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Vocabulary and Syntactic Knowledge Factors in 5th Grade Students' Reading Comprehension

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Abstract

In this study, we examined 5th grade students' levels of vocabulary knowledge and syntactic awareness relative to their reading comprehension performance. The aim was to explore the contributions of vocabulary and syntactic awareness as potential sources of reading comprehension difficulty for these readers. Overall, we found that both vocabulary knowledge and syntactic awareness contributed in significant yet unique ways to students' reading comprehension performance. Students who showed weaknesses in vocabulary and syntax also performed poorly on measures of reading comprehension. Additionally, we found that syntactic awareness explained a small amount of additional variance in reading comprehension beyond what was explained by vocabulary. The implications of these findings are discussed in light of research and practice addressing the relationships among syntax, vocabulary, and reading comprehension for more and less skilled readers.

Keywords: Vocabulary Development, Syntactic Awareness, Reading Comprehension, Adolescent Readers

Introduction

A fairly consistent finding in reading research over the past seven decades is that vocabulary knowledge contributes significantly to students' reading comprehension performance (e.g., Baumann, Kame'enui, & Ash, 2003; Davis, 1942, 1944; Ruddell, 1994; Thorndike, 1973; Whipple, 1925). This research has shown that vocabulary knowledge and reading comprehension are highly correlated, making vocabulary a leading predictor of reading comprehension among children and young adults.

The unique contribution of vocabulary knowledge to reading comprehension has been consistently established in a variety of factor analytic, correlational, and experimental studies as one of the best predictors of reading comprehension among school-aged children at the

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elementary, middle school, high school, and college levels. For instance, in a factor analytic study aimed at determining the basic skills underlying reading comprehension among a large group of college freshmen, Davis (1944) found that word knowledge had a factor loading of .80. Other studies (e.g., Bozo, 1951; Clark, 1972; Davis, 1968) resulted in vocabulary factor loadings ranging from .41 to .93.

These findings are consistent with other research studies showing that vocabulary knowledge strongly predicts reading comprehension among children in the early years of reading development (e.g., de Jong & van der Leij, 2003; Thorndike, 1973; Torgesen, Wagner, Rashotte, Burgess, & Hecht, 1997). For example, in one study, Thorndike (1973) reported correlations ranging from .66 to .75 between vocabulary knowledge and reading comprehension. In a longitudinal study commissioned by the NICHD Early Child Care Research Network (2005), the authors reported a correlation of .56 between students' Grade 1 picture vocabulary and Grade 3 reading comprehension performance. Various other studies have reported correlations between vocabulary knowledge and reading comprehension of around .50 (e.g., Dixon, LeFevre & Twilley, 1988; Hunt, 1953; Stanovich & Cunningham, 1992).

As can be seen in the above studies, the research literature is clear: Once children have developed basic decoding skills, the number of words they can read and understand begins to positively influence their ability to comprehend what they read (e.g., Beck, Perfetti, & McKeown, 1982; Chall, Jacobs, & Baldwin, 1990). These findings have been confirmed in recent large-scale studies. Results from the 2009 and 2011 National Assessment of Educational Progress (NAEP) indicate that students who scored higher on NAEP vocabulary questions also scored higher in reading comprehension (National Center for Education Statistics [NCES], 2012).

The contribution of vocabulary knowledge to reading comprehension has also been established in studies with students who are non-native speakers of English. For instance, Proctor, Carlo, August, and Snow (2005) tested a second-language reading comprehension model incorporating decoding and oral language measures on a sample of 135 Spanish-English speaking 4th graders and reported a correlation of .73 between students' vocabulary knowledge and reading comprehension outcomes. In another study, Gelderen et al., (2004) administered tests of English vocabulary knowledge and reading comprehension to 397 Dutch students in Grades 8 through 10 and found a correlation of .63. These studies provide evidence that vocabulary is critically important in first language as well as in second language reading.

However, findings from syntheses of reading research and practice (e.g., Cain, 2010; Cain & Oakhill, 2007; National Institute of Child Health and Human Development, 2000; Snow, 2002; Snow, Burns, & Griffin, 1998) indicate that while learning to read and understand word meanings is necessary, it is not consistently sufficient to ensure that readers effectively *comprehend* written texts. Although text comprehension is the ultimate goal of the act of reading, assessment reports often indicate that a significant number of children who have been identified as having successfully learned to read in grades one through three often face difficulties reading texts with understanding in grade four and beyond (e.g., Gregg, Donahue, & Dion, 2007; NCES, 2012).

