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Beyond raw frequency: Incidental vocabulary acquisition in extensive reading

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Abstract

Second language vocabulary can be learned incidentally while the learner is engaged in extensive reading or reading for meaning, inferring the meaning of unknown words (Huckin & Coady, 1999; Hulstijn, 1992; Krashen, 1993; Pigada & Schmitt, 2006). 12 Korean learners of English read authentic literary texts and were tested on their knowledge of vocabulary before reading (pretest), immediately after reading (Posttest 1), and 1 month after Posttest 1 (Posttest 2). The results showed a significant word gain between the pretest and Posttest 1 and that most gained words were retained at Posttest 2. Of the 3 different word classes that were used, nouns were a little easier to retain than verbs and adjectives. More frequent words were more easily learned than less frequent words across all 3 word classes. However, words of lower frequency were better learned than words of higher frequency when the meanings of the lower frequency words were crucial for meaning comprehension.

Keywords: Extensive reading, L2 reading, incidental vocabulary acquisition, literature-based approach

The past two decades have seen a considerable amount of interest in the cognitive processing of vocabulary acquisition (Arnaud & Bejoint, 1992; Coady & Huckin, 1997; Haastrup, 1991; Hatch & Brown, 1995; Hulstijn & Laufer, 2001; Meara, 1992). Many scholars have agreed that much second language (L2) vocabulary is learned incidentally while learners are engaged in extensive reading (ER) or reading for meaning and in inferring the meanings of unknown words (Huckin & Coady, 1999; Krashen, 1993; Paribakht & Wesche, 1997). In this case, vocabulary learning can be called incidental learning because it is a byproduct rather than the explicit purpose of reading (see Day, Omura, & Hiramatsu, 1991; Dupuy & Krashen, 1993; Hulstijn, 1992; Pigada & Schmitt, 2006; Pitts, White, & Krashen, 1989; Saragi, Nation, & Meister, 1978; Waring & Takaki, 2003).

The goal of the present study was to see how and which unknown words can be incidentally learned and retained while Korean learners of English read substantial amounts of authentic text

over a long period of time. More specifically, this study investigated the effect of frequency, but beyond the frequency, examined other factors such as word class. The paper is organized as follows: We introduce the previous studies of incidental vocabulary acquisition through reading in the L2 learning literature, followed by a description of the components of the present study. After reporting the design and results of the experimental study in the method section, we discuss how incidental vocabulary learning occurs, how successfully it is retained, and what the relationship between word frequency and learning might be. We conclude by calling for more efficient development and implementation of ER to enhance vocabulary learning in an L2.

Incidental Vocabulary Acquisition Through ER

Vocabulary acquisition occurs chiefly through spoken input in child first language (L1) learning. Lexical acquisition has usually been assumed to develop naturally, as children grow older, with no explicit instruction needed. However, the situation differs in an L2 environment. Here, vocabulary acquisition often occurs more through written text (Grabe, 2004). Of course, explicit instruction in word meanings can facilitate vocabulary acquisition by drawing attention to form and meaning mappings. However, incidental vocabulary learning has some advantages over direct instruction. For one, reading and word learning occur at the same time. For another, a richer sense of a word is learned through contextualized input. Furthermore, the incidental acquirer not only acquires word meanings but also increases his or her chances to get a feel for collocations and colligations that are not easily learned by learners of English as a foreign language (Bahns & Eldaw, 1993); therefore, learning can be facilitated by repeated exposure to words that go together (cf. Lewis, 1993; Nattinger & DeCarrico, 1992, for the importance of learning lexical phrases).

Research into L2 vocabulary learning has determined that such incidental vocabulary learning is possible while the learner is engaged in ER (Huckin & Coady, 1999; Krashen, 1993; Wodinsky & Nation, 1988). Based on this research, the incidental vocabulary learning hypothesis (Nagy, Herman, & Anderson, 1985) claims that teachers should promote ER because it can lead to "greater vocabulary growth than any program of explicit instruction alone ever could" (Coady, 1997, p. 225).

In addition to the vocabulary-expanding effects of reading extensively in an L2, many published L2 studies of ER also reveal general benefits for aspects of language development (see Bell, 2001; Hafiz & Tudor, 1989; Lai, 1993; Mason & Krashen, 1997; Robb & Susser, 1989, for change in reading comprehension ability; Hafiz & Tudor, 1990; Tsang, 1996, for essay writing; Lituanas, Jacobs, & Renandya, 1999; Mason & Krashen, 1997, for oral reading).

Unfortunately, the evidence of actual incidental word learning through ER does not unambiguously appear in previous research (Day et al., 1991; Hulstijn, 1992; Pigada & Schmitt, 2006; Waring & Takaki, 2003). This lack of a clear result is not for want of trying. Studies of vocabulary acquisition in L2 reading range from implementations across a whole school district (e.g., Elley, 1991; Lightbown, 1992) to case studies of individual learners (Cho & Krashen, 1994; Parry, 1991; Pigada & Schimitt, 2006). Overall, regardless of the scales of the studies, many studies on vocabulary learning through ER show that very few words are learned after reading in

relation to the reading time or text length. For example, Pitts et al. (1989) had ESL students read *A Clockwork Orange* for an hour and tested the subjects after 10 minutes on 28 items of Anthony Burgess' Russianate "nadsat" vocabulary, which was not invented but nevertheless unfamiliar to the subjects. A control group, which did not read the text, was also tested on the same items. A statistically significant but quite small increase in vocabulary was observed in the experimental group compared to the control group. Another example is that in Horst, Cobb, and Meara's (1998) study, the teacher read aloud the entire 21,232 words of the simplified *Mayor of Casterbridge* in class while the students followed along in their books. The students then took a 45-item multiple-choice test and a 13-item word-association test; the posttest results showed mean gains of 4.62 words on the multiple-choice test and 1.28 words on the word-association test. Similarly, Shin (2006) investigated whether vocabulary was incidentally acquired through reading selected units from textbooks (168 pages with 43,465 words) for an ELT writing course by 34 Korean college students and found that a small number of new words (3.6 out of 40 unknown words) were learned, with a significant relationship between the number of occurrences of the words and the relative learning gain.

In examining vocabulary learning and retention by 15 Japanese college students who read one graded reader, Waring and Takaki (2003) changed the forms of the 25 words that were used in the text to make them into non-words to control for previous knowledge of the words (e.g., changing *house* into *windle*). They found that "words can be learned incidentally but that most of the words were not learned" (p. 130). Three months later, only one of the incidentally learned items was remembered, and none of the items that appeared fewer than eight times were remembered. Waring and Takaki's (2003) use of non-words in the test should be considered in terms of the retention rate 3 months later. Such non-words might easily be imagined to be more difficult to remember than real words.

