness that academic writing warrants a different register of language may not be as well developed in students with LLD (Kamhi & Koenig, 1985).

Although it is hypothesized that students with LLD would have difficulty leveraging academic word use during academic writing tasks, there are few empirical studies that examine and describe disparities in academic word use in written language. Previous studies have largely focused on individuals' receptive understanding of academic vocabulary and its role in processing oral language and written text comprehension; however, research on students' generative use of academic language in written language may provide additional understanding of students' language sophistication.

Given the importance of academic language and its potential role in reading comprehension and general language and literacy outcomes, additional research is needed to extend our understanding of typical variability in students' use of academic words in a generative task. To address this important knowledge gap, the current study was designed to examine the use of academic words in students' written language, particularly for students from diverse linguistic and ability backgrounds. The aims of this study were partly, confirmatory, to confirm expected group differences in academic word use, and partly exploratory, in examining the relation between academic words and reading comprehension along with potential moderators of that relationship. Specifically, this study aimed to address the following research questions:

1. To what extent do students in fifth grade use academic words in an expository writing task?

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2. Is there a significant relation between students' use of academic words in a written sample and their performance on standardized assessments of language, literacy, and academic achievement?
3. Does academic vocabulary use in writing predict reading comprehension, and is the relation moderated by linguistic background and free/reduced lunch (FRL) eligibility?

Method

Data for this study were gathered as part of a larger study of the impact of word knowledge instruction on the writing skills of students in fifth grade. The project was approved by the university human subjects committee (HCS # 2018.25857). The larger study included 2,555 consented students of which 1,128 (44%) were randomly selected for the current study examining students' academic word use in written responses.

Participants

Participants in this study included 588 girls and 540 boys enrolled in fifth grade in 41 elementary schools in a large school district. Descriptive information on race and eligibility for FRL status is provided in Table 1. Using district data, students were further categorized into groups according to English proficiency and their identification as having a language-related exceptionality with eligibility for special education services.

Linguistic Background and Proficiency

This study included students from diverse linguistic backgrounds who demonstrated varied performance in English proficiency. Based on the district's administrative data, the study included 469 participants who spoke a language other than English at home and 659 who were monolingual English speakers. Students in the current study were from homes in which 35 different languages were spoken; however, the large majority of bilingual/multilingual students were from Spanish-speaking households (n = 416). Varied languages were identified by other students (n = 53), students of homes in which other languages were spoken (not Spanish or English). Languages reported by five or more households included Haitian Creole, Vietnamese, Arabic, and Chinese. Additional information on eligibility for the English to Speakers of Other Languages (ESOL) program support and English proficiency was obtained from the district's assessment records, which was available for 429 students. Of 429 students who reported another language spoken at home, 214 (49.89%) were identified as being ELs, labeled by the district as having limited English proficiency, and enrolled in ESOL support services. The ELs demonstrated numerically lower performance on the standardized assessment than their proficient peers in the same classrooms. On average, ELs scored equivalent to the 25th percentile rank on a vocabulary knowledge task (VKT; SD = 20), compared to their classroom peers who demonstrated average scores equivalent to the 44th percentile rank (SD = 27). Similarly, on a reading comprehension test, ELs demonstrated an average score equivalent to the 18th percentile rank (SD = 20), whereas their proficient peers averaged scores equivalent to the 39th percentile rank (SD = 29).

Among students considered proficient in English were those who had been reclassified, specifically 147 (34.27%) who had previously been enrolled in ESOL and exited less than 2 years ago. Additionally, 57 (13.29%) students had previously been enrolled in the ESOL program, exited 2 or more years ago, and passed a 2-year follow-up. The remainder of the students who spoke a language other than English at home (11 students or 2.56%) had not been referred or identified as eligible for ESOL support services.

Table 1. Descriptive characteristics of fifth-grade student participants.

		Total sample (N = 1,128)		English learner (n = 214)		English proficient (n = 914)	
Characteristic		***n***	**%**	***n***	**%**	***n***	**%**
FRL	Eligible for FRL	864	78.3	182	85	682	74.6
	Not eligible	11	1	1	0.5	10	1.1
	Did not apply	229	20.3	31	14.5	198	21.7
	Missing data	24	2.1			24	2.6
Race/ethnicity	Hispanic	586	52	201	93.9	385	42.1
	Black	290	25.7	6	2.8	284	31.1
	White	162	14.4	2	0.9	160	17.5
	Multiracial	50	4.4	3	1.4	47	5.1
	Asian	20	1.8	2	0.9	18	2
	Missing data	20	1.8	0	0	20	2.2
Exceptionality[a]	No identified exceptionalities	984	87.2	164	76.6	820	89.7
	Specific learning disorder	104	9.2	34	10	70	7.7
	Language impairment	48	4.3	25	7	23	2.5
	Articulation disorder	28	2.4	10	3	18	2

[a]The number for exceptionalities exceeds the sample size since some students with language learning disabilities had one or more of the exceptionalities and are therefore double counted. Specifically, a number of students with specific learning disorders or language impairment also had articulation disorders. FRL = free/reduced lunch.

