Vocabulary in Junior High School Textbooks and Exams

Isra Wongsarnpigoon
Kanda University of International Studies

Reference Data:

Wongsarnpigoon, I. (2018). Vocabulary in junior high school textbooks and exams. In P. Clements, A. Krause, & P. Bennett (Eds.), *Language teaching in a global age: Shaping the classroom, shaping the world*. Tokyo: JALT.

This paper details an investigation of the vocabulary content in an English textbook series used in Japanese junior high schools. The computer program Range (Heatley, Nation, & Coxhead, 2002) was used to find the level of the textbooks' vocabulary. The English content of public high school entrance examinations was also similarly analyzed for comparison. Additionally, opportunities for learning vocabulary through repetition or recycling in the textbooks were considered. Although a group of sample target learners did not have sufficient vocabulary knowledge for comprehension, the textbooks might serve as a suitable learning target, and the exams were also at an appropriate level. Learners, however, would not receive sufficient exposures for learning many high-frequency words from the textbooks alone. Teachers can use analyses such as this to better understand how they may need to support students' vocabulary learning by compensating for insufficient knowledge or providing repetition or recycling of previously learned words.

本論では、日本の中学校で使用されている英語教科書の語彙を考察する。語彙分析ソフトRange （Heatley, Nation, & Coxhead, 2002）を使用し、教科書で使用された単語のレベルを測定した。比較のために、公立高等学校の英語入学試験の内容も同様に分析した。また、それらの教科書で反復や再利用による単語学習の機会があるのかも考察した。対象となった学習者は理解に十分な単語の知識を持ち合わせていなかったものの、教材は彼らの学習目標に適していた可能性があり、試験も適切なレベルであった。しかしながら高頻度語に触れる機会は、教科書だけでは不十分であった。本研究のような単語使用頻度分析を行うことで、英語教師は知識の補足や反復・復習の促進など、学生の単語習得に必要な学習支援方法を熟慮することが出来ると言える。

The 2012 guidelines for English instruction issued by Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT) set a vocabulary learning target of 1,200 words for junior high school, an increase from the previous goal of 900 (MEXT, 2008). MEXT did not, however, specify any target words; the selection was left to textbook publishers. The vagueness of the guidelines raises questions about the lexical content in textbooks, which are major sources of input for learners. For instance, how suitable is the vocabulary for target learners' acquisition of useful words or for advancing to high school, a major goal of such students? This study is aimed at investigating these issues with one textbook series and a set of entrance examinations. It builds upon a previous study (Wongsarnpigoon, 2017) in which the vocabulary level of a single volume of the series and the vocabulary size of a group of target learners were analyzed.

Background

One major concept in vocabulary learning is that the amount of known words in a text is crucial to learners' comprehension. Laufer (1989) found that knowing 95% of a text's words enabled reasonable reading comprehension (defined as achieving a minimally acceptable score on a comprehension test). Hu and Nation (2000), however, determined that 98% was a more appropriate target for comprehension in unassisted reading for pleasure. Another principle is the importance of repetition in learning vocabulary. Learners need at least 10 encounters with new words in context for learning to occur (Webb, 2007). Some researchers suggest 20 exposures as a preferable target (Nation, 2013).

In Japan, several researchers have analyzed the vocabulary in English textbooks. Alberding (2006) investigated the vocabulary level and opportunities for learning in a university-level textbook by measuring the coverage provided by high-frequency words and examining word repetition within the book. He found that although the vocabulary level was appropriate for target learners, students would need more repetition and

recycling of previously introduced words than the textbook provided. Fujimori's (2005) analysis of high school textbooks revealed that the number of high-frequency and academic words did not reach MEXT's vocabulary targets and that vocabulary input was insufficient overall, with many high-frequency words having few occurrences.

Others have compared the vocabulary levels of high-stakes examinations with those of textbooks that ostensibly prepare students for such tests. Chujo (2004) used original word lists based on the British National Corpus (BNC) to analyze the vocabulary in multiple textbooks, the national Center Test for university admissions, both private and national university entrance examinations, and proficiency tests. She found that although proficiency tests generally contained vocabulary at appropriate levels, entrance exams were at more difficult levels than the textbooks. Kaneko (2012, 2013) performed similar analyses to find the vocabulary size needed for 98% coverage of major university entrance examinations. He concluded that examinees would not learn sufficient vocabulary from their school textbooks alone.