The gap between students' understanding of word meanings and poor reading comprehension is well documented. During the past several years, teams of prominent researchers (e.g., Cain, 2010; Cain & Oakhill, 2007; Clarke, Snowling, Truelove, Hulme, 2010; Nation, Cocksey, Taylor & Bishop, 2010) have examined and written extensively about the correlates, causes, and consequences of children's reading comprehension difficulties. A particularly important finding is that poor comprehenders can read words and sentences at

age-appropriate levels fluently, but have difficulties comprehending texts, even when they are matched on vocabulary knowledge and word reading, and compared to peer controls. In one longitudinal study of early reading and language skills in children with poor reading comprehension, Nation et al. (2010) reported that while these children (ages 5 through 8 years) showed normal reading accuracy and fluency at all ages, they exhibited "mild impairments in expressive and receptive language, listening comprehension, and grammatical understanding" (p. 1031).

Consistent with these findings, Clarke et al. (2010) found that weaknesses in understanding and using spoken language play a causal role in the reading comprehension difficulties faced by poor comprehenders. They reported finding that a language-based intervention program designed to enhance the oral language skills of 8-year-old children with poor comprehension skills resulted in significant improvements in both reading comprehension and expressive vocabulary. These results seem to indicate that effective reading comprehension requires both a fundamental knowledge of the meaning of words and an understanding of the internal structures of words and sentences.

In addition, a relatively small but growing body of research indicates that in addition to vocabulary knowledge, shortcomings in children's knowledge or awareness of certain aspects of language development (e.g., syntax) are considered significant sources of reading and writing difficulty and are presumed to account for a significant portion of variance in children's reading comprehension performance. Recent advances in language and literacy research suggest that while vocabulary knowledge deficits are at the core of reading problems among upper grade students, deficits in syntactic awareness skills, here defined as children's understanding of the syntactic structure of sentences and their ability to reflect on and manipulate that structure, are likely to play a larger role in explaining reading comprehension variance among developing and striving readers than originally assumed (e.g., Cain, 2010, 2007; Demont & Gombert, 1996; Scott, 2004; Tunmer & Bowey, 1984).

However, it is important to note that research findings exploring the relationships between children's syntactic abilities and reading comprehension performance have been mixed. For instance, in one study, Bowey and Patel (1988) assessed the syntactic awareness of 6-year-olds using a sentence correction task. They reported that performance on this measure did not result in any significant variance in either reading comprehension or word decoding after individual differences in vocabulary had been accounted for. In another study, Layton, Robinson, and Lawson (1998) examined the effects of syntactic awareness training on 4th-grade students' reading comprehension and accuracy and oral reading ability. Their findings indicate that while students made improvements in syntactic awareness skills, no evidence was found for a systematic effect of improved syntactic awareness on reading ability. In a related study, Willows and Ryan (1986) assessed six- to eight-year-old children's syntactic awareness using an oral cloze task and found that this measure was significantly associated with reading comprehension after controlling for vocabulary and IQ. However, it is difficult to interpret the nature of this association because semantic knowledge may have influenced children's performance on the cloze task, which requires decisions based on the semantic as well as the syntactic structure of words.

In some longitudinal studies, researchers found only weak associations between syntactic awareness and reading comprehension. For instance, Demont and Gombert (1996) documented children's progress from preschool to second grade using measures of phonological awareness, syntactic awareness, word reading rate and accuracy, and sentence comprehension, after taking into account verbal and general ability. They reported more impressive results for the relationship between phonological skills and decoding than

between syntactic awareness skills and comprehension. In a similar longitudinal study, Blackmore and Pratt (1997) found only weak relations between preschool grammatical awareness and later reading comprehension. Oakhill and Cain (2007) maintain there might be developmental differences in the influence of syntactic awareness and reading comprehension. In a longitudinal study, Oakhill, Cain, and Bryant (2003) found that while syntactic ability did not predict reading comprehension ability (or word reading accuracy) among seven and eight year-olds after controlling for vocabulary and IQ, it explained significant variance in reading comprehension, but not word accuracy in the same sample of children a year later.

