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Where Do We Get Our Academic Vocabulary? Comparing the Efficiency of Direct Instruction and Free Voluntary Reading

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ABSTRACT

Some researchers have argued that low-achieving students may never acquire sufficient levels of academic vocabulary to be successful in school without some form of explicit vocabulary instruction (e.g. Snow, Lawrence, & White, 2009). In this paper, I summarize the available data on the efficiency, in words learned per minute of instruction, of explicitly teaching academic vocabulary. I also examine another possible source for academic vocabulary knowledge: pleasure reading, or what Krashen (2004) refers to as "free voluntary reading." A large corpus of popular, young adult fiction is analyzed to assess the likelihood that academic words can be acquired at least in part through reading. Comparing the relative efficiency of direct instruction and free reading, I found that reading is between two and six times more efficient than explicit teaching of academic vocabulary.

INTRODUCTION

There is considerable evidence that we acquire most of our vocabulary, in both a first and second language, from reading (Krashen, 1989; Nagy, Herman, & Anderson, 1985; Smith, 2012). According to Krashen's (2003) *Comprehension Hypothesis*, we acquire both first and second languages, including vocabulary, primarily by listening and reading to compelling, "comprehensible input," or language we can understand (Krashen, Lee, & Lao, 2018). Our knowledge of new words is thought to come incrementally, being acquired little by little each time we see or hear it, and incidentally, as a by-product of our main goal in listening and reading, comprehension.

A rival theory to explain word learning is what Krashen (1991) termed the *Skill Building Hypothesis*. The Skill Building Hypothesis claims that a substantial part of our language proficiency comes from deliberate practice and study. In this view, vocabulary can often be learned most efficiently as a result of explicit teaching, and that this teaching makes a significant contribution to schoolchildren's word knowledge (Biemiller & Boote, 2001).

Several researchers have advocated the explicit teaching of "academic vocabulary" (e.g. Nagy & Townsend, 2012; Schmitt, 2008). Academic vocabulary consists of both technical terms specific to a given discipline (e.g. *photosynthesis*, *tidal pool*, *cosine*), and sub-technical words that appear across many different subject areas (e.g. *hypothesis*, *influence*, *thread*). The Skill Building Hypothesis holds that the best way to help low-achieving students, including language

minority and second language students, to "catch-up" to their age peers in academic vocabulary is through a program of direct, "rich" instruction of these word families.

None of the studies on the effectiveness of academic vocabulary interventions have included a direct comparison to free reading as a possible source of student word knowledge. We can, however, compare direct instruction and free reading by determining their relative *efficiency* in helping students acquire new words. Efficiency calculations can help us determine which approach would be the most effective use of instructional time in promoting vocabulary growth (Mason, 2007).

HOW MANY ACADEMIC WORDS CAN STUDENTS LEARN FROM EXPLICIT INSTRUCTION?

In Table 1, I report the outcomes from seven large-scale academic vocabulary intervention studies, mostly conducted with low-achieving middle school students. These studies usually included a substantial number of language minority and English language learners. Table 1 includes the number of academic words taught, the number of words learned, the amount of time spent on instruction, and the efficiency of the instruction in words learned per minute (Krashen, 1989; Mason, 2007).[1]

The word gains shown in column 4 are the estimated total growth of word knowledge due to the intervention. I estimated total gains by multiplying the raw score increase (post-test minus pre-test score) by the quotient of total words taught divided by total words tested. In Leseaux et al. (2014), for example, 70 words were taught but only 30 were included on the pre- and post-tests. The raw score gain was thus multiplied by 2.33 (70/30) to obtain an estimate of all word gains. Efficiency scores (number of words learned per minute) were calculated by dividing the total word gains by the total instructional time.

