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# **English Vocabulary Learning: Analysing Frequency Data and the Case for an E-learning Implementation for Japanese Junior High Schools**

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The use of explicit vocabulary teaching can be an effective tool for increasing Japanese students' English vocabulary. The present paper examines the potential for the use of one e-flashcard software platform, Repetitions, in the context of one Japanese junior high school in an English as a Foreign Language class. The background of Japanese JHS English education, textbook usage, and design is then discussed. Salient points of contention found in the literature as it relates to vocabulary acquisition are then introduced. Next, a theoretical implementation of a blended learning program, leveraging e-flashcards to enhance vocabulary learning in a Japanese JHS EFL classroom is outlined with a particular focus on spaced repetition. Finally, a discussion of possible benefits and drawbacks to this theoretical learning is given. The ideas presented are of benefit to any teacher in the Japanese grade school context looking to engage their students more in vocabulary learning activities.

Keywords: vocabulary, Japan, EFL, junior high school, education

## **INTRODUCTION**

The importance of vocabulary acquisition and development cannot be overstated in the realm of language education. Laufer (1998) estimated that an English speaker might know around 18,000 family (root) words, compared to 3500-4000 for an upper-intermediate English second language (L2) high school graduate. In addition to this daunting disparity, problems arise for L2 learners in terms of choosing which vocabulary to learn, in what order, and how to learn them.

Japanese junior high school (JHS) students, aged between 12 and 15, are very familiar with these difficulties. In a system that leans towards rote learning, current teaching strategies have their origins in a combination of the centuries-old influence of Confucianism and the post-World War II American-led educational reforms (Aspinall, 2010). Repetition, whether in the form of drilling, repeating, or writing the same word a number of times, is an established practice used in JHSs. Essentially, this amounts to facilitating knowledge retention through repetition. While rote learning has its detractors, it has been shown to be effective for memorization, though these established methods might end up irrelevant if teachers do not make better use of computer-aided learning (Diakou, 2015).

Detriments of the system are frequently debated, but they will not form the focal point of this paper. Rather, given that a rote-based pedagogy is a somewhat intrinsic aspect of the educational system, this paper will examine the use of e-

flashcard learning within the scope of vocabulary learning theory as an additional effective means to increase retention for English studies. In order to cement this position, the current paper will first discuss the existing literature related to vocabulary learning and how words should be chosen for study in the context of Japanese JHSs. The paper will then investigate e-flashcards as a possible effective vocabulary learning aid, and consider how it might be implemented in a Japanese JHS.

## **DETERMINING VOCABULARY FOR STUDY**

### **Overview**

The Ministry of Education, Sports and Science (MEXT) determines the English curriculum for publicly-funded schools nationwide. MEXT decided that by the end of the third year of JHS, students should know approximately 900 English words (Ruegg, 2007). However, one is immediately faced with questions as to how and where such a number originated. A public list of the specified 900 words could not be found, but through established vocabulary research, and analysis of a MEXT-approved textbook, the answers to these questions can be speculated. McCarthy (1999) notes that the first 2000 most frequent words would cover the majority of core vocabulary needed for “everyday use” (p. 4) and might suggest the reasoning behind this decision.

In more recent times, a number of scholars (Kilgarriff, 1997; McCarthy, 1999; Nation, 2013) have suggested choosing vocabulary by performing a systematic analysis of English texts. In doing so, one can identify the most frequently occurring words, and choose vocabulary accordingly. Kilgarriff (1997) in particular observes that “more common words should be taught to foreign learners first, both so that they understand them and so that they know how to, and are inclined to, use them” (p. 1). This is crucial to cultivating efficient learners, especially with Japanese JHS students at a rudimentary English level.

### **Using corpus data**

Word frequency uncovered from analyzing an appropriate body of written or spoken text—a corpus—can greatly aid with the learning process. In such cases *lemma* which are root or family words are often listed, and encompass a range of conjugations, contractions, and other forms. One such corpus is the CANCODE (Cambridge and Nottingham Corpus of Discourse Data), a 5 million-word database of transcribed conversations. It gives a clear indication of how frequency declines with obscurity, as identified by McCarthy (1999). The steep and continual decline is highly noteworthy—uncommon words become rarer and rarer on a linear, sharp decline.