The above findings indicate that the role of syntactic knowledge or awareness and skills in text understanding among children and adolescent readers may be more important than previously assumed. In fact, several published studies reported that syntactic awareness predicts later comprehension of longer written texts (e.g., Muter, Hulme, Snowling, & Stevenson, 2004). Syntactic awareness has been shown to aid reading comprehension in direct ways such as when attempting to comprehend words within individual sentences and integrating the meaning of multiple sentences in larger units of texts, as well as in indirect ways such as when making grammaticality judgments or correcting grammatical errors in sentences (e.g., Tunmer & Bowey, 1984). Research has shown that children's ability to detect and correct syntactic errors is directly related to their ability to comprehend textual materials (e.g., Bentin, Deutsch, & Liberman, 1990; Demont & Gombert, 1996). Poor readers have been shown to differ on a number of syntactic processing tasks (e.g., sentence correction, grammaticality judgments) and these differences, according to some researchers (e.g., Leikin, 2002; Tunmer & Bowey, 1984; Tunmer & Hoover, 1992), suggest the existence of a syntactic processing deficit among some struggling readers. Syntactic awareness has been shown to help readers interact successfully with text, in that it gives them guidance in how to parse text into meaningful "chunks" or units. Kintsch (1998) argues that grammar or syntax is an essential feature of language and goes as far as suggesting that syntactic knowledge can be even more important than topic or domain knowledge. In other words, "if a text is well-written, syntactic cues can tell the reader what is important in the text, even in the absence of specific domain knowledge" (Kintsch, 1998, p. 134), thus allowing the reader to construct an adequate interpretation of text.

In summary, our review of research indicates that the nature of relationship between vocabulary knowledge, syntactic awareness, and reading comprehension is to some extent ambiguous. There is strong support for the fact that vocabulary knowledge predicts later comprehension performance and that that relationship may be reciprocal. On the other hand, the role of syntactic awareness skills is less clear-cut, although available research seems to suggest that vocabulary knowledge is more highly predictive of reading comprehension than is syntactic awareness. The present study explores these relationships among upper elementary grade students.

Aims of the Study

In this study, we examined 5th-grade students' levels of vocabulary knowledge and syntactic awareness in relation to their reading comprehension performance. The aim was to explore the contributions of vocabulary knowledge and syntactic awareness as potential sources of reading comprehension difficulty for these readers. Specifically, we were interested in finding out whether students' levels of vocabulary knowledge and syntactic awareness were significantly associated with their ability to read with comprehension. In light of findings from prior research addressing vocabulary and syntactic awareness as potential sources of comprehension difficulty, we predicted that lower levels of vocabulary knowledge would

contribute significantly to explaining variance in low reading comprehension performance among our study participants. Additionally, we predicted that syntactic awareness would explain additional variance in students' reading comprehension above and beyond that explained by vocabulary knowledge. Specific research questions included the following:

1. What are the relative contributions of vocabulary knowledge and syntactic awareness in explaining variance in 5th grade students' reading comprehension performance?
2. Does syntactic awareness explain additional variance in reading comprehension performance beyond what is explained by vocabulary knowledge?

Method

Participants

The participants consisted of 32 fifth-grade students (17 males; 15 females) enrolled in two classrooms in a small neighborhood school in the South Central United States. Of the 32 students (*Mean age* = 11.32; *SD* = .642), twenty (63%) were Caucasian, two (6%) were African American, three (9%) were Hispanic American, and seven (22%) American Indian. School records indicated that seven of the 32 students received daily supplemental assistance in reading, three qualified for and received Special Education services, and one was enrolled in the school's Gifted and Talented program. None of the students received assistance in the areas of speech and language development.

We selected students in upper-elementary grades (i.e. 5th grade) for two main reasons. First, during this period of development, vocabulary knowledge increases exponentially along with growth in other language skills such as morphology and syntax (e.g., Nagy & Herman, 1987; Nippold, 1998, 2004). As students progress through the grades, they become increasingly capable of analyzing the structure of derived words and compounds, and inferring the meaning of words and sentences from word parts. Second, as students transition from early- to upper-elementary grades, they become progressively more immersed in reading, writing, and thinking about language because linguistically complex words and sentences are sufficiently common in children's texts to make it likely that the processing of these language skills plays an increasingly important role in reading (Carlisle, 2004; Scott, 2004).

Data Collection

We administered two sets of tests to measure students' reading vocabulary, reading comprehension, and syntactic awareness. A brief description of each of these tests follows.

The Gates-MacGinitie Reading Tests (MacGinitie, MacGinitie, Maria, Dreyer, & Hughes, 2000). The Gates-MacGinitie Reading Tests are standardized norm-referenced reading tests designed to provide a general assessment of reading achievement. The tests consist of two subtests: reading comprehension and vocabulary. The comprehension subtest measures students' ability to read and understand passages of published works including narrative, expository, literacy non-fiction, and poetry text selections. The content of the selections is esoteric, which reduces the likelihood that a student would have knowledge of the various subjects addressed. Most of the questions (42 out of 48) are phrased differently from the text and require inferential processing.