Table 1. Efficiency of Explicit Academic Vocabulary Instruction in 7 Studies

Study	Instructional Time (minutes)	Words Taught	Words Learned	Efficiency (words learned per minute)
Lawrence et al. (2012)	1800	120	12.6	.007 wpm
Lawrence et al. (2014) (Year 1)	1800	120	12.9	.007 wpm
Lawrence et al. (2015)	1800	120	5.8	.003 wpm
Lawrence et al. (2016)	1800	120	7.1	.004 wpm
Lesaux et al. (2014)	4095	70	9.6	.002 wpm
Mokhtari & Velten (2016)	2040	85	12.5	.006 wpm
Snow et al. (2009)	1800	120	13.3	.007 wpm

Average (SD)			**10.54 (3.07)**	**.005 wpm (.002)**

The seven studies produced fairly consistent results, with an average gain of around .005 wpm. The average total number of words learned by students after a year of instruction was a little more than 10.

The interventions devoted a sizable amount of class time on vocabulary instruction, spending an average the equivalent of 10 to 20 minutes daily over a 180-day school year, or roughly 20 to 40% of a 50-minute class. In most of the interventions, students were given a wide range of exercises and activities with the goal of learning the target words. In Lesaux et al. (2014), for example, students were given a minimum of 10 hours of instruction *each* on semantic mapping, context clues, dictionary definitions, the use of "productive representations" of words (such as drawings), morphological analysis, and mock interviews using the target words. Given the length and breadth of the interventions, a gain of 10 words per year seems a very modest return on time invested.

Note that students in these interventions received far more vocabulary instruction than students in a typical language arts classroom. Classroom observation studies have found that most teachers devote relatively little time to teaching new words in elementary and middle school. Leasaux et al.'s (2014) found that teachers spent about 10% on vocabulary instruction in the control classes used in their study. This amounts to five minutes per day in a 50-minute class. Scott, Jamieson-Noel, and Asselin (2003) reported even lower time estimates in the 23 classrooms they observed. Teachers in upper-elementary and middle school they observed spent on average only 6% of classroom time to vocabulary teaching in language arts classes, and a mere 1.4% of their time teaching new words in other subject areas (math, science, art, social studies).

At the same rate of word learning achieved by the students who received "successful" direct instruction in the interventions reviewed in Table 2 (.005 wpm), students given five minutes of instruction (10% of instructional time) per day for 180 days would learn only 4.5 words per year. This is not nearly enough words to make significant progress in their academic vocabulary in the future. At 4.5 words per year, students currently in sixth grade would learn 27 of the 570 AWL word families by the time they graduated from high school. Even if they managed to learn at twice the rate as previous interventions, or spend 20% of their time in vocabulary instruction, this would still cover less than 10% of the AWL words.

There is also no evidence that the limited time currently devoted to vocabulary instruction in most classrooms is spent on teaching AWL words, nor that teachers use the kind of "rich instruction" advocated by the intervention researchers. Kelley et al. (2010) reported that the control classroom teachers in their study focused on "superficial instruction that focused on rare, unfamiliar words" (p. 7). This makes prior direct instruction an unlikely source of students' pre-intervention vocabulary knowledge.

HOW MANY ACADEMIC WORDS CAN STUDENTS ACQUIRE FROM POPULAR FICTION?

An alternative source of students' vocabulary is their pleasure or free voluntary reading (Krashen, 2004). We know that academic words account for a smaller proportion of the tokens in

popular fiction than in school texts. Gardner (2004) reported that only 0.8% of the tokens in his corpus of juvenile fiction were academic in nature, compared to 2.7% in expository books. Yet there is some evidence that academic words may appear frequently enough in fiction to give readers a good chance of acquiring a substantial portion of them. Rolls and Rogers (2017) examined a corpus of science fiction and fantasy texts to determine how often 318 "science words" appeared in the texts. These were words that appear across various scientific disciplines, excluding words from the AWL. Rolls and Rogers found that with a million words of reading, students would encounter nearly all of the science words (92%) at least once, with close to half (44%) of the words appearing 10 or more times.

The precise meanings of these academic words may of course differ in some cases in fiction versus academic texts. But the AWL word families themselves appear to have stable meanings across academic disciplines. Ming-Tzu and Nation (2004) found that Coxhead's list of word families contained only a handful of homographs (unrelated meanings for the same word form). This means that acquiring an AWL word in one domain is beneficial in other academic disciplines as well. While reading popular fiction is unlikely to be sufficient to pick up all of the nuanced meanings of academic words, it may give students a significant head start in acquiring them.