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Students With LLD

The current study was conducted in inclusive classrooms that included students with identified exceptionalities who received special education support services for language-based disabilities. District data were used to determine if the student was identified as having a language-based disability. Based on the district's classification system, there were participants with three designations that were considered language-based disabilities, including language or communication impairment, language learning disability, and autism spectrum disorder. The term *language impairment* is used by the district to describe students with communication disorders, such as expressive or receptive language impairment that adversely affects the students' educational performance. A *language learning disability* is used by the district to refer to a disorder in one or more of the basic learning processes involved in understanding or in using language, spoken or written, that may manifest in significant difficulties affecting the ability to listen, speak, read, write, or spell (e.g., dyslexia, dysgraphia, or developmental aphasia). Finally, *autism spectrum disorders* is used to refer to individuals with autism, Asperger's syndrome, Rhett's disorder, or pervasive developmental disorder (Not Otherwise Specified).

This criterion resulted in inclusion of 144 students with LLD. Of the 144 students with LLD, 94 were proficient English speakers and 50 were also categorized by the district administrative data as being ELs and received ESOL support services in addition to exceptional student support services. The students with language-based disabilities demonstrated numerically lower performance on the state assessment than their participating peers in the same classrooms without exceptionalities. On average, students with LLD scored equivalent to the 28th percentile rank on a VKT (SD = 22), compared to their classroom peers who demonstrated average scores equivalent to the 42nd percentile rank (SD = 27). Similarly, on a reading comprehension test, students with LLD demonstrated an average score equivalent to the 18th percentile rank (SD = 22), whereas their peers without exceptionalities averaged scores equivalent to the 37th percentile rank (SD = 29).

Measures

Writing Task

Researchers collected students' written language samples based on an expository writing task that was used by the partnering schools as an interim writing assessment. The use of this writing task, which was implemented district-wide as a curriculum-based assessment measure, presented advantages in feasibility, minimized additional assessment demands on students, and was considered familiar and meaningful to partnering school personnel. The prompt challenged writers to a dual purpose: to inform about the benefits of fitness and to persuade the reader to consider fitness routines. Expository and informative writing are recognized by the Institute of Education Sciences Practice Guide among main purposes of writing for elementary school students (Graham et al., 2012; The Writing Site, 2008). The purpose of persuasive writing is for students to share an opinion in a manner that convinces the reader that this point of view is correct or valid.

For the writing task used in this study, teachers distributed a packet containing two written passages about the benefits of exercise, directions for the writing task, and lined paper. The directions instructed students to read two passages, plan a response explaining how fitness can contribute to unexpected outcomes, write the response, and revise and edit the response. The first passage pertained to the unexpected outcomes of fitness. The passage was seven paragraphs long (one and a half pages double-spaced) and contained subheadings on paragraphs. The second passage was about the benefits of fitness for an individual who was blind. The second passage was approximately two pages in length. The passages contained 18 words from the Coxhead academic vocabulary list, three of which occurred twice in the passages (*challenge, environment,* and *physical*). Students were given 120 min to read the two passages and write a response explaining the benefits of fitness.

Academic Vocabulary

Using the students' writing samples, the authors examined academic vocabulary use. Only text in English was considered in the samples for analyses. The authors identified academic vocabulary based on the Coxhead word list (Coxhead, 2000). The Coxhead word list was reportedly compiled from a corpus of 3.5 million words of written academic texts. The academic words consisted of 570 word families that account for approximately 10% of the total words in academic texts outside of the 2,000 most frequently occurring words in English. To ensure the academic word list included words that appear across the various academic subject areas, the corpus for the Coxhead (2000) academic word list involved 28 subject areas organized into seven general areas of four disciplines, including science, arts, economics, and law. Words were selected for inclusion in the academic word list if they appeared in the corpus of 3.5 million words with at least 100 occurrences. On average, the words had at least 25 occurrences in each of the four sections of the corpus.

Measures of academic words in the current study include total number of occurrences of academic words and number of unique academic words. *Total* occurrences include multiple occurrences of the same word. In contrast, *unique* academic words are used here to the number of different academic words. This measure refers to novel occurrences of the academic word without regard for derivations within word families, which were considered the same word.

Standardized Language and Literacy Achievement Measures

We focused on four oral language measures of the Florida Assessments for Instruction in Reading–Florida Standards (FAIR-FS; Foorman, Petscher, & Schatschneider, 2015). Four measures were of interest, including (a) Word Recognition, (b) Vocabulary Knowledge (including recognition of morphological patterns), (c) Syntactic Knowledge, and

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(d) Reading Comprehension. The FAIR-FS is a computer-adaptive assessment for Grades 3–12 that was developed under Institute of Education Sciences grants and licensed to the Florida Department of Education royalty free. Task descriptions and psychometric information are provided by the authors (Foorman, Petscher, & Schatschneider, 2015), and latent profiles and their association with standardized reading outcomes have been derived from the normative sample (Foorman et al., 2017).