Although abundant research exists on vocabulary in textbooks and exams, few studies address materials for younger learners. Such areas merit attention, considering the liberty that Japanese textbook publishers have in selecting lexical content. Building on existing research, three research questions were developed to address those issues:

RQ1. What is the vocabulary level of an English textbook series for Japanese junior high school learners?

RQ2. Does the vocabulary in the textbooks suitably prepare learners for public high school entrance examinations?

RQ3. To what degree do the textbooks provide opportunities for learning high-frequency vocabulary through repetition?

Materials

New Crown English Series (Takahashi et al., 2012) is a MEXT-authorized junior high school textbook. (A subsequent edition was published in 2016, but for methodological reasons, the 2012 edition was used here.) The three-volume series contains 1,237 target words and 199 *additional words* (meant to stimulate student interest in the content; Sanseido, n.d.). According to supporting materials, vocabulary was selected using frequency and range data from dictionaries and a learner corpus, with the aim of including the most practical vocabulary for learners' daily and future use (New Crown Editorial Committee, 2012).

Methodology

The textbook and a corpus of high school entrance examinations were analyzed using methods described by Webb and Nation (2008) for evaluating the vocabulary load of texts with the free computer software Range (Heatley, Nation, & Coxhead, 2002). Range analyzes texts, comparing the vocabulary within to a series of user-specified baselists. The software provides data on the vocabulary's frequency and distribution across the analyzed texts. The results can be used to determine the vocabulary size necessary for comprehension of texts.

Text files of the textbook's contents and scripts for listening material were downloaded from *New Crown*'s CD-ROM for teachers. The scripts were also analyzed, following Fujimori's (2005) reasoning that the printed and audio materials together represent learners' total potential lexical input. All files were edited to remove extraneous text (e.g., page numbers and Japanese instructions). The text for all three volumes was analyzed with Range using Nation's (2006) 14 baselists based on 1,000-word frequency levels in the BNC. Using these lists enabled direct comparison with learners' vocabulary knowledge as measured by Nation and Beglar's (2007) Vocabulary Size Test (VST), which was based on the same lists. The unit for counting words was word families (consisting of a headword, inflected forms, and closely derived forms), which are appropriate when considering receptive vocabulary knowledge (Nation, 2006). Although others have argued that lemmas (Schmitt, 2010) or flemmas (McLean, 2017) are more appropriate units when counting words for low-proficiency learners, word families were chosen to enable comparison with results from the VST, which also used word families, and other studies (Nation, 2006; Fujimori, 2005) that used the same counting unit.

Range sorts proper nouns and marginal words (e.g., *ah*) according to separate, preset lists included with the 14 BNC wordlists. The analysis results were examined for additional proper nouns (e.g., *Kumi*) that were categorized as "not found in any list." These were added to Nation's preset wordlist of proper nouns. It was assumed that Japanese learners would know Japanese words in the results (e.g., *origami*), so they were also added to the list of proper nouns. Analysis with the revised baselists was then repeated on each individual volume and also on all volumes combined.

A corpus of prefectural public high school English entrance examinations for the prefectures in the Kanto region of Japan (Chiba, Gunma, Ibaraki, Kanagawa, Saitama, Tochigi, and Tokyo) was similarly analyzed. Materials for the exams administered in 2015 and 2016 were downloaded from the *Tokyo Shimbun*'s website (*2015 nen shutoken*, 2015; *2016 nen shutoken*, 2016). These years were selected as they were the only ones in which examinees could have used all three volumes of *New Crown*'s 2012 edition in

junior high school. Sixteen exams were analyzed (Chiba administers two exams annually) with Range, using the same 14 baselists. Included in the analysis were all questions and reading passages, listening scripts, answers and distractors for multiple-choice questions, and answers for questions with definite answers (e.g., vocabulary questions). Proper nouns and Japanese words were accounted for as above. The listening and written sections were analyzed both separately and together. Additionally, words glossed in reading passages were treated as being known by learners and removed from the individual text files for each test separately, in order to account for prefectures glossing different words. Range analysis was then repeated on the texts without glossed words.