Pigada and Schmitt (2006) used 70 nouns and 63 verbs in their study in investigating incidental vocabulary acquisition with a participant, G, a native Greek speaker, by using four graded readers in French. Because the texts were short, Pigada and Schmitt included only "the most common parts of speech found in natural text" (Webb, 2005, p. 36, cited in Pigada & Schmitt, 2006, p. 9), in the hope that further research would include other word classes. They organized the two word classes into six different frequency groups according to the number of encounters and tested three types of word knowledge (meaning, spelling, and grammatical behavior). They found that substantial word learning occurred during the ER, although the improvement was not uniform across the three types of word knowledge. Spelling was enhanced in all noun frequency groups and in all but two verb groups. For meaning, low-frequency nouns and verbs showed limited learning, and verbs were more limited than nouns. Grammatical behavior knowledge was improved in all frequency groups of nouns, while the percentage of grammatical mastery of verbs was much lower than that of nouns.

A comparison of nouns and verbs has been the focus of attention in the current literature of cognitive and linguistic development, literacy, and academic achievement in school-age children (Snow, Cancini, Gonzales, & Shriberg, 1989; Watson, 1985; Wechsler, 1991, cited in Marinellie & Johnson, 2004). According to Markman (1989), while nouns occur in structured categories with hierarchical internal organizations (e.g., *apple–fruit*) that may result in simpler, more predictable semantic relations, verbs and adjectives have less structured and less predictable

lexical relations. Verbs may be represented by nonhierarchical relations, such as change, causality, and manner (Miller, 1991). Marinellie and Johnson (2004) observed that nouns and verbs are significantly different in terms of their definitional styles in upper-elementary school children. The rate of definitional forms for nouns was significantly higher than for verbs (p. 230). They suggested that this might be due to an internal lexical organization for verbs that is less structured and less predictable than that for nouns. In child language development, verbs are suggested to be more difficult to learn than nouns and to be acquired at a slower rate (Benedict, 1979; Gentner, 1978, 1982; Greenfield & Smith, 1976).

Linguistically, the position that nouns and verbs have different conceptual bases has been widely accepted. Gentner (1982) proposed that the concepts referred to by nouns are more accessible than those referred to by verbs because they are conceptually more basic than the concepts referred to by verbs or prepositions. Gentner further posited that "linguistic distinction between nouns and verbs is based on a preexisting perceptual-conceptual distinction between concrete concepts such as persons or things and predicative concepts of activity, change-of-state, or causal relations" (p. 301).

According to Huttenlocher and Lui (1979), nouns and verbs have different semantic organizations:

> Concrete nouns fall into closely related and hierarchically organized domains, while verbs form a more matrix-like organization. Two reasons have been proposed for these differences in organization. First, the object categories encoded in concrete nouns are independent entities in the mental lexicon, organized chiefly in relation to each other, whereas verbs encode dependent categories with directed connections to their noun arguments. Second, verbs have many elements of meaning which cut across semantic field, e.g., manner, intention. (p. 141)

The kinds of things denoted by nouns are different from the kinds of things denoted by verbs. Nouns postulate something definite such as a substance or individual; however, verbs cannot be indicated separately from substances. Verbs can be real only if something definite is implied in such a predicate because we never use verbs without implying their argument structures. For example, *eat* has two argument structures, corresponding to *John ate* and *John ate the apple* (cf. Pinker, 1989).

Failure of Acquisition vs. Failure of Research Methodology

Of course, the generally poor results of incidental vocabulary acquisition research may be due to faults of the experimental methodology. These faults might include the amount of reading text, the number of test items, the kinds of text used (e.g., simplified vs. authentic), and how many words participants already know before the reading. In most studies, the measurement instruments have been multiple-choice tests, and these have limitations in measuring readers' exact knowledge of words because they allow guessing from contextual information. Other methodologies such as self-report checklist measures, meaning-translation tests, or word-form recognition tests can be used to overcome the shortcomings of multiple-choice tests and to

measure more precisely learners' vocabulary knowledge.

The amount and the kind of reading may also affect incidental vocabulary learning and explain the paucity of experimental results. Participants in most of the experimental studies read one or two graded readers or a short reading passage to see the effect of reading on incidental vocabulary learning. Huckin (1983), Rigg (1991), and Widdowson (1979) have variously objected that simplified texts have many problems, offering insufficient exposure to unknown words, tedious rewriting, highly manipulated syntax, and distortions of pragmatic use. In this respect, using authentic texts of substantial length that may contain enough repetitions of words may provide more relevant results.

When using authentic materials in the instruction of English as a foreign language, the selection of texts is significant given that students are the most motivated and open to language input when their emotions, feelings, and attitudes are most engaged (Tomlinson, 1986). Students will get few benefits if a text is extremely difficult on either a linguistic or cultural level (Mckay, 1982; Vincent & Carter, 1986). Using simplified texts or graded readers is one common method of solving the problem, but a serious disadvantage is that simplification tends to produce a homogenized product in which the information becomes diluted (Honeyfield, 1977). As an alternative to using simplified versions, Mckay (1982) suggested literature written for young adults. One of the characteristics of these books indicated by Donelson and Nilsen (2005) is that they are stylistically less complicated, which is a significant factor in language learning.

Returning to the problem of lower rates of incidental vocabulary acquisition, we are interested in whether different word classes are a factor affecting incidental word learning; for example, whether nouns are easier to learn than verbs or vice versa. As stated above, many studies have looked at the differences between nouns and verbs in definitional style and developmental order in child language acquisition. Unfortunately, however, significant empirical studies have not reported on this issue in second or foreign language learning (cf. Pigada & Schmitt, 2006). It is important to understand how L1 acquisition and L2 learning differ, if at all (cf. Bley-Vroman, 1990), and how different word classes are learned by foreign language learners, especially incidentally, not through instruction.

In the attempt to extend the scope of investigation in this study, we included adjectives, a group that has not been included in previous research (e.g., Marinellie & Johnson, 2004, for L1 acquisition; Pigada & Schmitt, 2006, for L2 learning), in addition to the most common word classes, nouns and verbs. We hypothesized that the three word classes would produce different behaviors in the self-report checklist measures of word knowledge in the present study due to the conceptual differences and the different organizations of the internal lexicon on definitions of nouns, verbs, and adjectives.

Taken as a whole, the L2 reading studies reviewed indicate that relatively short texts and small numbers of test items result in a relatively modest increase in vocabulary learning. Such small gains may be attributed to the limited opportunity to read and encounter new words.

We generated four research questions to examine the amount of incidental vocabulary acquisition, proportion of vocabulary retention, and the effect of occurrence frequency and word

classes:

1. How much vocabulary is incidentally acquired from ER of three authentic teen novels (over 100,000 words)?

2. What proportion of the incidentally learned words are retained 1 month later?

3. What is the relationship between the frequency of occurrence and the learning rates of words?

4. How do the learning rates of words vary according to different word classes (i.e., noun, verb, and adjective)?

Method

We selected authentic, unsimplified texts and explored the effect of these texts containing a large number of words on adult Korean learners of English as a foreign language.