Word Recognition Task

In the word recognition task, students identify a word from a drop-down menu that corresponds to the word pronounced by the computer (e.g., identify the target "assembly" from *assembally*, *assemble*, *assembly*). Ten percent of the targets are nonwords in order to test grapheme–phoneme correspondence rules (i.e., decoding), and the other 90% are real words selected based on grade-level frequencies (Zeno et al., 1995). Distractors represent orthographic patterns known to predict reading comprehension (García & Cain, 2014). Marginal reliability across Grades 3–10 is .86, .88, and .93 for fall, winter, and spring administrations, and concurrent correlations range from .30 to .46 with Torgesen et al.'s (2012) Test of Word Reading Efficiency (Foorman, Koon, et al., 2015).

VKT

In the VKT, students select from a drop-down menu the word that best completes the sentence. Although this subtest is titled VKT, correct responses require students to recognize morphological patterns in words. Based on the justification in the technical manual, measuring students' recognition of morphological patterns is purported to generalize recognition of new words (Foorman, Petscher, & Schatschneider, 2015). Response options vary in morphological structure (e.g., *In some states you can get a driver's [permission, permissive, permit] when you are fourteen years old*). Evidence for this task's validity is provided by (a) the 2%–9% unique variance it explained in the FAIR-FS reading comprehension at the end of the year, after controlling for prior reading comprehension, word analysis, and text reading efficiency (Foorman et al., 2012) and (b) concurrent correlations with Dunn and Dunn's (2007) Peabody Picture Vocabulary Task–Fourth Edition ranging from .47 to .67 (Foorman, Petscher, & Schatschneider, 2015). Marginal reliability across Grades 3–10 is .91, .89, and .90 for fall, winter, and spring performance.

Syntactic Knowledge Task

In the syntactic knowledge task, the computer reads aloud a sentence on the screen that has a missing verb, pronoun, or connective, and students select the best response from a drop-down menu of words in the same form class that best completes the sentence. An example of an item with connectives is as follows: "Pizza is one of my favorite foods, [although, as, when] we only get to eat it on special occasions." Evidence for the validity of connectives in predicting reading comprehension has been demonstrated in several studies (e.g., Cain et al., 2005; Uccelli et al., 2015; van Silfhout et al., 2015) and by concurrent correlations ranging from .37 to .61 with the Grammaticality Judgement subtest of Carrow-Woolfolk's (2008) Comprehensive Assessment of Spoken Language (Foorman, Petscher, & Schatschneider, 2015). Marginal reliability across Grades 3–10 is .93, .92, and .93 at the fall, winter, and spring administrations.

Reading Comprehension Task Reading Comprehension

The reading comprehension task portion of the FAIR-FS was administered to assess students' reading ability level. Reading comprehension was of interest in the current study as studies provide significant evidence that reading comprehension reflects both decoding and oral language skills in school-age students (e.g., Foorman et al., 2012). For this task, students silently read a passage ranging from 200 to 1,300 words in length. After each passage, students are prompted to answer seven to nine multiple-choice questions. The task is not timed; however, the subtest takes an average of 15 min. Students' are given the following instruction: "Please read the passage and answer all the questions. You may read the passage silently and you can refer back to the passage whenever you need to." Concurrent validity (r = .67–.74) with the Stanford Achievement Test–10th Edition is reported in the FAIR technical manual (Foorman, Petscher, & Schatschneider, 2015).

Procedure

The investigators ensured all of the writing samples were transcribed into the electronic database for analysis using the Systematic Analysis of Language Transcripts (SALT) program. Research assistants typed the written samples into a Word document to prepare it electronically for graduate research assistants who reviewed the paper copies against the electronic file to check accuracy and formatted the transcript using SALT conventions. A subset (20%) was typed by multiple research assistants independently to compute agreement, resulting in 98% agreement at the word level. Because the SALT program has specific formatting conventions, a check for formatting errors was conducted by another research assistant prior to running SALT analyses.

To calculate the total number of academic words used, the investigators created a custom word list in SALT that included all the words on the Coxhead Academic Word List. After selecting transcripts for the 1,128 participants in a rectangular data file, we explored the occurrences of the custom word list for all the transcripts at one time. The software program was used to generate an automated data report on the number of occurrences of each academic word within each transcript, displaying each item in the word list as a separate variable.

Analytic Strategy

To address the research questions of the study, we first computed descriptive statistics including means, standard deviations, and correlations for the entire sample. To

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investigate variability in academic word use across the diverse sample, a series of hierarchical linear models (HLMs) were fit, with students nested within schools. In the first two HLMs, we partitioned the variance into between-school variance and between-students within-school variance on academic word use and number of unique academic words used. In the next set of models, we estimated group differences on dependent variables for EL speakers versus proficient speakers, students with LLD versus without LLD, EL without LLD versus EL with LLD, and English proficient with LLD versus English proficient without LLD on the two dependent variables. The second research question was investigated by estimating correlations between academic word use, unique academic word use, and measures of Word Recognition, Vocabulary Knowledge, Syntactic Knowledge, and Reading Comprehension. Finally, the third research question, we fit HLMs to examine the relationship between academic word use and reading comprehension and examined EL status, free/reduced-price lunch, and LLD status as potential moderators.