Within the Gates-MacGinitie test, vocabulary is considered a separate construct, which is designed to measure students' reading vocabulary skills. This subtest consists of 45 questions that assess a range of grade-appropriate words by requiring students to identify a synonym for a word provided in a sentence or short phrase. Some words assessed have double

meanings, and require students to identify the intended meaning from context. Questions consist of either short sentences or sentence stems with the vocabulary word underlined. Some of the questions are based on understanding words or phrases such as *nearly*, *seldom*, or *straight away*. The number and type of questions cover an array of word meanings to make the scores reliable for individual students as well as groups of students.

The Gates-MacGinitie Reading tests take a total of 55 minutes to complete with 35 minutes devoted to reading comprehension and 20 minutes for vocabulary. The two subtests have excellent psychometric properties as indicated by reliability coefficients ranging from .90-.95 for reading vocabulary and .88-.94 for reading comprehension. We used Normal Curve Equivalent (NCE) scores as a unit of analysis for both the comprehension and vocabulary subtests. NCE scores are normalized standard scores that range in value from 1 to 99, with a mean of 50 and a standard deviation of 21.06.

Test of Language Development- Intermediate [TOLD-I: 3] (Hammill & Newcomer, 1988). The TOLD-I:3 test battery consists of six individually-administered norm-referenced subtests that are designed to assess the language skills (spoken language, semantics, syntax, listening, and speaking) of children ages 8 through 12. Collectively, the tests are designed to measure a child's ability to combine sentences, understand word meanings, produce appropriate sentence structures, make generalizations, and locate incorrect grammatical structures. Overall test performance is indicated by the Spoken Language Quotient, which reflects a composite of the child's listening, speaking, vocabulary, and grammar skills.

For purposes of this study, we used students' performance on three of the six subtests in the test battery (Sentence Combining, Word Ordering, and Grammatical Competence) to assess syntactic awareness. The result of the three subtests yielded a Syntax Quotient (SynQ), which we used to determine participants' syntactic knowledge or awareness. We used normalized standard scores, which are based on a distribution with a mean of 100 and a standard deviation of 15. Reviews indicate that the TOLD-I: 3 is considered to be a valid and reliable test of language ability assessment. Coefficients for all subtests exceed .84, and all composites are .90 or greater.

Data Analyses

We used multiple regression analysis to determine whether we could make a prediction about 5th grade students' reading comprehension based on information obtained from the two predictor variables, namely vocabulary knowledge and syntactic awareness. For purposes of this study, we conducted a power analysis using the *G*Power3* software (Faul, Erdfelder, Lang, & Buchner, 2007) to determine how many participants would be needed to achieve 85% power for detecting a statistically significant regression model. The results indicated that with two predictors in our study, and an alpha (α) level for testing the regression model set at .05, we needed 30 participants to achieve power of .80. The number of participants needed to achieve higher levels of power for detecting a statistically significant regression model increased from 33 participants for 85% power to 44 participants for 95% power. Our sample size of 32 was therefore sufficient to conduct our analyses assuming an 80-85% power and an effect size of .15.

Results

Table 1 provides a summary of the results obtained using a format for presenting information proposed by Tabachnick and Fidell (2013). Initial examination of our reading comprehension data for a sample of thirty-two 5th-grade students indicates that there were positive correlations among all three pairs of variables, namely reading comprehension, vocabulary knowledge, and syntactic awareness. It is important to note, however, that the correlation between the predictor variables of vocabulary and syntax ($r = .733$) shows an acceptable level of multicollinearity, indicating that these two variables are less likely to contribute too much superfluous or redundant information.

Table 1. Results of Standard Multiple Regression to Predict Reading Comprehension from Vocabulary and Syntactic Awareness

Variables	ReadComp	Vocabulary	Syntax	<i>b</i>	β	sr^2_{unique}
Vocabulary	.768***			.362**	.415	.283
Syntax	.786***	.733***		.627***	.481	.327
				Intercept = -27.56		
Means	50.78	53.50	94.06			
SD	16.05	18.41	12.32			
$R^2 = .676$; $R^2_{\text{Adj}} = .676$; $R = .835^{***}$						

N=32; ** $p < .01$; *** $p < .001$.