Materials

From a pedagogical point of view, the main goal of ER is not vocabulary acquisition per se but rather to develop reading fluency through rapid access to known L2 words by encountering them repeatedly (Day & Bamford, 1998). For this purpose, reading passages excerpted from textbooks or graded readers, which are simplified fiction or non-fiction texts graded at varying levels of English vocabulary and structure, have been used in L2 classrooms because of their easy access. However, participants in the present study read authentic written texts (chapter books[1]) that were uncontrolled for vocabulary and grammatical complexity. The biggest difference between graded readers and chapter books is that the former target English language learners, whereas the latter are written for native speaker readers, mainly adolescents in English-speaking countries.

The students in this study read three chapter books over the course of 5 weeks. *Holes* deals with the interlocking friendships and individual destinies of a group of teenage delinquents. It is 256 pages long. *Hatchet* is a Robinson Crusoe story about a boy, containing 189 pages. *The Giver* is a work of dystopic science fiction, containing 193 pages. In all, these three books contained 134,013 words and 638 pages. Details of the three chapter books are given in Table 1.

Table 1. *Chapter books used*

Title	Author	Word count	Target grade (NS)[a]	Theme
Holes	Sachar (1998)	46,213	4–6	Friendship, destiny
Hatchet	Paulson (1987)	44,168	4–8	Adventure, self-realization
The Giver	Lowry (1993)	43,632	6–8	Science Fiction, dystopia
Total		134,013		

[a]The target grades are based on an online teachers' resource manual website (www.edhelper.com) that provides paid teaching materials for various chapter books for students in secondary schools in the US.

Accordingly, the reading time required of the students was considerably long. Participants in this study read on average 4–6 hours per day for 5 weeks, whereas the reading times were about 1 hour in many other studies. Students had to read each text carefully to understand the meaning of the story because they were required to take a detailed comprehension quiz at the beginning of the following class.

Participants

The participants were 12 students (11 male and 1 female) who were taking the intermediate English reading course during the 2006 winter session at Pohang University of Science and Technology in Korea. All of the participants were majoring in science or engineering. Their average age was 21.5 years. Seven of the students provided TOEFL scores (average score = 607) from the ITP (paper and pencil) test, which is administered at the university as a requirement for graduation; the minimum score for graduation is 550. Eight of the students were not taking any other English courses during the winter session, and 3 were taking either conversation or speech courses in addition to the reading class. None had ever lived in an English-speaking country.

Test Design

All of the pages in each book were computerized and loaded into a software program (Monoconc Pro) that quantified the word frequencies in the corpus of the texts. Of the 134,013 words, the most frequent content words were selected. We then eliminated many common words (e.g., *man*, *water*, *have*, *do*) that occurred hundreds of times. To determine whether words with higher frequencies were more likely to be learned and retained, several hundred words that were relevant for the current study were selected. Of these, 367 words were selected for the test. These words were sorted into three word classes within three bands of frequency (20 or more, 7–19, and 1–6 occurrences).

Table 2. *Eighteen most frequent content words in corpus of 134,013 words from books used*

Frequency order	Frequency	Word	Frequency order	Frequency	Word
1	136	warden	10	46	spear
2	134	dig	10	46	squid
3	110	shovel	12	43	release
4	93	community	13	42	stare
5	87	shelter	14	40	magnet
6	65	nod	15	37	release
7	58	hatchet	16	33	assignment
8	53	thumb	17	32	shore
9	52	canteen	17	32	sled

The 18 most frequent words, which occurred more than 30 times each, are shown in Table 2. Because these words are context-dependent and low in frequency in the English language as a whole, students had not had many opportunities to encounter these words before reading the stories.

We selected verbs, nouns, and adjectives based on their frequencies, which ranged from 1 to ≥

50 occurrences. Of the 367 words used in the test, 147 were nouns, 153 were verbs, and 67 were adjectives. The words in each word class were divided into three bands of frequency: I (≥ 20 occurrences), II (7–19 occurrences), and III (1–6 occurrences). Most of the selected words occurred from 1 to 6 times, and relatively few verbs and nouns (around 10 verbs, 20 nouns, and 1 adjective) occurred more than 20 times. Words that occurred at frequencies in between (i.e., 7–19 occurrences) were grouped together. The number of words in each band is summarized in Table 3.

Table 3. *Number of words in three word classes for each frequency band*

Band	Frequency	Noun	Verb	Adjective	Total
I	≥ 20	14	7	1[a]	22
II	7–19	39	32	8	79
III	1–6	94	114	58	266
Total		147	153	67	367

[a]Only one adjective appeared in Band I, and this was already known to the learners based on the pretest; thus, the results for the adjective in Band I are omitted in the analysis and not reported in the results in Table 7 below.

We assumed that if a learner encountered *canteen* in one place and *canteens* in another place, the representative lexeme is *canteen*, and he or she encountered the word twice. In counting verbs, the inflected forms of a regular verb (e.g., *stared*, *staring*) were counted as occurrences of the base verb (e.g., *stare*). However, for irregular verbs, the base form and past form (e.g., *slide* and *slid*) were counted as separate items.

Table 4. *Sample items from self-report checklist of word knowledge*

Item	Option 1	Option 2	Option 3
1. abate	Yes	NS	No
2. abrupt	Yes	NS	No
3. absorb	Yes	NS	No
4. acknowledge	Yes	NS	No
5. acquire	Yes	NS	No
6. adequate	Yes	NS	No
7. affectionate	Yes	NS	No
8. afflict	Yes	NS	No
9. agony	Yes	NS	No
10. alert	Yes	NS	No

The 367 words were alphabetized after the technique in Horst and Meara (1999) and Horst (2000, 2005). The alphabetical list was presented to the students, who were asked to choose one of the three options: *Yes*, if they thought they knew the meaning of the given word; *NS*, if they were not sure; and *No*, if they did not think that they knew the meaning of the word. We assumed that the *NS* option would reveal learners' partial knowledge of the word and also allow an honest response, neither overestimating nor underestimating their word knowledge forcing them to choose between *Yes* or *No*. A portion of the test material is shown in Table 4.

Data Analysis

The nominal data were quantified for statistical analysis. A word with *Yes* circled was assigned 2 points; *NS*, 1 point; and *No*, 0 points. The maximum possible scores were therefore 2 times the number of words, resulting in 294 for nouns, 306 for verbs, and 67 for adjectives. The analysis of the nominal data before quantification is reported in the Appendix to show the way the data were collected. This shows the same results as the quantified analysis.

Procedure

Pretest. On the first day of the class, the students completed the self-report test on word knowledge for the 367 words. They were told that the test would not affect their course grades. The students took the test after they completed their language background information questions. The test took about 15 minutes to administer.