Results

Average Use of Academic Words

To address the first research question, we first describe the total number of academic words and number of different academic vocabulary used in writing by students in fifth grade. Overall, students demonstrated 5.3 academic words (SD = 4.85) in their written responses. There was substantial variability between students with a range of zero to 43 academic words in written responses. Table 2 displays descriptive statistics on academic word use by groups of students who differed in English proficiency and identification of LLD. The means and standard deviations are provided in Table 3 to describe academic vocabulary use by students of diverse language backgrounds, including ELs and students with and without LLD.

To examine variability in students' use of academic words, we examined the use of academic words between students who differed in English proficiency, exceptionality, and socioeconomic backgrounds. For these analyses, we fit a series of HLMs with students nested within school and school, was estimated as a random effect in the prediction of academic words. First, we fit an unconditional model that partitioned the variance into two components: the variance between schools and the variance within schools between students. The random effects of this model showed significant variance at the school level (.72; $\chi^2(1) = 9.56$, p = .002) with an intraclass correlation coefficient of .72/27.8 = 2.6%. Students' use of academic words differed between groups based on English proficiency when nested within schools, $t(1, 011.1) = -4.5$, ($p \leq .0001$) with a Cohen's d effect size of 0.37. On average, ELs produced fewer academic words in written responses, whereas students who were proficient English speakers demonstrated a higher rate of use of academic words. In addition, to differences in rate of occurrence, the groups differed in variety of different unique academic words used, with ELs demonstrating fewer unique academic words. As a group, students who were proficient in English demonstrated a total of 141 different academic words, whereas students who were ELs demonstrated 63 different academic words. Recognizing that there were varying language abilities and exceptionalities within both groups of students, we considered potential within-group differences. ELs (without LLD) demonstrated a low number of academic words (M = 3.95, SD = 0.29) and limited variety of different academic words compared to proficient English-speaking students (without LLD) who demonstrated 5.89 academic words on average (mean difference = 1.94).

Next, we compared the occurrence of academic words in the written responses of students with LLD and their peers nested within schools. There was not a significant difference between group when nested within school in the use of academic words in writing, $t(1023.7) = 1.8$, p = .068. On average, students with LLD appeared to use fewer academic words than their peers without LLD, but it was not a statistically significant difference. In total, there were 141 different academic words that occurred in responses of students without exceptionalities and 57 different academic words in the written responses of students with LLD.

To examine potential within-group differences for students with LLD, we also compared academic word use for students from different linguistic backgrounds (refer to Table 4). Within the group of students with LLD, there were no significant differences between ELs and English-proficient students in the rate of academic word use in written responses (p = .933). When considering the number of unique academic words used, there were significant

Table 2. Average use of academic vocabulary words by groups differing in proficiency and ability.

Groups	*n*	Rate of use *M* (*SD*)	No. of different academic words *M* (*SD*)	Total no. of different academic words
English proficient[a]	914	5.94 (4.93)	3.69 (2.84)	141
English learners[a]	214	3.83 (3.83)	2.74 (2.34)	67
No language disorders	984	5.56 (4.93)	3.69 (2.79)	141
Language learning disabilities	144	3.63 (3.85)	2.32 (2.39)	53

[a]Proficiency groups did not exclude students with exceptionalities. Similarly, language learning disability grouping variable did not exclude students based on English proficiency.

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Table 3. Average use of academic vocabulary words within groups by proficiency and ability.

Group	*n*	Rate of use *M* (*SD*)	No. of different academic words *M* (*SD*)
ELs without LLD	164	3.95 (0.29)	2.36 (2.05)
ELs with LLD	50	3.62 (3.43)	2.87 (2.41)
English proficient with LLD	94	3.67 (4.08)	2.31 (2.57)
English proficient without LLD	820	5.89 (0.17)	3.85 (2.83)

Note. ELs refer to students who are English learners and categorized by the district as having limited English proficiency. LLD = language learning disabilities.

within-group differences. Specifically, proficient students without LLD used a wider variety of academic words than EL students with LLD. For ELs, there were no significant within-group differences in the variety of different academic words used ($p = .181$) when comparing ELs with and without LLD.

Next, we compared the occurrence of academic words between students who differed in economic background based on eligibility for FRL. Students' use of academic words differed between groups based on FRL when nested within schools, $t(1104.9) = -2.74$, $p = .006$, with a Cohen's d effect size of 0.20. On average, students who were eligible for FRL produced fewer academic words ($M = 5.1$, $SD = 4.7$) in written responses than students who were not eligible for FRL ($M = 6.1$, $SD = 4.6$), although the overall mean difference was approximately one academic word per written response.