With respect to the overall multiple regression to predict 5th-grade students' reading comprehension based on information obtained from their vocabulary knowledge and syntactic awareness levels, we found that when both vocabulary and syntax were used as predictors, about 68% of the variance in reading comprehension could be predicted. The overall regression was statistically significant, $F(2, 29) = 33.38$, $p < .001$.

Vocabulary knowledge was predictive of reading comprehension when syntactic awareness was statistically controlled, $t(29) = 2.77$, $p = .010$. The positive slope of vocabulary knowledge as a predictor of reading comprehension was about a .36 unit increase in reading comprehension for each unit increase in vocabulary, controlling for syntactic awareness. The squared semi-partial correlation that estimated how much variance in reading comprehension was uniquely predicted from vocabulary knowledge was .283. In other words, about 28% of the variance in students' reading comprehension was uniquely predictable from their vocabulary knowledge when controlling for their knowledge of syntax.

The data provided in Table 1 indicates that syntactic awareness was also predictive of reading comprehension when vocabulary knowledge was statistically controlled, $t(29) = 3.20$, $p = .003$. The slope to predict reading comprehension from syntactic awareness was .627. In other words, there was slightly more than a half point increase in reading comprehension for each 1-point increase in syntactic awareness. The semi-partial correlation for syntactic awareness ($sr^2 = .327$) indicates that students' levels of syntactic awareness uniquely predicted about 33% of the variance in their reading comprehension when we controlled for their vocabulary knowledge.

Overall, the above findings indicate that the original zero-order correlation between vocabulary knowledge and reading comprehension ($r = .768$) was partly but not entirely accounted for by syntactic awareness. When syntactic awareness was statistically controlled, vocabulary knowledge still uniquely predicted 28% of the variance in reading comprehension. Similarly, the correlation between syntactic awareness and reading comprehension ($r = .786$) was partly but not entirely accounted for by vocabulary knowledge. When vocabulary

knowledge was statistically controlled, syntactic awareness uniquely predicted 33% of the variance in reading comprehension.

Discussion

There are at least two possible interpretations for these findings. First, the regression analysis indicates that 68% of the variance in reading comprehension was predictable from vocabulary knowledge and syntactic awareness in combination (i.e., $R^2=.676$). Second, the results show that 28% and 33% of the variance in reading comprehension was uniquely predicted from vocabulary knowledge and syntactic awareness, respectively; thus the remaining variance could be predicted equally well by reading vocabulary or syntactic awareness since these two predictors could be confounded or redundant to some extent. To the extent that vocabulary knowledge and syntactic awareness are positively correlated with each other, they appear to compete in explaining some of the variance in reading comprehension. It is evident in our findings that both vocabulary knowledge and syntactic awareness contribute uniquely useful predictive information about reading comprehension.

The finding that syntactic awareness explained additional variance in reading comprehension challenges the widespread assumption in the literature that vocabulary knowledge serves as the leading predictor of reading comprehension. It is indeed a challenge to various correlational and experimental research studies, in which syntactic awareness was either not associated with reading comprehension performance (e.g., Layton et al., 1998) or found to play a lesser role than vocabulary knowledge (e.g., Demont & Gombert, 1996, Blackmore & Pratt, 1997). On the other hand, the finding appears to be consistent with some longitudinal research studies reporting that syntactic awareness is an important predictor of children's reading comprehension ability (e.g., Muter et al., 2004; Oakhill et al., 2003). Overall, these results suggest that syntactic awareness plays at least an equally important role in students' reading comprehension than previously assumed, and that our understanding of students' reading comprehension performance can be enhanced by examining their levels of syntactic awareness as well. Indeed, it makes sense to argue for a compensatory processing conceptualization of the contribution of these two variables to reading comprehension. Such a conceptualization recognizes the fact that both knowledge sources act in a collaborative, synergistic manner rather than an additive one.

Implications for Research and Practice

The findings of this study have important implications for literacy research and practice. These findings indicate that reading requires fundamental knowledge of the meaning of words and fundamental knowledge of the internal structure of sentences. It is important to note, however, that reading also requires fundamental knowledge of other variables (e.g., reader, text, and context variables) that have not been accounted for in this study.

With respect to broader research implications, it is important to recognize that while the research insights gained over the past seven decades have helped advance our understanding of how students' reading vocabulary and syntactic awareness contribute to their understanding of what they read, future research has yet to account for the impact of reading vocabulary and syntactic awareness against the backdrop of other variables that are likely to have an impact on reading comprehension. First, the study of metalinguistic variables such as phonology, morphology, and syntax are critically important areas of research that are well beyond the realm of reading and writing. Consequently, literacy researchers should consider teaming up with experts in the domains of applied linguistics and other speech sciences so as to explore the roles of metalinguistic variables such as syntax in reading comprehension.