Treatment (ER). Because we were interested in how ER facilitates incidental vocabulary acquisition in adult L2 learners, the students were encouraged to read extensively without focusing on learning vocabulary while reading. They were told to skip unknown words if doing so did not interfere with their understanding of the story. To confirm that the students had completed the reading assignments before the next class, a content comprehension quiz for the assigned chapters was given at the beginning of each class.

The class met for 100 minutes every day from Monday to Friday for 5 weeks. Each day, the students were assigned three or four chapters of a chapter book to read at home[2]. Every class began with a comprehension quiz of 15 questions. Then the students were divided into four groups of three or four students, and a leader was chosen. Each group discussed a separate topic prepared by the instructor. After the group discussion, the four group leaders gathered on a stage and reported what they had discussed about their topics. Finally, during the last 20 minutes of each class, the students wrote an in-class response journal on a topic selected by the instructor from the chapters used in the class on that day.[3] These journals were submitted at the end of each class. The schedule of instruction for each class is shown in Table 5.

Table 5. *Class schedule for ER using chapter books*

Duration (minutes)	Activity	Percentage of course evaluation[a]
10	Class management	
10	Comprehension quiz	20
20	Clarification questions Report of interesting or best part	10
20	Small-group discussion (topics provided)	10
20	On-stage discussion by small-group leaders	20
20	Response-journal writing	20

[a]The percentages do not include the components for attendance (10%) or completing the assigned reading (10%).

Note that none of the class activities encouraged any focus on vocabulary during the in-class treatment session by, for example, drawing attention to particular meanings of words or phrases

or completing vocabulary quizzes. Contrary to Horst (2005), who included "adding entries to vocabulary notebook" (p. 367) with other activities like discussing books in pairs in her study with graded readers, the present study was designed to avoid any manipulated attention to vocabulary during the ER treatment session to keep intact the purpose of the study (incidental vocabulary acquisition through ER).

Posttests 1 and 2. Posttest 1, the immediate posttest, was given on the last day of instruction. Posttest 2, the delayed posttest, was given 4 weeks after Posttest 1. For both Posttests 1 and 2, the same procedure was followed as in the pretest except for the linguistic background questions.

Results

Results Based on Word Class

The maximum possible scores were 294 for the nouns, 306 for the verbs, and 134 for the adjectives. The mean self-reported scores on the pretest were 128.75 (43.8%) for the nouns, 148.66 (48.6%) for the verbs, and 70.58 (52.7%) for the adjectives (see Table 6). These scores across the three word classes suggest that the participants either knew or thought they might know the meanings of a substantial proportion of the test words before the pretest.

Table 6. *Mean and percent word knowledge of nouns, verbs, and adjectives summed over all frequency bands*

	Pretest	Posttest 1	Posttest 2	*F*
Nouns				
M	128.75 (40.23)	214.91 (33.17)	207.75 (40.09)	309.65**
%	43.2	72.1	69.7	
Verbs				
M	148.66 (45.76)	201.66 (40.488)	209.16 (42.21)	275.05**
%	48.6	65.9	68.4	
Adjectives				
M	70.58 (18.11)	94.83 (16.95)	94.41 (21.63)	290.34**
%	53.0	71.0	70.0	

Note. Standard deviations are in parentheses. $n = 12$ for all tests. % = mean score converted to percent of maximum.
**$p < .001$.

The mean self-reported scores of vocabulary knowledge significantly increased between the pretest and Posttest 1 in all three word classes, and these gains were largely retained 1 month later (Posttest 2). For the analysis, the students' scores were converted to percentages of the maximum possible score in each word class. This approach eliminated the effects of the differing numbers of words in the three word classes. A repeated-measures one-way ANOVA revealed that the differences in the percentages between the tests were statistically significant for the nouns, $F(1,11) = 309.65$, $p < .001$; for verbs, $F(1,11) = 275.05$, $p < .001$; and for adjectives, $F(1,11) = 290.34$, $p < .001$. Post hoc multiple comparisons using LSD multiple-range tests were run to locate differences, and these revealed that the mean difference between the pretest and Posttest 1 was significant, but the mean difference between Posttests 1 and 2 was not for the

nouns, *MSE* = 3,927.78, $p > .05$; verbs, *MSE* = 4,552.33, $p > .05$; or adjectives, *MSE* = 930.11, $p > .05$. The mean test scores ranked the pretest < Posttest 1 = Posttest 2 for all word classes. This result suggests that incidental word learning occurred and that knowledge of words was retained without significant attrition 1 month later.

The mean scores for each word class on each test were separately converted to percentages of the maximum possible scores (Figure 1). For the comprehension of the word classes, the results differed among the tests. On the pretest, vocabulary understanding differed significantly among the word classes, $F(2,22) = 16.1$, $p < .0001$. The comprehension scores of the three word classes were all significantly different from each other (LSD, $p < .05$) on the pretest. The percentage of understanding ranked adjective > verb > noun.

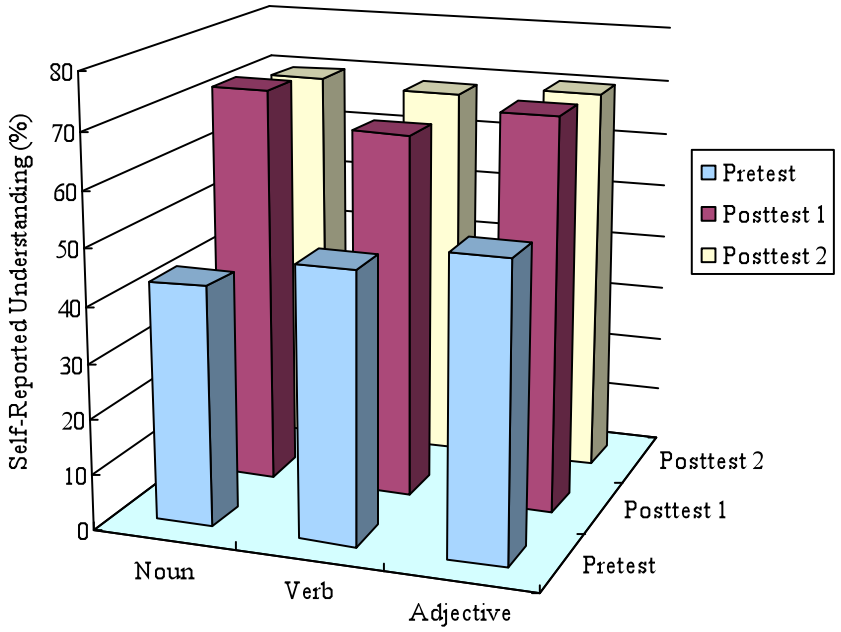

Figure 1. Self-reported understanding of words in three word classes (% of maximum) in three sequential tests.

On Posttest 1, the understanding of the word classes was ranked noun > adjective > verb, and all differences were significant (LSD, $p < .05$). Note that compared to the results of the pretest, the nouns moved from the last to first position, while the ranks of the verbs and adjectives did not change. This result indicates strongly that the students acquired nouns preferentially over the other word classes. On Posttest 2, student understanding did not differ among the word classes (LSD, $p > .05$).