Relation Between Use of Academic Vocabulary and Reading Comprehension

To address Research Question 2, we examined the relation between academic word use and performance on language and literacy assessments. First, correlational analyses were conducted to describe relations between the number and proportion of academic vocabulary words with performance on standardized measures of language and literacy achievement. As demonstrated in Table 5, results indicated a positive relationship between academic word use and reading comprehension ($r = .309$, $p \leq .0001$), as well as academic word use and vocabulary knowledge ($r = .217$, $p \leq .0001$). Additionally, there were statistically significant relationships between academic vocabulary use and performance in syntactic knowledge ($r = .142$, $p \leq .001$) and word recognition ($r = .096$, $p = .004$); however, these were considered to be trivial in strength.

To answer Research Question 3, we examined moderators of the relationship between academic word use and reading comprehension at the school and individual level (refer to Table 6). Again, we fit a series of HLMs with students nested within schools. The first model estimated the amount of school- and student-level variance in reading comprehension that is accounted for by number of academic words. At the school level, academic word use accounted for 39% of the school-level variance in reading comprehension. The relationship between academic word use and reading comprehension did not significantly differ by school. At the individual level, academic word use accounted for 16.3% of the variance in reading comprehension. Overall, an increase of one academic word was associated with a 5.5-point increase in reading comprehension.

Additionally, we examined the characteristics of the students (EL status, LLD status, FRL) as potential moderators of the relation between academic word use and reading comprehension. There was no differential relation between groups in how academic word use predicts reading comprehension. In other words, the relationship between academic word use and reading comprehension was similar for students from differing linguistic and language ability backgrounds. However, the relation between academic word use and reading comprehension was moderated by socioeconomic status (see Table 6). The strength of the relation between academic word use and reading comprehension was lower for students from economically disadvantaged backgrounds measured by FRL eligibility (see Figure 1). For students who were eligible for FRL, an increase of one academic word was associated with a 4.5 increase in reading comprehension. In contrast, for students from economically

Table 4. Group comparisons in average use of academic vocabulary words in written responses.

Group comparison	Mean difference	*t* (*df*)	*p*
English proficient vs. English learner	2.11	2.68 (185.3)	.008
Students with LLD vs. students without LLD	1.93	3.54 (185.3)	< .00001
EL without LLD vs. EL with LLD	0.33	5.85 (87.6)	.56
English proficient with LLD vs. English proficient without LLD	2.22	4.92 (128.5)	< .00001

Note. EL refers to students who are English learners. These contrasts were performed with Welch corrections. LLD = language learning disabilities.

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Table 5. Correlations between students' academic word use and performance on standardized measures of language and literacy, variable correlations, and number of participants.

Variables	*N*	2	3	4	5
1. Academic Words	1,128	**.096**	**.217**	**.309**	**.142**
2. Word Recognition	872	872	**.177**	**.267**	**.146**
3. Vocabulary Knowledge	871	871	871	**.555**	**.398**
4. Reading Comprehension	796	796	796	796	**.480**
5. Syntactic Knowledge	763	763	763	763	763

Note. The number of participants is displayed on the lower portion of the table. Correlation coefficients are displayed in bold on the upper portion of the table. All correlations were significant at the .01 level with $p < .001$. All tests were subtests of the Florida Assessments for Instruction in Reading, Aligned to the Language Arts Florida Standards (Foorman, Petscher, & Schatschneider, 2015).

advantaged backgrounds, an increase of one academic word was associated with an increase of 8.89 in their reading comprehension score. This relationship was significant for both groups of students.

Discussion

Key Findings

Students generally used few academic words in their written expository responses, and the average number of academic words varied across students. The use of academic words was associated with performance on standardized language and literacy measures. In particular, results demonstrated a significant relation between academic word use in written responses and performance on standardized measures of reading comprehension and vocabulary knowledge. The relation between academic word use and reading comprehension was similar across students who differed in proficiency and ability backgrounds. The strength of the relationship was moderated by FRL eligibility.

Comparison to the Existing Literature

The current findings substantiate previous findings, pointing to gaps in academic language for students from linguistic minority backgrounds that may contribute to additional risk for poor academic achievement (e.g., Townsend et al., 2012). Although the underlying cause of the observed group differences cannot be determined, previous studies have proposed factors that potentially contribute to differences in the frequency of exposure to diverse vocabulary words beginning at an early age, including socioeconomic status, print exposure, and home literacy practices (e.g.,

Table 6. Parameter estimates examining moderators of the relation between academic words and reading comprehension.