Second, interdisciplinary teams of literacy and language researchers should consider using a range of methods and procedures to account for variables that contribute to reading comprehension, thus enabling the impact of new issues or questions to be revealed. It is conceivable that inconsistent findings across studies may be due to the specific methods used when analyzing the data pertaining to the roles of vocabulary knowledge and syntactic awareness in reading comprehension. Shiotsu and Weir (2007) reported on three studies in which they found support for the relative superiority of syntactic knowledge over vocabulary knowledge in predicting performance on a text reading comprehension test. They made the case for using structural equation modeling (SEM), rather than conventional regression techniques, as a more robust data analysis method, which, they argue, is more capable of accounting for the differential reliabilities of scores obtained on the measures employed. They maintain that in some published studies SEM techniques, which are capable of partialing out measurement errors, might have produced coefficients less in favor of vocabulary. In our study, we were not able to use SEM due to the limited number of participants and variables; however, we believe that SEM would be a useful analytic technique in future research.

Third, researchers could design studies aimed at determining the impact of reading vocabulary and syntactic awareness instruction on students' reading comprehension performance. Establishing meaningful, causal links among these variables requires the design and implementation of empirical investigations using randomized experimental or quasi-experimental designs, which are beyond the scope of this study. The idea is that if struggling readers, given intensive instruction in vocabulary knowledge and/or syntactic awareness, make significant gains in reading comprehension performance, then the causal effect of these variables would be empirically established. The design of studies that could test the effectiveness of vocabulary and syntactic awareness instruction would be very helpful in resolving inconsistencies across studies examining the roles of vocabulary knowledge and syntactic awareness on students' reading comprehension performance.

Finally, the findings of this study have important implications for curriculum development and classroom instruction. The findings point to the development of curriculum materials aimed at improving students' vocabulary and syntactic awareness competencies, then measuring the consequences of such curricula on students' reading achievement, as has been done quite successfully with other literacy components such as phonemic awareness. Developing vocabulary and syntactic awareness curricula and conducting experimental intervention studies aimed at improving children's vocabulary and syntactic awareness would be important steps toward establishing critical causal links between vocabulary knowledge, syntactic awareness, and reading performance. Intensive instruction in vocabulary and syntax is largely untested and researchers need to evaluate the effectiveness of such instruction on students' reading performance.

In an effort to significantly advance students' reading vocabulary and syntactic knowledge, we recommend that teachers consider integrating the teaching of vocabulary and syntax across the language arts, mathematics, science, and social studies disciplines. This approach has been used quite successfully by a group of researchers and educators affiliated with the Strategic Education Research Partnership (SERP) at Harvard University (Snow & White, 2008). These researchers developed an evidence-based academic vocabulary program, *Word Generation*®, which has been implemented successfully in various schools in the United States and around the world. The Word Generation program focuses on the teaching of academic vocabulary for middle grade students across the language arts, science, mathematics, and social studies classrooms. In light of the findings of this study, which highlight the critical roles of both vocabulary and metalinguistic skills, we encourage teachers representing the

language arts, social studies, science, and mathematics disciplines to devote some instructional time to the teaching of both vocabulary and syntax and to do so across their respective disciplines.