These results are congruent with the literature on child L1 lexical development, in which nouns are acquired more quickly than verbs (Gentner, 1982) and are easier to define than verbs (Marinellie & Johnson, 2004). The L2 learners in this study also performed better for nouns than verbs, which implies, in this respect, that the lexical development processes are similar in L1 and L2 vocabulary acquisition.

Results Based on Frequency in Each Word Class

In general, the mean differences between the pretest and Posttest 1 were statistically significant, but those between Posttests 1 and 2 were not, which means that incidental vocabulary learning occurred after reading and was retained for at least 1 month. The students' self-reported pretest knowledge increased with word frequency. Overall, learning and retention rates were higher for more frequent words than for less frequent words in all three word classes. This supports the intuitively obvious assumption that the more frequently one encounters a content word, the more easily that word may be acquired.

The mean word knowledge of all three word classes according to the three tests in all frequency bands is presented in Figure 1. The results of a one-way ANOVA with repeated measures show that the mean differences between the tests were statistically significant, and post hoc multiple comparisons using an LSD multiple-range test revealed that the mean difference between the pretest and Posttest 1 was significant, but the mean difference between Posttests 1 and 2 was not throughout the frequency bands and word classes (pretest < Posttest 1 = Posttest 2). These results suggest that incidental vocabulary learning occurred after reading and that the words learned were retained regardless of the word classes.[4]

However, one case was an exception for this acquisition pattern (see Table 7). The mean differences between the tests were statistically significant for nouns in Band II, $F(1,11) = 418.32$, $p < .001$. A post hoc LSD test revealed that the mean difference between the pretest and Posttest 1 was significant and that the mean difference between Posttests 1 and 2 was also significant: pretest < Posttest 2 < Posttest 1 ($MSE = 246.57$, $p < .05$). Better performance on Posttest 1 than on Posttest 2 indicates that words learned immediately after reading attrited in 1 month.

Table 7. *Mean self-reported understanding of words in three classes in each band and ANOVA results*

Word class	Band	Pretest	Posttest 1	Posttest	*F*
Noun	I	13.33 (4.39)	25.92 (1.44)	23.83 (3.38)	776.01**
	II	38.25 (11.24)	63.08 (7.57)	59.25 (10.29)	418.32**
	III	77.17 (25.87)	125.92 (25.47)	124.67 (28.19)	220.63**
Verb	I	9.17 (2.72)	12.42 (1.08)	12.00 (4.53)	264.47**
	II	31.92 (13.87)	46.67 (8.35)	47.00 (12.76)	190.86**
	III	107.58 (31.07)	142.58 (32.49)	150.17 (29.79)	275.28**
Adjective	II	11.83 (1.69)	13.83 (1.74)	13.92 (1.73)	1,169.04**
	III	56.83 (16.77)	79.00 (16.10)	78.67 (20.15)	223.58**

Note. Standard deviations are in parentheses.
**$p < .001$.

The mean self-reported understanding of nouns (% of maximum possible understanding score) is shown in Figure 2. We see a strong frequency effect in word growth in the figure: Nouns in the highest frequency band (I) were less known on the pretest than the nouns in the lower frequency band (II); however, at the times of Posttests 1 and 2, the higher-frequency nouns show a higher learning rate than the lower-frequency nouns in contrast to the pretest.

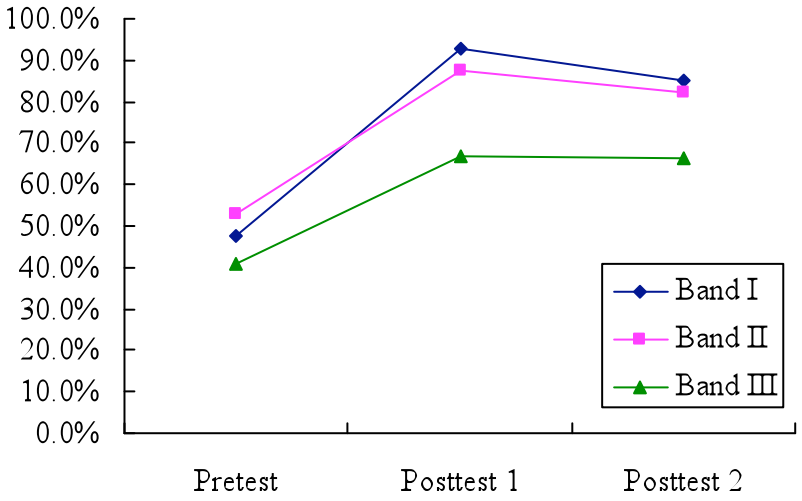

Figure 2. Self-reported understanding of nouns in each frequency band.

The mean self-reported understanding of verbs (% of maximum possible understanding score) is summarized in Figure 3, and it shows that the more frequent words were already known to a greater degree and consequently, learned and retained more than the less frequent words. Those verbs with higher frequency seem to be easier to learn incidentally and retain than do the less frequent ones.

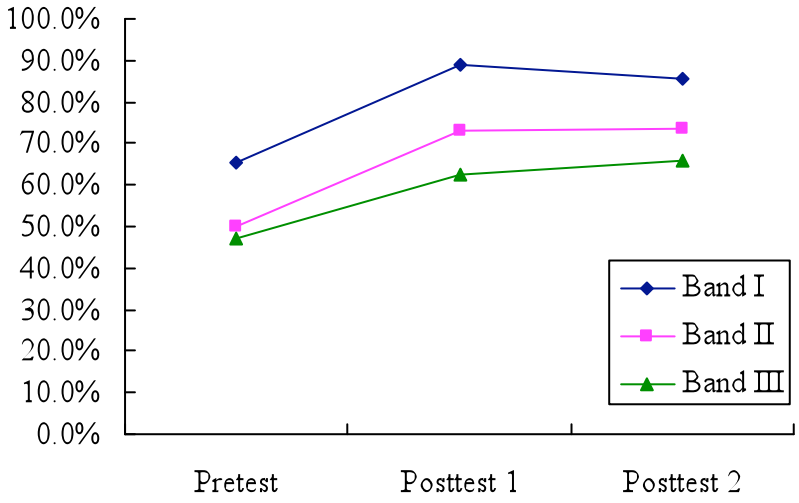

Figure 3. Self-reported understanding of verbs in each frequency band.

The mean percentages of the adjectives learned in Bands II and III according to the three tests is summarized in Figure 4. Only one adjective was in Band I, and this was already known to the learners on the pretest; so the results for the adjective in Band I are not reported here. The participants reported higher levels of knowledge for the more frequent adjectives on all of the tests.