Model	Effect	Estimate	*t* value/chi squared	*df*	*p* value
Unconditional model	Intercept	425.6	92.4	37.5	< .0001
	School Random Effect	643.5	16.9	1	< .0001
	Residual	8226.4			
EL status	Intercept	409.7	69.3	98.2	< .0001
	Acad Words	5.3	8.2	792.4	< .0001
	EL Status	–47.4	4.2	794.4	< .0001
	Acad Words × EL	–1.9	–1.0	786.5	.333
	School Random Effect	383.6	17.9	1	< .0001
	Residual	6481.8			
Free/reduced lunch	Intercept	402.2	35.7	572.8	< .0001
	Acad Words	8.9	6.4	781.6	< .0001
	FRL	–3.6	–0.31	787.0	.76
	Acad × FRL	–4.4	–2.8	788.5	.005
	School Random Effect	336.3	13.9	1	.0002
	Residual	6751.6			
LLD status	Intercept	401.7	71.0	78.0	< .0001
	Acad Words	5.5	8.8	793.6	< .0001
	LLD	–58	–2.7	784.1	.007
	Acad Words × LLD	–1.9	–0.53	777.5	.594
	School Random Effect	369.7	15.4	1	< .0001
	Residual	6709.5			

Note. FRL refers to eligibility for free or reduced lunch. Acad Words refers to total number of academic words in written response. EL = students who are English learners; LLD = language learning disabilities.

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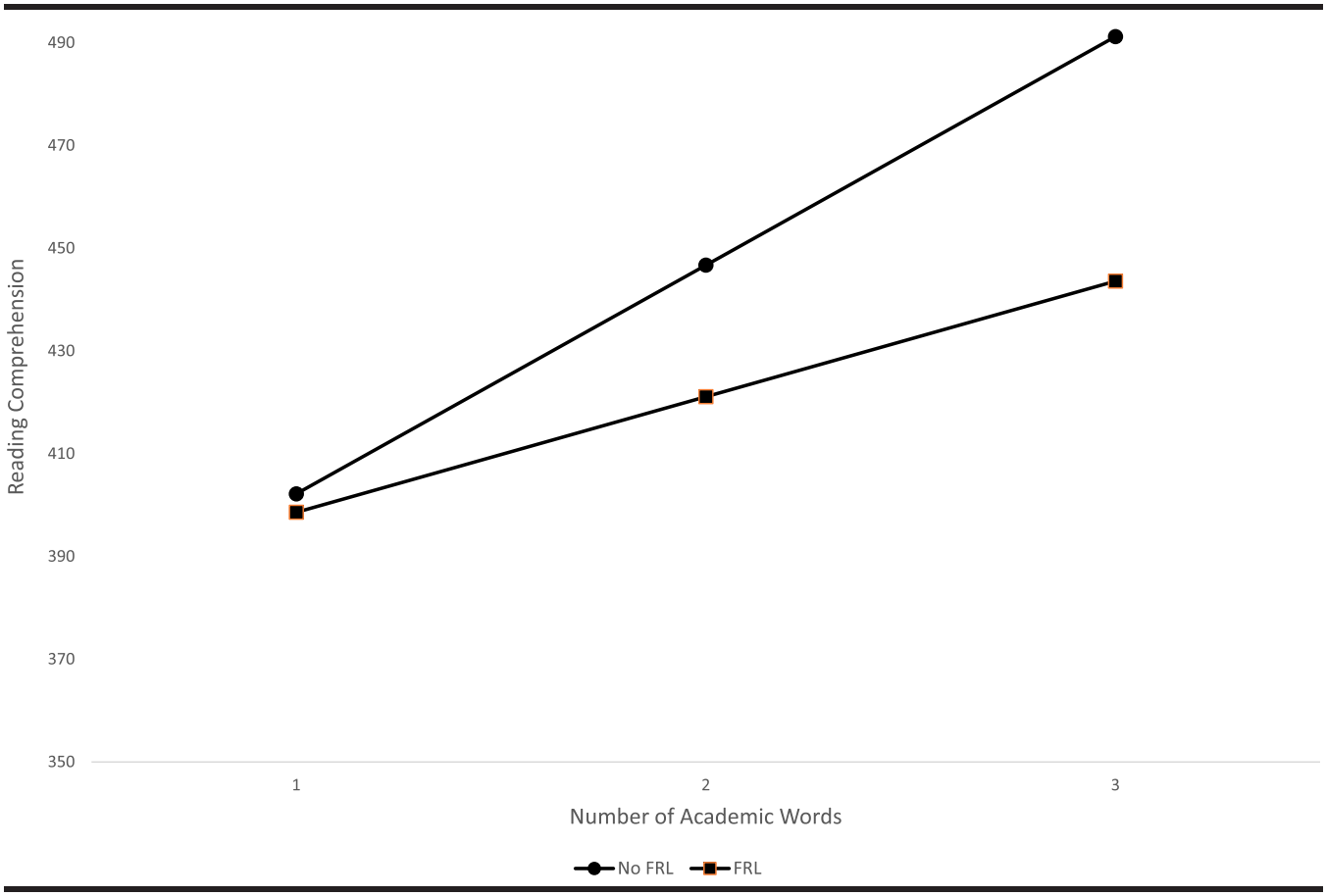
Figure 1. Relation of academic words to reading comprehension by free or reduced lunch (FRL) eligibility.