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References

- Baumann, J. F., Kame'enui, E. J., & Ash, G. (2003). Research on vocabulary instruction: Voltaire redux. In J. Flood, D. Lapp, J. R. Squire & J. Jensen (Eds.), *Handbook of research on teaching the English language arts* (pp. 752-785). Mahwah, NJ: Lawrence Erlbaum.
- Beck, I. L., Perfetti, C.A., & McKeown, M.G. (1982). Effects of long-term vocabulary instruction on lexical access and reading comprehension. *Journal of Educational Psychology*, 74, 506-521.
- Bentin, S., Deutsch, A., & Liberman, L.Y. (1990). Syntactic competence and reading ability in children. *Journal of Experimental Child Psychology*, 48, 147-172.
- Blackmore, A. M. & Pratt, C. (1997). Grammatical awareness and reading in grade 1 children. *Merrill-Palmer Quarterly*, 43, 567-590.
- Bowey, J. A., & Patel, R. K. (1988). Metalinguistic ability and early reading achievement. *Applied Psycholinguistics*, 9, 367-383.
- Bozo, W. A. (1951). A factorial study of reasoning and closure factors. *Psychometrika*, 16, 361-386.
- Cain, K. (2007). Syntactic awareness and reading ability: Is there any evidence for a special relationship? *Applied Psycholinguistics*, 28, 679-694.
- Cain, K. (2010). *Reading development and difficulties*. West Sussex, United Kingdom: British Psychological Society & Blackwell, Ltd.
- Cain, K., & Oakhill, J. (2007). Reading comprehension difficulties: Correlates, causes, and consequences. In K. Cain & J. Oakhill (Eds.), *Children's comprehension problems in oral and written language: A cognitive perspective* (pp. 41-75). New York: Guilford Press.
- Carlisle, J. F. (2004). Morphological processes that influence learning to read. In A. Stone, E. Silliman, B. Ehren, & K. Apel (Eds.), *Handbook of language and literacy: Development and disorders* (pp. 318-339). New York, NY: Guilford Press.
- Chall, J. S., Jacobs, V. A., & Baldwin, L. E. (1990). *The reading crisis: Why poor children fall behind*. Cambridge, MA: Harvard University Press.
- Clark, N. L. (1972). *Hierarchical structure of comprehension skills*. Hawthorn, Victoria, Australia: A.C.E.R.
- Clarke, P.J., Snowling, M.J., Truelove, E., & Hulme, C. (2010). Ameliorating children's reading comprehension difficulties: A randomised controlled trial. *Psychological Science*, 21(8), 1106-1116.

- Davis, F. B. (1942). Two new measures of reading ability. *Journal of Educational Psychology*, 33, 365-372.
- Davis, F. B. (1944). Fundamental factors of comprehension in reading. *Psychometrika*, 9, 185-197.
- Davis, F. B. (1968). Research in comprehension in reading. *Reading Research Quarterly*, 3, 499-545.
- de Jong, P.F., & der Leij, A.V. (2003). Development changes in the manifestation of a phonological deficit in dyslexic children learning to read a regular orthography. *Journal of Educational Psychology*, 95, 22-40.
- Demont, E., & Gombert, J.E. (1996). Phonological awareness as a predictor of decoding skills and syntactic awareness as a predictor of comprehension skills. *British Journal of Educational Psychology*, 66, 315-332.
- Dixon, P., LeFevre, J., & Twilley, L. C. (1988). Word knowledge and working memory as predictors of reading skill. *Journal of Educational Psychology*, 80, 465-472.
- Faul, P., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39 (2), 175-191.
- Gelderen, A. V., Schoonen R., Glooper, K. D., Hulstijn, J., Simis, A., Snellings, P., & Stevenson, M. (2004). Linguistic knowledge, processing speed, and metacognitive knowledge in first-and second-language reading comprehension: A componential analysis. *Journal of Educational Psychology*, 1, 19-30.
- Gregg W., Donahue P., & Dion, G. (2007). *The nation's report card: 12th grade reading and mathematics 2005* (NCES 2007-468). Washington DC: US Department of Education, National Center for Education Statistics.
- Hammill, D., & Newcomer, P. L. (1988). *Test of Language Development-Intermediate* (TOLD-I:3). San Antonio, TX: The Psychological Corporation.
- Hunt, J. T. (1953). The relation among vocabulary, structural analysis, and reading. *Journal of Educational Psychology*, 44, 193-202.
- Kintsch, W. (1998). *Comprehension: A paradigm for cognition*. New York: Cambridge University Press.
- Layton, A., Robinson, J., & Lawson, M. (1998). The relationship between syntactic awareness and reading performance. *Journal of Research in Reading*, 21, 5-23.
- Leikin, M. (2002). Processing syntactic functions of words in normal and dyslexic readers. *Journal of Psycholinguistic Research*, 31(2), 145-163.
- MacGinitie, W.H., MacGinitie, R. K., Maria, K., Dreyer, L. G., & Hughes, K. E. (2000). *Gates-MacGinitie reading tests* (4th ed.). Boston, MA: Riverside.
- Muter, V., Hulme, C., Snowling, M., & Stevenson, J. (2004). Phonemes, rimes, vocabulary, and grammatical skills as foundations or early reading development: Evidence from a longitudinal study. *Developmental Psychology*, 40, 665-681.
- Nagy, W.E., & Herman, P.A. (1987). Breadth and depth of vocabulary knowledge: Implications for acquisition and instruction. In M.G., McKeown & M.E. Curtis (Eds.). *The nature of vocabulary acquisition* (pp. 19-35). Hillsdale, NJ: Erlbaum.
- Nation, K., Cocksey, J., Taylor, J., & Bishop, D. (2010). A longitudinal investigation of early reading and language skills in children with poor reading comprehension. *Journal of Child Psychology and Psychiatry*, 51, 1031-1039.
- National Center for Education Statistics. (2012). *The nation's report card: Vocabulary results from the 2009 and 2011 NAEP reading assessments* (NCES 2013-452). Institute of Education Sciences, U.S. Department of Education, Washington, D.C.