The results for all of the word classes demonstrate that the understanding of the words increased

after reading the texts. They also demonstrate that the more frequent words were better understood and were retained at a higher level than were the less frequent ones. This observation proves that text frequency plays a major role in the acquisition of vocabulary. However, the significant attrition of nouns in Band II on Posttest 2 implies that the frequency may not have been sufficient to ensure long-lasting acquisition of some of the words. We will return to this issue in the discussion.

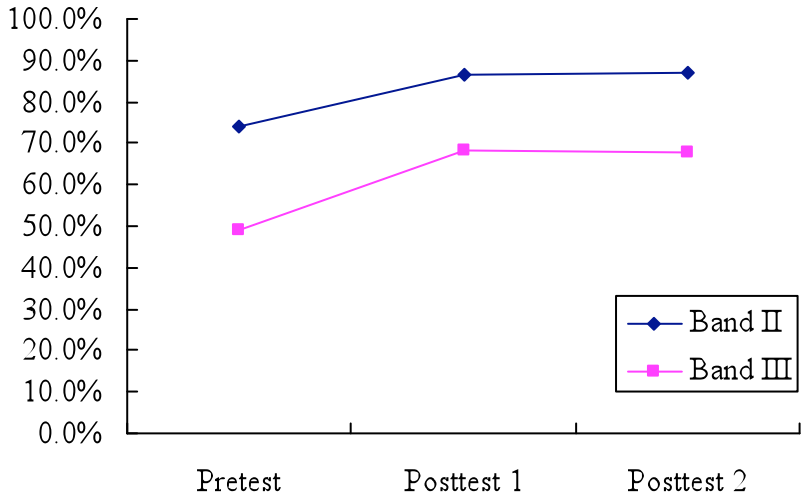

Figure 4. Self-reported understanding of adjectives in each frequency band.

Posttest Verification of Vocabulary Acquisition

At the time of Posttest 2, we were interested in seeing how many and what words had been unknown to every participant and how many of them were eventually acquired or remembered through reading. As a check on actual gains of unknown words after reading, participants were asked to complete a second measure, using words selected from the list of words that had been marked *No* ("I don't know this word") on the pretest. The format of this measure was based on Wesche and Paribakht's (1996) vocabulary knowledge scale (VKS), used in Horst (2005). On the pretest, 32 words were marked *No* by every participant, and the understanding of these words was assessed again on Posttest 2. The possible scores on the adapted VKS ranged from 1 to 4, as shown in Figure 5.

Lullaby

Score:

1 I don't know what this word means.
2 I have seen this word before, and I think it means_____
3 I know this word. It means_____
(Give the meaning in English or Korean)
4 I can use this word in a sentence. (Write a sentence)
_____
(If you choose 4, please also complete 3.)

Figure 5. Sample of word knowledge rating scale.

In the VKS measure, if a mean is 4 for a particular word, that means that all the participants knew the meaning of the word and could use it in a sentence. Responses such as "a kind of animal" for *porcupine* or "a man" for *sheriff* were considered evidence for partial knowledge; to account for this, 0.5 points were deducted from the full score. Of the 32 words that no students understood on the pretest, the 17 in Table 8 were selected for discussion in terms of the relationship between their frequencies and scores on the adapted VKS.

Words that were unknown to all participants before the test were learned to varying degrees according to the scores on Posttest 2, as indicated in Table 8. In general, words with higher text frequencies showed more gain on the adapted VKS than words with lower frequencies. However, this tendency is not straightforward, and word class clearly has a mediating effect. For example, the noun *annex*, which occurred 13 times, has a mean adapted VKS of only 1.58, but the verb *groan* in the same occurrence band has a mean of 2.45. We will return to this issue in the next section.

Table 8. *Frequency and VKS scores of selected words*

Word class	Word	Frequency	Adapted VKS score
Noun			
	canteen	52	3.40
	anorak	13	1.91
	annex	13	1.58
	porcupine	6	2.82
	blister	4	1.58
	loot	4	1.50
	bushplane	3	2.60
	twig	3	2.20
	bonfire	3	1.90
Verb			
	groan	14	2.45
	spat	11	2.40
	flicker	4	1.45
	evict	1	1.91
	spurt	1	1.00
Adjective			
	meticulous	4	1.42
	lukewarm	1	1.50
	anesthetic	1	1.42

Discussion

Our first research question asked how much vocabulary can be incidentally acquired from reading three authentic novels. The results of the tests show significant differences in student understanding between the pretest and Posttest 1 but no significant differences between Posttests 1 and 2. Therefore, we can safely conclude that vocabulary was incidentally acquired through ER and that most words acquired were retained without much attrition. The nouns in Band II were an exception to this observation. The pure word gain rate was as high as 40%, with the

possibility of learners' overestimation of their knowledge due to the self-evaluation. Nevertheless, this gain is quite high compared to other studies, although the direct comparison of pure word gain cannot be made between the present paper and other studies mentioned due to the absence of comparable data. We claim that ER has a strong influence on incidental vocabulary acquisition by Korean learners of English.

Nouns were significantly lost in Band II between Posttests 1 and 2. This selective attrition may be explained by the circumstance that the nouns in Band II are not words that occur frequently in the input available to Korean learners of English in general. For example, out of the 39 words in this band, 9 were marked as unknown by every participant on the pretest (e.g., *anorak*, *annex*, *sheriff*, *chastisement*). The remaining words were probably unfamiliar to the learners due to gaps in cultural knowledge (e.g., *raspberry*, *rattlesnake*, *rudder*, *tunic*). This suggests that incidental vocabulary learning can be affected not only by input frequency (note the successful retention of nouns in the less frequent band), but also by the degree of familiarity with words used in the texts, which convey messages that may be unfamiliar to foreign language learners (e.g., *hammock*, *bushplane*).

While Pitts et al. (1989) reported that over 50% of their participants failed to finish, the participants in the present study finished their reading. This was mainly because the students were engaged by interesting storylines and partly because a series of comprehension quizzes was administered to assist the students' completion of the assigned reading. This might have motivated steady reading with attention. Finally, word gain and retention rates can be influenced by the kinds of words that are tested: Non-words and real words may be processed differently in learners' working memories.

The second research question asked what proportion of incidentally learned words was retained 1 month later. As shown in Figures 2–4, significant word gain occurred between the pretest and Posttest 1 and persisted until Posttest 2. The general retention percentages on Posttest 2 are higher than the percentages of prereading word knowledge for the nouns (69.7 vs. 43.2%), verbs (68.4 vs. 48.6%) and adjectives (70.0 vs. 53.0%). Again, these results suggest that nouns are easier to learn than verbs and adjectives (cf. Benedict, 1979; Gentner, 1978, 1982; Greenfield & Smith, 1976, for child language development). This study is in line with the accounts in the literature: A higher percentage of the nouns was retained than of the verbs.