Dickinson & Porche, 2011; Hoff, 2003; Phillips & Lonigan, 2009). The significant variability between students in academic word use may reflect inequities of experience, in that not all students gain sufficient experience or exposure to academic words in their everyday communicative exchanges (Blachowicz & Fisher, 2000).

The current findings are aligned with what we would expect considering the usage-based theory of language acquisition (Tomasello, 2009). Applying this theory, binding academic word labels to the referent would be expected to require rich input for students to understand enough about the meaning of an academic word to incorporate the word into their lexicon and use it expressively. Extending the importance of language input, social interactions, and cognitive–linguistic ability to making connections between academic word exposure and meaningfulness/relevance, it is not surprising that ELs with and without language-based disorders would demonstrate significantly lower use of academic words in writing.

The current findings bring to light that some students experience challenges in using academic language in writing and greater attention is warranted to the relation between vocabulary, writing, and reading comprehension. The lack of academic vocabulary may be expected to compound difficulties in text comprehension in later grades when informational texts are densely packaged with content and sophisticated word use. The current study indicates that students' academic word use in written language is related to their performance on standardized measures of reading comprehension. Although this study did not directly test causal mechanisms and additional research is needed to further consider causality, we suspect there is dual directionality in the relation between academic word knowledge and reading comprehension. It seems logical that students' academic word knowledge facilitates their ability to understand the language of texts when reading. Simultaneously, it is also likely that students with better reading comprehension may acquire academic words more readily. This notion acknowledges that understanding the text surrounding an academic word may aid students in deducing the meanings of academic words from the context or bootstrapping meanings from the syntax.

The relation between academic word performance and reading comprehension substantiates findings in the literature that suggest that academic word knowledge is associated with better comprehension of text (Nagy & Scott, 2000). The current findings indicating academic word use accounts for 16% of variance in reading comprehension

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at the individual level and 34% of school-level variability are similar to previous findings reported in a study by Townsend et al. (2012). The authors reported that general academic word knowledge accounted for 19%–34% of the variability observed in achievement measures. Taken together, the current findings on written academic word use and related findings on academic word knowledge in previous study, these relations substantiate the important connectedness between expressive and receptive language, reading comprehension, and academic achievement (e.g., Foorman, Koon, et al., 2015).

Unique Contributions

Perhaps more unique to this study is the finding that the relation between academic word use and reading comprehension is similar across students who differ in proficiency and ability backgrounds. This finding substantiates that, despite students' diverse backgrounds and relatively low use of academic words, academic vocabulary *matters* and is importantly connected to reading comprehension. Additionally interesting in the current results is the finding that socioeconomic status moderates the relation between academic word use and reading comprehension. This finding may suggest that, although academic word use predicts reading comprehension, for students from disadvantaged backgrounds, there is a larger proportion of other influencing factors, unmeasured in the current study, that also contribute to the variability in reading comprehension in addition to academic word use.

Previous research has pointed out disparities in knowledge of academic language and subsequent academic achievement. This study is one of few, if any, that describe expressive use of sophisticated academic words in writing by students from diverse backgrounds. The examination of students' use of academic words in an authentic curriculum-based writing assessment task offers a unique contribution to broaden our understanding of disparities in academic vocabulary. We argue that the power of academic language comes not just in recognizing academic word meanings but also in leveraging their use during academic writing. There are few, if any, empirical studies that describe school-age students' sophisticated vocabulary use in writing, particularly in inclusive classrooms rich in cultural, linguistic, and ability diversity.

Perhaps the most unique contribution of the current study is that it extends the literature on the relation between academic words and reading comprehension with consideration of differential relations between groups who differ in proficiency and ability backgrounds. The fact that there was no interaction between proficiency or ability with the relationship is an important contribution in confirming that academic words relate to reading comprehension for all students in inclusive classrooms regardless of proficiency and ability level.

A unique advantage of the current inquiry was the use of open-ended written responses to examine academic vocabulary, which may have prevented potential constraints of ceiling effects, allowing us to observe group differences without suppressing potential differences by closed sets of choices or a limited range of occurrences. The fact that the number of potential academic words used was open-ended allowed for observed variability across groups that differed in proficiency and ability. As such, these findings extend the knowledge base and enhance understanding of gaps in academic vocabulary by demonstrating differences in the use of academic words, rather than focusing solely on recognition of words. In addition, the current findings suggest that the gaps are apparent in written text composition, which is relatively understudied.

Implications

The current findings reiterate concerns for achievement gaps in academic language acquisition for students from disadvantaged backgrounds, as noted in the previous literature (Townsend et al., 2012). The group differences indicate that we cannot assume that all students have equitable or sufficient opportunities to acquire English academic words or that the sociocultural relevance of academic words is comparable across students from diverse cultural and linguistic backgrounds. The observed gaps in academic vocabulary use call for additional research to identify malleable factors that contribute to students' vocabulary, academic writing, and reading comprehension to lead to development of innovative approaches to improve outcomes. Although identifying the cause of the word gap is beyond the scope of the current study, it is possible that students from diverse linguistic and ability backgrounds have fewer meaningful connections with academic word meanings or experience a relevance gap. Alternatively, it may be that students experience inadequate learning supports for acquisition of academic words, which lends support for efforts to intensify instructional experiences with academic words, ensure exposure to academic words, and heighten awareness of academic words within the general curriculum.