Corpus Analysis of Free Reading Materials

To estimate the number of academic words that can be acquired from reading popular fiction, I created a million-word corpus (1,025,943 tokens) from 22 young adult books taken from five series popular with American schoolchildren in recent years, according to a large book publisher (Scholastic, 2015): four books from *Twilight* (Meyers, 2010); 10 books from *Goosebumps* (Stine, 1995; 2005; 2011a; 2011b; 2016); two books from *A Series of Unfortunate Events* (Snicket, 2001a; 2001b), three books from *Nancy Drew* (Keene, 1991a; 1991b; 1992) and three books from *The Baby-Sitters Club* (Martin, 1990; 1992; 1996). All of the texts have 98% vocabulary coverage at 5,000 word families. This means that readers who know the first 5,000 most frequently occurring word families in English will be able to understand 98% of the running text.

Using *AntWordProfiler* software (Anthony, 2012), I found that 1.02% of the tokens in the corpus were on the AWL list, slightly more than Gardner's (2004) estimate from his corpus of juvenile fiction. There were 484 AWL word families that occurred at least once in the corpus, or roughly 85% of the total of 570.

How many of these AWL words are likely to be acquired? The most common method to estimate gains in vocabulary in corpus studies is to use a "cut-off" or minimum number of repetitions. The cut-off point usually estimated from previous experimental "read-and-test" studies of incidental word acquisition. In read-and-test experiments, students read a text and then take a vocabulary test on potentially unknown words. The more repetitions of a word family in a text, the more likely it is to be acquired (Hulme, Barksy, & Rodd, in press).

Pellicer-Sanchez and Schmitt (2010), for example, found that when a word is repeated at least 10 times in a text, scores on a word recognition test were around 80% for second language (L2) acquirers, with the percentage acquired rising to nearly 90% after 28 repetitions. Webb (2007) reported that readers who saw words repeated 10 times on average scored 87.5% on a recognition test and 71.9% on a recall test. Based on these and other studies, Nation (2014) used

12 occurrences as a minimum to count a word as "acquired" in his corpus analysis. Cobb (2007) and McQuillan and Krashen (2008) used a lower cut-off of six occurrences.

For this analysis, I used three different cut-off points for classifying a word family as acquired: Nation's recommended minimum of 12 repetitions, along with more stringent cutoffs of 20 and 25 repetitions. Table 2 reports the results of these using these three models. Since the cut-off method requires counting all occurrences in the corpus, those estimates are listed only in the final row of the table rather than by book series.

Table 2. Three Models Estimating the Number of Academic Words Likely to Be Acquired From Reading Popular, Young Adult Fiction

Series Title	**Total Tokens**	**AWL Word Families**	**12 times**	**20 times**	**25 times**
Baby Sitters Club	71,514	109	--	--	--
Series of Unfortunate Events	87,353	200	--	--	--
Nancy Drew	94,791	249	--	--	--
Goosebumps	258,336	165	--	--	--
Twilight	513,949	452	--	--	--
Total	**1,025,943**	**484**	**213**	**143**	**113**

At the average reading speed for fourth graders (150 wpm) (Spichtig, Hiebert, Vorstius, Pascoe, Pearson, & Radach, 2016), a student would need about 6,840 minutes (114 hours) to read all the novels in the corpus. At 30 minutes a day, this would take students 228 days, or about seven and a half months, including weekends.

As shown in Table 2, depending on the model of word acquisition used, students would acquire somewhere between 113 and 213 AWL word families after reading the 22 novels in our corpus, with word-per-minute acquisition efficiencies ranging from .01 wpm to .03 wpm at an average fourth-grade reading speed. For comparison, the number of words that would likely be learned over an equivalent period of direct instruction, assuming an efficiency of .005 wpm, would be 34.2. This means that pleasure reading is between two and six times as efficient as direct instruction in promoting AWL word growth.

Note that Table 2 includes only the AWL word families that could be acquired. Students would also likely acquire general vocabulary words, perhaps doubling the estimated number of new word families acquired overall.