The percentages of retention on Posttest 2 are greater than the percentages of prereading knowledge across the three word classes. For example, for words in Band I, the retention percentage is 85.1% for nouns and 85.7% for verbs, which indicates a very high percentage of retention and a significant increase from the prereading knowledge percentages in each word class (see Figures 2–4 for Bands II & III). Therefore, we can safely say that the retention rate of the words gained incidentally through ER was quite high 1 month later. Interestingly, the exceptionally high retention percentage of adjectives seems to be attributable to the quite high prereading knowledge. Of course, concluding that vocabulary was successfully retained through ER would be hasty because the interval between Posttests 1 and 2 is crucial to determine whether the reading program was really successful. However, note that the participants in the study reported that they had not studied English between Posttests 1 and 2. Future studies should be conducted to further investigate this issue.

The relatively high retention rate (not only word-gain rate) in this study contrasts with other research that showed a quite low retention rate (Day et al., 1991; Dupuy & Krashen, 1993; Hulstijn, 1992; Pitts et al., 1989; Saragi et al., 1978; Waring & Takaki, 2003). One factor that may have contributed to this difference is the difference in the amount of reading. The greater the amount, the more exposure to the input and more repetition may take effect. Horst (2005) reported that her L2 participants read 10.2 graded readers over 5 weeks and learned 7 new words out of 50 test items; she claimed that the amount of reading has a prominent effect on word learning. In contrast, the participants in the present study read around 130,000 words in about 640 pages.

The third research question asked whether the frequency of words is related to their learning rates. Unsurprisingly, the words in Band III (the lowest frequency group) show the lowest prereading knowledge compared to the words in the other bands (41% for the nouns, 47.2% for the verbs, and 49% for the adjectives). Correspondingly, students' prereading understanding of the words in Band II was lower than that of the words in Band I for the verbs (49.9 vs. 65.5%), but not for the nouns (53.1 vs. 47.6%). Nevertheless, the retention percentages of the words on Posttest 2 illustrate that high-frequency words are remembered more readily than low-frequency words regardless of the word classes: The order of the retention rates is Band III < Band II < Band I.

Overall, the trends in percentage change of prereading knowledge, word gain, and retention are parallel, as illustrated in Figures 2–4. For all three word classes, the words occurring in higher frequency bands were learned better than those in lower frequency bands. This is the case throughout all three word classes, and we can say that more frequent words were more likely to be learned and were more resistant to attrition. Understanding and retention rates increased significantly even for the words with the lowest frequency, although low-frequency words were retained less than higher frequency words.

Note that the frequencies in this study are the text frequency and may not reflect the frequency in the language at large. Horst et al. (1998) did not find that high-frequency words in general language were learned more easily, although they found a significant text frequency factor. They argued that this was due to the lack of sufficient exposure to general English input for a repetition effect to facilitate learning. Similarly, in the present study, one of the highest frequency words was *canteen*, which occurred 52 times in the text and was successfully acquired in the end, but this word is not frequent in language use and was known to no participant before reading. This observation suggests that the frequency of words in a text may be more important in vocabulary acquisition than the general frequency of words in a language in terms of accumulated exposure and readiness to be picked up. The raw frequency of words in language is insufficient to explain the rate at which learners acquire them.

As shown in Table 8, the adapted VKS scores were higher for some words with lower text frequencies than for some of those with higher text frequencies, although they were all entirely unknown at the prereading stage. This observation requires explanation. More often than not, the text frequency is not directly reflected in the adapted VKS score. This observation may be attributable to the different "conceptual" recognitions of the words, which depend on the

different degrees to which the words were meaningful in the context for comprehension of the storyline. It does not seem feasible to define a number of exposures that is sufficient for successful acquisition, such as at least 10 exposures (Saragi et al., 1978) or 5–16 exposures (Nation, 1990). As Henriksen (1999, p. 314) pointed out, word acquisition seems to be able to range "over continua of lexical knowledge" from partial recognition knowledge to productive use ability, depending on how many and what kinds of exposures are needed for successful acquisition. The observation that some words that do not appear frequently, but are nevertheless acquired and retained, apparently because they are salient and significant to a story, is highly interesting. We suggest that the rate of incidental vocabulary learning is not simply related to the raw frequency of specific words in the language. We further propose that learning is a consequence of noticing and the conscious learning of words that are important in the narrative (Schmidt, 2001).

To answer the last research question, we demonstrated that the students learned words in different word classes at different rates. On Posttest 1, the students' self-reported understanding of the word classes was ranked noun > adjective > verb; this result is in contrast with the results of the pretest, in which the students' understanding of the nouns was the lowest. This change suggests that the nouns were easier to learn than the verbs or adjectives. Interestingly enough, on Posttest 2, the students' understanding did not differ among the word classes. Actually, the noun class was the only one that attrited in the interval between the posttests. Two questions arise: (a) Why were the nouns easier to learn incidentally through ER than the other word classes? (b) Why did the understanding of the nouns attrite, unlike the other word classes, 1 month after they were learned?

If we can assume that foreign language learning is not fundamentally different from child language development (cf. Slabakova, 2006; White, 2003), we can provide a plausible explanation for the preferential learning of nouns over other word classes in foreign language learning by adopting the accounts of child language development that indicate that nouns are learned before verbs. For the learners in this study, nouns might have been easier to understand because they are conceptually more basic than verbs or adjectives. This interpretation suggests that nouns are relatively simple entities in the mental lexicon, whereas verbs encode dependent word classes with directed connections to their noun arguments. The mapping between form and meaning for verbs would be more difficult because the argument structure information of verbs, such as how many and what kinds of arguments (e.g., theme, goal, or location), should be met in the learning process of verbs, while this process is not necessary when learning nouns. However, we can also assume that because nouns are easier to learn than verbs or adjectives and incur less cognitive cost of storage in the mental lexicon, they can be also more easily forgotten simply because of that low cost. We postulate that ease of acquisition is associated with ease of loss.

Finally, the limitations of the present study should be mentioned. First, on the pretest, the participants indicated that they understood 50% or more of the words throughout the three frequency bands (see Figures 2–4). This means that the participants did not have many opportunities to meet unfamiliar words in the ER materials. Learners who have smaller English vocabularies than these participants are needed to observe whether different word gain and retention rates would be observed among those students also. Second, the experimental methodology used in this study, the self-report checklist technique, is one of various

methodologies to measure learner word knowledge. If a different methodology, such as multiple-choice questions or translation test, had been used in this study, the number of words remembered on the delayed posttest might have been different because different experimental techniques can produce different measurement results (Gu & Johnson, 1996). Lastly, to determine the retention time of words incidentally learned through ER, a further study is necessary in which the delayed posttest is conducted after a longer period than in the present study.

Acknowledgments

We deeply appreciate the helpful comments and suggestions of the two anonymous reviewers of *Reading in a Foreign Language*, which helped us to fill the gaps of the previous version of the paper. We want to thank the students who participated in the study and enjoyed reading novels. All of the remaining errors are, of course, our own.