Analysis and Results

To answer Research Question 1, the Range results were used in order to find the vocabulary sizes that provided the 95% and 98% coverage of the text recommended by Laufer (1989) and Hu and Nation (2000) respectively. As students generally do not read textbooks unassisted, the 95% threshold might be an appropriate target. The 98% threshold is more practical for exams, however, as students must read them without assistance. Range output files list the number of words from each baselist appearing in the text and the percentage of the total number of words represented by each baselist. Cumulative coverage was calculated by adding the coverage of tokens (or running words) for each 1,000-word level until the 95% and 98% thresholds were reached. Proper nouns and marginal words are frequently assumed by researchers to impose a minimal learning burden (Nation, 2006). Although some have challenged this belief (Brown, 2010), *New Crown* contained a large amount of Japanese words and names along with support (e.g., illustrations) for understanding proper nouns. Accordingly, proper nouns were treated as known by learners and were included when calculating cumulative coverage. Table 1 contains cumulative coverage figures for the textbook series and individual volumes.

Table 1. Cumulative Coverage of *New Crown*, Including Proper Nouns, Marginal Words, and Japanese Words

Word level	Volume 1 (PN = 10.62%)	Volume 2 (PN = 6.90%)	Volume 3 (PN = 6.72%)	All volumes (PN = 7.99%)
1,000	88.87%	88.75%	91.15%	89.67%
2,000	94.00%	95.40%	96.75%	95.47%
3,000	95.78%	96.77%	97.97%	96.91%
4,000	97.22%	97.53%	98.43%	97.77%
5,000	97.83%	97.94%	-	98.23%
6,000	98.92%	98.67%	-	-

Note. PN = proper nouns, marginal words, and Japanese words.

Knowledge of the first 2,000 word families provided coverage of 95% of the textbook series, and the first 5,000 words allowed 98% coverage. Individual volumes, however, had varying results. Contrary to what might be expected, Volume 1 (for Grade 7) required the highest vocabulary level for 95% and 98% coverage, at 3,000 and 6,000 words, respectively. Conversely, in Volume 3, the first 2,000 words provided 95% coverage, and 4,000 words ensured 98% coverage. Closer examination of the Range output provides insight into this discrepancy. Volume 1 contained a larger amount of mid-frequency (past the first 2,000) content words, such as food or animal names (e.g., *lion*, *spaghetti*). Over 1% of tokens came from the 6,000-word level alone, including 71 occurrences of *baseball, basketball,* and *soccer*, which were all relatively infrequent in the BNC. Baselists drawn from North American English might provide different results. Meanwhile, Volume 3 contained more function words, verbs, or words representing abstract concepts that were all in the first 1,000 words (e.g., *already*). From these figures, the textbooks contained vocabulary suitable for students still learning the most common words.

Table 2. Cumulative Coverage of Examinations, Including Proper Nouns, Marginal Words, and Japanese Words

Word level	Listening (PN = 3.40%)	Written, unadjusted (PN = 5.25%)	Written, glossed words removed (PN = 5.48%)	Both sections, unadjusted (PN = 4.83%)	Both sections, glossed words removed (PN = 5.00%)
1,000	94.03%	91.99%	94.04%	92.44%	94.04%
2,000	97.68%	96.61%	97.67%	96.84%	97.68%
3,000	98.85%	97.69%	98.33%	97.94%	98.46%
4,000	-	98.12%	-	98.33%	-

Note. PN = proper nouns, marginal words, and Japanese words.

Table 3. Distribution of the First 2,000 Words in the Textbook

Range of appearance	First 1,000	Second 1,000
Volume 1 only	33	33
Volume 2 only	52	53
Volume 3 only	102	90
2 volumes	191	74
3 volumes	321	47
Total	699	297

Research Question 2 was answered using the same procedure. Table 2 contains cumulative coverage figures for each section of the entrance exams separately as well as the combined tests, both with and without glossed words.

For the combined examinations as well as the listening sections alone, when glossed words were omitted, the first 2,000 words provided 95% coverage, and for 98%, the first 3,000 words were necessary. Without adjustments for glossed words, 98% coverage was reached at the 4,000-word level for the combined exams and also for the written sections alone. These results demonstrate some benefits of glossing vocabulary, such as enabling use of texts that might otherwise be too difficult for target learners and making passages more comprehensible (Nation, 2013). Here, glosses brought the written and listening sections to the same vocabulary level. Analysis showed the examinations' vocabulary level to be lower than that of the textbooks; thus, knowledge of enough vocabulary for comprehension of the textbooks would be sufficient for the exams.