DISCUSSION

Even under the most pessimistic assumptions for incidental acquisition, reading is more efficient in acquiring new academic words than direct instruction. Given this result, providing students with sustained silent reading (SSR) time and plentiful access to compelling reading materials may be a better intervention than doing numerous "rich" vocabulary exercises and activities, as Krashen (2004) found in his review of SSR programs. Reading is also more pleasurable for most students than direct instruction (McQuillan, 1994), such that even if an intervention could match reading's efficiency, reading would still be preferred. It is less work for the teachers and more enjoyable for the students.

My results are consistent with previous efficiency comparisons of vocabulary teaching and free reading. McQuillan (2016) concluded that in most direct comparisons of reading-only and reading plus vocabulary instruction for adult second-language students, reading-only was more efficient that reading plus instruction. McQuillan (2019) found that simply reading stories to pre-literate children was 66% more efficient than teaching words explicitly. In a re-analysis of 14 direct instruction vocabulary studies, McQuillan (in press) found that short-term interventions lasting at least two hours had an average efficiency of .039 wpm. Long-term studies of at least 25 hours duration had an efficiency of .01 wpm. Note that these are roughly the same efficiencies calculated for free reading in our analysis (.01 to .03 wpm), which only took into account about half of the potentially unknown words in the corpus (1% instead of 2%). We can conclude that free reading is thus as good as or superior to direct instruction for both short- and long-term interventions.

Our findings are also in line with previous studies of the relationship between academic and general vocabulary. Masrai and Milton (2017; 2018) found strong correlations (r = .78 and .73, respectively) between tests of academic and general vocabulary for their adult subjects, and factor analysis indicated that the two tests were likely tapping the same construct. Academic vocabulary knowledge appears to explain little additional variance in reading comprehension or academic achievement once general vocabulary is controlled for (Masrai & Milton, 2018; Townsend, Filippini, Collins, & Biancarosa, 2012). One explanation for these findings is that both academic and general vocabulary knowledge come largely from the same source, free reading. It may also be that general vocabulary knowledge acquired through free reading facilitates the acquisition of academic language by making academic texts more comprehensible. Students who read for pleasure have an easier time understanding their textbooks and are able to acquire more academic vocabulary from them. In either case, reading fiction appears to be a potentially powerful source for students to develop knowledge of academic words.[2]

I do not argue that reading popular fiction is sufficient for acquiring *all* aspects of academic language, or even all the meanings needed to comprehend them in an academic text. But it can serve as a bridge or "conduit" to academic language. Krashen (2012) has proposed a two-stage approach to helping students acquire academic language. Stage 1 is pleasure reading, which gives students general vocabulary and, if our analysis is correct, at least partial meanings of a substantial number of academic word families. Stage 2 is free reading on an academic topic chosen by the student. Reading on a single topic or narrow range of topics will not only make texts more comprehensible (Schmitt & Carter, 2000), but will allow students to acquire important features of academic language found across different disciplines (Biber, 1995). Given the relatively poor efficiency of explicit instruction in promoting word growth, free reading seems at least worth a closer look.

NOTES

1. I excluded Lesaux, Kieffer, Faller, and Kelly (2010), another academic vocabulary intervention, since it did not report raw vocabulary test scores from which gains could be calculated.
2. It could be claimed that academic vocabulary is more difficult to acquire than the vocabulary one picks up via free reading, and therefore a direct comparison of their efficiencies is unfairly biased toward reading. But the words used to determine the efficiency of acquiring a new word incidentally in read-and-test studies are often as "conceptually difficult" or more so than those taught in vocabulary interventions. In Herman, Anderson, Pearson, and Nagy (1987), for example, more than 80% of the target words tested were rare (not found in the first 25,000 most frequently appearing word families). Two-thirds of the words could be classified as technical vocabulary that would require some new conceptual information for students to understand (e.g. *drainage basin, rills, levee, renal, capillary*). Nevertheless, even students reading below the 30th percentile on a standardized reading test acquired words at rates comparable to those used in this analysis (probability of .05 to .10).

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