Notes

1. Chapter books are so named because the episodes in most of the books are divided into chapters with or without their own titles.

2. An anonymous reviewer pointed out that "the researcher was not able to observe the extent to which the students might have looked up words in a dictionary or engaged in vocabulary learning activities while they were reading." The students were strongly encouraged to read for meaning and pleasure, not for learning words. This was verified in students' oral reports that they had not paid much attention to the meanings of the individual words that they did not know for sure. They tried to guess the meanings in context and did not want to stop reading to look up words in a dictionary, especially when they were deeply engaged in the story.

3. For more information about the class procedure, refer to Kweon's (2008) article, which describes in pedagogical terms how the ER program can be implemented in L2 classrooms.

4. As an anonymous reviewer correctly suggested, the results of the present study should be interpreted with caution, considering that the tests measured word knowledge on the basis of a self-report measure. The self-report measurement lacks evidence that the words rated *Yes* and *NS* were indeed known or unsurely known to the students. However, the results of the adapted VKS study conducted at the time of the delayed posttest in fact prove that the self-report measure was a reliable method of measuring the learners' knowledge: words that had been checked *No* by all the participants on the pretest were found to be learned after reading even for the words with low frequencies.

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Appendix

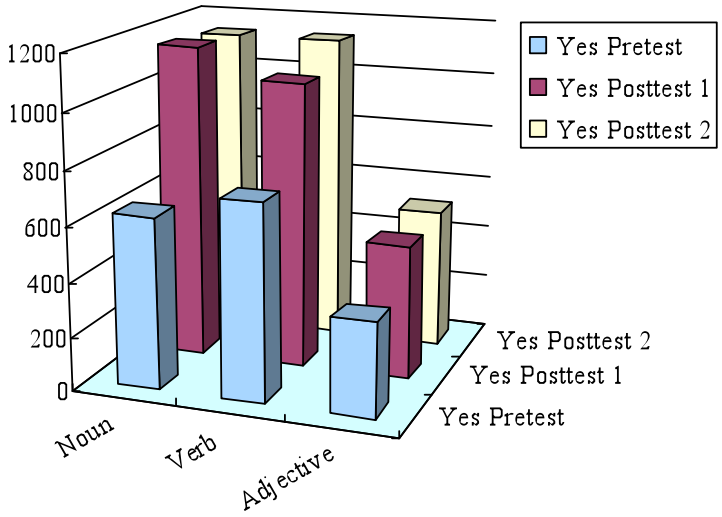
Nominal Data Collection

1. Numbers of *Yes*, *NS*, and *No* responses by all participants on the three tests

	Pretest				Posttest 1				Posttest 2			
	Yes	NS	No	Total	Yes	NS	No	Total	Yes	NS	No	Total
Noun	629	287	848	1,764	1,156	267	341	1,764	1,138	217	409	1,764
Verb	720	344	772	1,836	1,049	322	465	1,836	1,139	209	488	1,836
Adjective	345	158	301	804	493	152	195	804	513	107	185	804

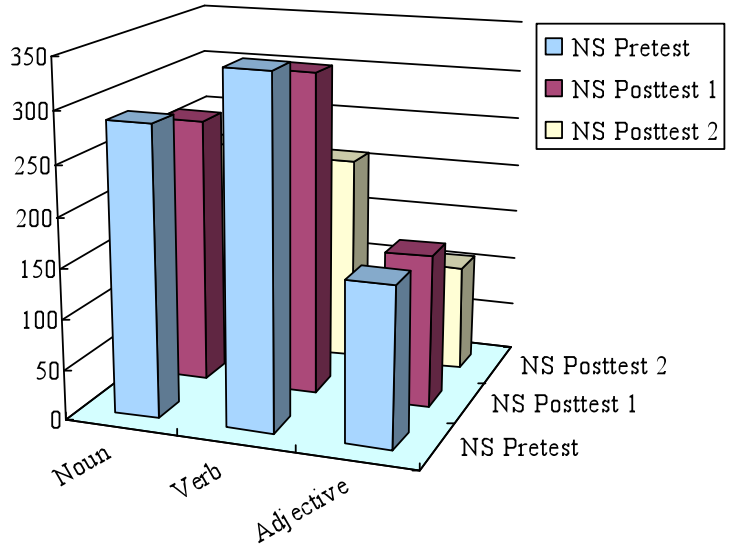
The total of 1,764 indicates 147 nouns × 12 students. The total of 1,836 indicates 153 verbs × 12 students. The total number of 804 indicates 67 adjectives × 12 students. For information on the total number of words in the classes, refer to Table 3.

2. Number of *Yes* responses in three word classes on the three tests



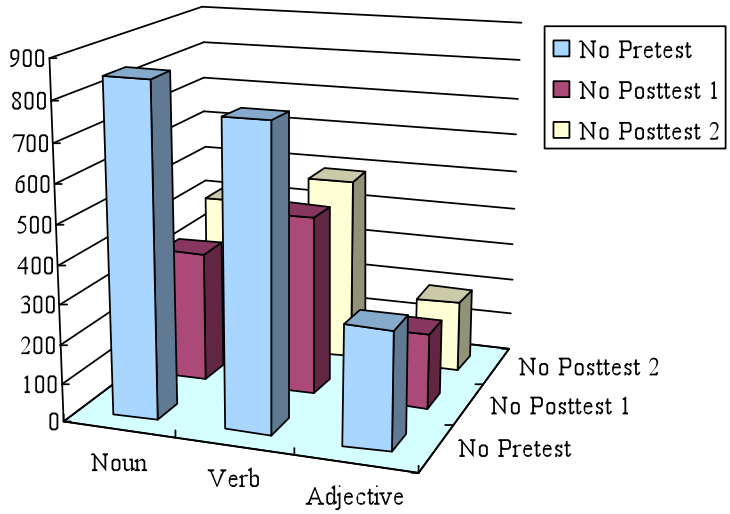
The figure shows that the number of *Yes* responses in three word classes across the three tests increased significantly. Nouns increased on Posttest 1 by about 85%; verbs, 46%; and adjectives, 43%, which suggests that the learners acquired word knowledge on Posttest 1. This supports the hypothesis that nouns are easier to learn than verbs. Interestingly, however, the students' word knowledge had increased at the time of Posttest 2 compared to Posttest 1. Based on the enormous increase of *Yes* answers on Posttest1, vocabulary was possibly acquired through extensive reading.

3. Number of *NS* response in the three word classes on the three tests



The numbers of *NS* responses in the three word classes across the three tests are shown in the figure. Between the pretest and Posttest 1 is not a big change; however, on Posttest 2, the *NS* responses decreased. The consistent NS response between the pretest and Posttest 1 suggests that if change occurred between these two tests, it was between the *Yes* and *No* responses, and in fact, as the *Yes* responses increased, the *No* responses decreased proportionally (see the figure below).

4. Number of *No* responses in the three word classes on the three tests



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