- National Institute of Child Health and Human Development. (2000). *The report of the National Reading Panel. Teaching children to read: An evidence-based assessment of the scientific literature on reading and its implications for reading instruction*. Washington, DC: U.S. Government Printing Office.
- NICHD Early Child Care Research Network. (2005). Early child care and children's development in the primary grades: Results from the NICHD study of early child care. *American Educational Research Journal*, 43, 537-570.
- Nippold, M.A. (1998). *Later language development: The school-age age and adolescent years*. Austin, TX: Pro-Ed.
- Nippold, M.A. (2004). Research on later language development: International perspectives. In R. Berman (Ed.), *Language development across childhood and adolescence* (pp. 1-9). Philadelphia, PA: John Benjamins Publishing Company.
- Oakhill, J., & Cain, K. (2007). Introduction to comprehension development. In J. Oakhill and K. Cain, *Children's comprehension problems in oral and written language*. (pp. 1-40). New York: Guilford Press.
- Oakhill, J., Cain, K., & Bryant, P. E. (2003). The dissociation of word reading and text comprehension: Evidence from component skills. *Language and Cognitive Processes*, 18, 443-468.
- Proctor, C., Carlo, M., August, D., & Snow, C. (2005) Native Spanish-speaking children in English: toward a model of comprehension. *Journal of Educational Psychology*, 9, 246-156.
- Ruddell, M. R. (1994). Vocabulary knowledge and comprehension: A comprehension process view of complex literacy relationships. In R. B. Ruddell, M. R. Ruddell, & H. Singer (Eds.), *Theoretical models and processes of reading* (pp. 414-447). Newark, DE: International Reading Association.
- Scott, C. (2004). Syntactic contributions to literacy learning. In C.A., Stone, E.R. Silliman, B.J. Ehren, & K. Apel (Eds.). *Handbook of language and literacy: Development and disorders* (pp. 340-362). New York, NY: Gilford Press.
- Shiotsu, T., & Weir, C.J. (2007). The relative significance of syntactic knowledge and vocabulary breadth in the prediction of reading comprehension test performance. *Language Testing*, 24, 99-128.
- Snow, C. (2002). *Reading for understanding: Toward an R & D program in reading comprehension*. Arlington, VA: Rand Education.
- Snow, C. E., & White, C. (2008). *Word generation*. Boston, Mass: Strategic Education Research Partnership.
- Snow, C.E., Burns, M.S., & Griffin, P. (1998). *Preventing reading difficulties in young children*. Washington, DC: National Academy Press.
- Stanovich, K.E., & Cunningham, A.E. (1992). Studying the consequences of literacy within a literate society: The cognitive correlates of print exposure. *Memory & Cognition*, 20, 51-68.
- Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th Edition). Boston: Allyn and Bacon.
- Thorndike, R.L., (1973). Reading as reasoning: A study of mistakes in paragraph reading. *Journal of Educational Psychology*, 8, 323-332.
- Torgesen, J.K., Wagner, R.K., Rashotte, C.A., Burgess, S., & Hecht, S. (1997). Contributions of phonological awareness and rapid automatic naming ability to the growth of word reading skills in second to fifth grade children. *Scientific Studies of Reading*, 1, 161-185.
- Tunmer, W. E., & Hoover, W. (1992). Cognitive and linguistic factors in learning to read. In P. B. Gough, L. C. Ehri & R. Treiman (Eds.), *Reading Acquisition* (pp. 175-214). Hillsdale, NJ: Erlbaum.
- Tunmer, W.E., & Bowey, J.A. (1984). Metalinguistic awareness and reading acquisition. In W.E. Tunmer, C. Pratt, & M.L. Herriman (Eds.), *Metalinguistic awareness in children* (pp. 144-168). New York: Springer-Verlag.

- Whipple, G. (Ed.). (1925). *The twenty-fourth yearbook of the National Society for the Study of Education: Report of the National Committee on Reading*. Bloomington, IL: Public School Publishing.
- Willows, D. M., & Ryan, E. B. (1986). The development of grammatical sensitivity and its relationship to early reading achievement. *Reading Research Quarterly*, 21, 253–266.

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