To answer Research Question 3, the Range analysis output for the textbooks was examined, particularly data for high-frequency (i.e., the first 2,000) words. First, the distribution data, or the number of volumes each word appeared in, were considered. Table 3 shows these figures. Of the 699 1,000-level words (the most frequent 1,000) in *New Crown*, 321 (45.92%) appeared in all three volumes. Many of these were function words, but the figure also includes content words such as *fly* or *park*. Forty-seven of the 297 words (15.83%) from the 2,000-word level (the second 1,000), such as *pen*, occurred in all volumes. In contrast, 33 1,000-level words, including *jump* and *fire*, and 33 2,000-level words (e.g., *neck*, *toy*) were introduced in Volume 1 and never reappeared in later volumes. Another 52 and 53 words from the two levels (e.g., *land*, *tall*) respectively, appeared first in Volume 2 but were not in Volume 3. Students would thus never see 85 (12.16%) words from the 1,000-level appearing in the textbook and 86 (28.96%) from the 2,000-level past the volume that they were introduced in. Additionally, 42 words from the first 2,000 (e.g., *far*, *plane*) appeared in the first two volumes but not in Volume 3. In total, of the high-frequency words in the textbook series, 213 did not reappear in Volume 3.

Table 4. Repetition of High-Frequency Words Appearing in All Volumes

Occurrences	First 1,000	Second 1,000
20 or more	188	16
10 – 19	76	15
Fewer than 10	57	16
Total	321	47

Frequency figures enabled examination of the exposure to high-frequency words through repetition in the textbook. Table 4 contains frequency data for the high-frequency words that appeared in all three volumes. Although 321 1,000-level words appeared in every volume, only 188 (58.57%), such as *bag*, passed Nation's (2013) recommended threshold of 20 occurrences. Another 57 words (e.g., *eye*), or 17.76%, appeared fewer than the 10 times Webb (2007) required for learning. Of the 47 2,000-level words occurring in every volume, only 16 (34.02%) had 20 or more repetitions

(e.g., *mountain*), and 16 (e.g., *trip*) did not reach 10 repetitions. Thus, of the 2,000 most frequent words in the BNC, only 204 had both a high range of distribution and frequency of repetition in *New Crown*. In contrast, 513 of the most frequent 2,000 words appeared six or fewer times, representing 51.51% of the high-frequency words in the textbooks.

Discussion

High-frequency words, including proper nouns, comprised a large amount of the tokens in the textbooks: 89.67% and 95.47% by the first 1,000 and 2,000 words respectively. This focus on high-frequency words is appropriate for a beginner-level textbook and matches Nation's (2013) emphasis on learning them first. *New Crown* has a higher percentage of high-frequency vocabulary and a simpler vocabulary level than unsimplified novels or newspapers in Nation's (2006) study on the vocabulary size required to comprehend various text genres, and the textbooks' levels compare favorably with his findings for a graded reader. Although methodological differences preclude direct comparison, *New Crown* contained a higher percentage of high-frequency words than the high school textbooks analyzed by Fujimori (2005). Additionally, whereas Chujo (2004) found that knowledge of 3,000 to 3,200 words (without proper nouns) provided 95% coverage of junior and senior high school textbooks, here, the first 2,000 words with proper nouns enabled 95% coverage. *New Crown* therefore accords with results from other research. Furthermore, in an earlier study (Wongsarnpigoon, 2017), 220 Japanese eighth- and ninth-grade students were found, using the VST (Nation & Beglar, 2007), to have insufficient knowledge of the most frequent 2,000 words, which provided 95% coverage and might allow comprehension. This fact is not unexpected, as the textbook is intended for explicit instruction and not unassisted reading. As the students were still learning the first 2,000 words, however, the high representation of those words would make the textbooks' content an appropriate learning target.

Distribution and frequency data, however, showed the vocabulary input from the textbooks to be inadequate. The series contained 996 of the first 2,000 words, which is lower than MEXT's 1,200-word target. The remaining words in the textbooks were mid-frequency items, although many could be additional words intended to stimulate learner interest. Also, the textbook would not give learners sufficient opportunities to learn or strengthen knowledge of high-frequency words. Only 36.94% of those words appeared in every volume, and 171 words were not recycled in later volumes after being introduced. Additionally, although about 55% of the 368 high-frequency words occurring in every volume had 20 or more repetitions, over half of all high-frequency words in the textbooks appeared six or fewer times. These words therefore would not likely be learned adequately from the textbooks alone. These findings mirror other research (Alberding, 2006; Fujimori, 2005) that found input from textbooks to be insufficient.