The current findings substantiate the importance of considering the relationship between vocabulary, academic writing, and reading comprehension for diverse classrooms and schools. Additional research is needed to further examine the relationship and empirically test strategies to improve achievement. Speech-language pathologists may consider partnering with classroom teachers to increase awareness of academic language and implement instructional supports for vocabulary and reading comprehension. Recognizing that academic words occur frequently in classroom textbooks (Fang et al., 2006) and knowledge and use of academic words is related to academic success, it seems critical for educational personnel to consider linguistic scaffolding or other instructional supports to facilitate students' access to the academic language of texts.

Further research is needed to identify the most effective practices for improving students' knowledge and use of academic language. Although this study was not designed to identify or test effective practices for instruction, findings of related research point to promising active ingredients that

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warrant further empirical study. Specifically, findings of intervention studies suggest that robust vocabulary instruction includes approaches that emphasize morphological problem-solving to deduce word meanings (e.g., Crosson et al., 2019; Lesaux et al., 2014; McKeown et al., 2018), include multiple exposures to targets (e.g., Apthorp et al., 2012; Blachowicz & Fisher, 2000; Schwab & Lew-Williams, 2016), and integrate explanation of word meanings within meaningful contexts (e.g., Dalton et al., 2011; Snow et al., 2009).

Limitations

It should be noted that the task demands of writing in response to reading a passage may have heightened the contrasts in performance between groups. Notably, the cognitive and linguistic demands are quite high in a 2-hr task that requires reading passages in English and composing a written response. As such, ELs and students with language-related learning disorders would be expected to be at a likely disadvantage in performance; however, the task was an authentic classroom-based writing assessment and not a contrived research-developed writing task. Despite the considerably high demands of the task, by using the existing classroom measure, it likely reflects the realistic challenges and expectations for fifth-grade students.

We acknowledge that academic word use is not a proxy for overall academic language knowledge. Additionally, results should be interpreted cautiously, with the understanding that the task did not explicitly instruct students to try to use academic words or may not have sufficiently required or elicited the use of academic vocabulary. As such, the results may not reflect students' "optimal" use. Furthermore, recognizing that the current study assessed academic word use in an expressive written language task, expressive use of vocabulary is not intended to serve as a proxy for receptive understanding. It is possible that measuring spontaneous use of academic words in written responses to a prompt may underestimate students' knowledge and understanding of academic words. Despite not using academic words in this expository writing task, it is possible that students were capable of composing written responses with other academic words if the task would have explicitly demanded their use or if students were prompted to use words from a list. Recognizing this as a limitation in the current study, further research including various prompts and types of texts would be interesting to see if the results replicate across different genres of writing. Additionally, obtaining multiple written samples per child would be preferred; however, only one sample was elicited in the current study, which the authors recognize as a limitation.

The contrasts between groups in the current sample should also be interpreted cautiously, recognizing that limited information was available regarding specific characteristics of the participants. Prior educational history regarding late-arriving ELs was not available. Similarly, specific instructional supports received by students were not available to the researchers. Furthermore, important secondary descriptive data may have proven useful to consider (e.g., performance on cognitive tasks) but were unavailable. Because this study used administrative data from the school district, the researchers did not have access to information on the degree of severity of the language learning disability. However, this limitation is partially mitigated by the inclusion of performance data on standardized measures of language and literacy.

Suggestions for Future Research

Future studies are needed to examine the use of academic words in other types of writing tasks. Expository writing, for example, may provide implicit demands for sophisticated word use, which may result in a higher rate of academic word use than in other genres such as written personal narratives. Additionally, incorporating different writing tasks would be interesting to examine other attributes of academic language use, such as complex syntax, in addition to academic words. Furthermore, future studies are needed to explore the relation between knowledge and use of academic words combined within the same study, in addition to assessing other related skills, such as morphological awareness, which are purported to play a role in academic word knowledge (Carlisle, 2003).

Future studies are also needed to explore the relationship between the academic word use reported in this study and the writing quality of the written samples. The findings would expand on previously published research related to vocabulary use and writing quality (Grobe, 1981; Olinghouse & Leaird, 2009; Olinghouse & Wilson, 2013; Silverman et al., 2015). Additional knowledge on the relationship between academic words and writing quality may contribute information on how and why to incorporate academic vocabulary instruction into the classroom.

Author Contributions

Christopher Schatschneider: Methodology (Lead), Writing – review & editing (Supporting). **Allyssa VelDink:** Conceptualization (Supporting), Writing – original draft (Supporting).

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