Analysis of the entrance examinations suggested interesting points. The exams contained easier vocabulary than the textbooks, contrasting with other studies in which textbooks at higher stages of education were inadequate for preparing learners for target examinations (Chujo, 2004; Kaneko, 2012, 2013). This discrepancy could stem from the nature of public high school entrance exams, which are used by multiple schools in their prefectures and test a much wider range of examinees than individual university entrance exams. Next, disregarding glossed words, 976 word families occurred in the exam corpus, which was fewer than MEXT's learning target of 1,200. Students could conceivably see few words on the exams that they had not encountered in the textbooks. Overall, the exams represented an appropriate vocabulary learning target for students that had studied *New Crown*. As an implicit function of the textbooks is to prepare students for such tests, publishers could more strongly emphasize useful vocabulary for examinees in future editions, especially through increased repetition and recycling.

Limitations

Some methodological choices in this study merit consideration. First, as described above, the use of alternative units of counting or not treating proper nouns as known (Nation, 2006) might have provided measurements more indicative of learners' actual vocabulary knowledge. Next, wordlists based on the BNC, which was developed using British English texts, were used for analysis. Alternative baselists, such as the lemma-based New General Service List (Browne, Culligan, & Phillips, 2013), which was developed with Japanese learners in mind, might have provided results more practical for this context. Finally, examining the degree of overlap between the vocabulary in the textbooks and exams might have allowed more precise comparison, but time constraints prevented such analysis. Future research could include such measures.

Implications for Teaching

Although the vocabulary level of the textbooks was appropriate, it was found that they were insufficient as a main source of input to adequately learn many high-frequency words in them, similar to findings by Alberding (2006) or Fujimori (2005). Naturally, textbooks are reread multiple times in classroom and individual studying, providing some repetition of vocabulary; students are unlikely to read through a unit once and move on. Still, recycling of vocabulary from previous volumes or units would be vital. This study's results underscore the importance of teachers' roles in supplementing

textbooks to aid vocabulary learning, especially for *New Crown*'s target learners, for whom learning the most frequent words should be an immediate priority. Webb and Nation (2008) suggested pedagogical options for supporting learners, including preteaching vocabulary, glossing, and simplifying or enhancing text. Fortunately, textbooks or teachers' practices might already include some of these. Classroom teachers can also provide additional exposures to and recycling of previously encountered words through supplementary materials such as worksheets to strengthen word knowledge, communicative tasks that encourage students to use high-frequency vocabulary, or additional reading materials. For instance, students can do interview activities involving topics or situations that require previously learned words. Teachers can also find level-appropriate reading material on the Internet or even use beginner-level graded readers. Such reading could be assigned as an introduction to extensive reading.

One benefit of analyses such as the one in this study is that teachers can discover which words require more explicit focus or repetitions in instruction. For example, words in the first 1,000 lacking recycling or with few repetitions in the textbooks could be deliberately included more often in materials or tasks (Alberding, 2006). Conversely, less common words or words with more appearances in the textbook could be given less attention, as teachers might decide that the inherent repetition in classroom instruction or individual studying would be enough. Finally, teachers can include instruction on ways to review vocabulary outside of the classroom (e.g., using flashcards or mobile applications) that can help students retain previously learned words, particularly ones given less attention in class.

Conclusion

Analysis showed that these textbooks were insufficient as a sole source of vocabulary input for target learners. Although the vocabulary content was appropriate for the goal of taking public high school entrance examinations, the textbooks would not provide enough exposures to words for adequate learning. This type of analysis can help teachers know materials' lexical content and adjust their practices accordingly to support their students. Such awareness will be increasingly vital, as in the next MEXT guidelines, vocabulary targets for junior high school will rise to between 1,600 and 1,800 words (MEXT, 2017). Considering the figures for vocabulary frequency and distribution in this study, some major concerns will be the degree to which future textbooks can provide exposure to useful words and how teachers manage the increased demands and still ensure learning. The author hopes that this study provides an example of how teachers can use vocabulary analysis to make instruction more efficient and useful for students.

Bio Data

Isra Wongsarnpigoon is a learning advisor at Kanda University of International Studies. He has an MSEd in TESOL from Temple University Japan and has also taught English in Japanese elementary, junior high, and senior high schools. His research interests include L2 vocabulary learning, learner autonomy, and learner motivation. He can be reached at isravw@gmail.com

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