### **Zipf’s Law**

In a manual positioned as an L2 learning guide, Nation (2014) reports that 100 of the most common words cover 50% of most written or spoken texts, 1000 words covers 80%, while 5000 covers 98% (p. 13-14). This pattern falls under Zipf’s Law, a mathematical distribution model made popular by George Kingsley Zipf. It states that the frequency rank of the highest ranking item is proportional to the second, the second having twice the appearances as the third, the third having

three times the occurrences of the fourth, and so on, in a linear fashion (Piantadosi, 2014). What results is very large disparity between common and uncommon words (Kilgarriff, 1997). Of course, the subject matter level is relevant to the frequency of words—a family film such as *Shrek* would need knowledge of approximately 4000 lemma to achieve a 98% comprehension rate, while a high-level novel might need around 9000 (Nation, 2006).

### **Word frequency in the New Horizon textbooks**

The study described below was conducted in Hirakata, Japan and involves one Native English Teacher (NET), a native English speaker recruited with the intention of giving students greater exposure to spoken, native English. In this teaching context, students receive one extra 50-minute lesson a week with a NET to “engage in English activities in cooperation with Japanese English Teachers” (Hirakata Board of Education, 2016, n.p.). The textbook used in JHSs is a series called *New Horizon English Course*. It is a MEXT-approved series with a lexical foundation based on American English.

Combining all three books, which encompass the three years of Japanese JHS, a total of 969 combined listed words were counted, which is comprised of bolded vocabulary deemed important to learn. This thus falls within MEXT’s approximate 900-word guideline. They appear in the “Word List” section towards the back of the books, an example of which is shown in Appendix A.

The required vocabulary from *New Horizon* was compared to the Corpus of Contemporary American English (COCA) (Wordfrequency, 2015), which contains a list of the 5000 most frequent lemma from a database of 450 million. The bolded vocabulary in *New Horizon* are arranged alphabetically and appear as lemma, thus making them ideal for comparison to the COCA corpus. Ten randomly selected verbs were chosen from each textbook. Verbs were chosen due to their postulated regular incidence rate, compared to other lexical items. They are displayed in addition to the COCA lemma ranking beside each item in Table 1.

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**Table 1****New Horizon 1-3 Verb Frequency compared to the COCA Corpus**

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<u>New</u> <u>Horizon 1</u> <u>(Sample</u> <u>verbs)</u>	<u>COCA</u> <u>Frequency</u> <u>Ranking</u>	<u>New</u> <u>Horizon 2</u> <u>(Sample</u> <u>verbs)</u>	<u>COCA</u> <u>Frequency</u> <u>Ranking</u>	<u>New</u> <u>Horizon 3</u> <u>(Sample</u> <u>verbs)</u>	<u>COCA</u> <u>Frequency</u> <u>Ranking</u>
be	2	answer	824	arrive	813
call	645	become	139	cut	415
come	70	call	645	forget	875
cook	1426	cry	1358	move	207
get	39	excuse	3514	run	202
have	8	feel	134	stand	282
practice	565	hear	195	turn	170
teach	546	try	127	use	92
swim	2	answer	824	arrive	813
be	645	become	139	cut	415

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**Analysis**

Although most of the verbs fall within what McCarthy (1999) described as part of the 2000-word core vocabulary, there are some discrepancies, despite the admittedly small sample size. Yearly progression, in terms of frequency ranking seems to be quite erratic and nonlinear. Furthermore, some verbs (e.g., cook, swim, cry, excuse, wash) fall considerably out of the 900 range, suggesting MEXT might not have based their approved list on foreign corpora.

Corroborating this data in a much more comprehensive study, Ruegg (2007) conducted an analysis of second-year Japanese JHS students that had completed the first two New Horizon textbooks. The study was undertaken in order

to ascertain not just the number of words known, but also the depth of knowledge, and the usefulness of the words themselves. She compared their knowledge to the 1000 most common word list from Nation, which itself is based on the British National Corpus (BNC) and COCA corpora. The study found that while the students' vocabulary range was sufficient, their understanding of the individual words was low. Additionally, the vocabulary in the books was often shown to be low to medium frequency (Ruegg, 2007).

It should be highlighted that Ruegg's study was conducted in 2007, and since that time, New Horizon has been revised a number of times. It is unknown at the present time to what extent the vocabulary list has changed. As it stands, the data collected for the purposes of this study was taken from the recently updated 2016 editions, and given the similar variation and distribution frequency that was found, credibility can be given to Ruegg's (2007) study.

Japanese textbooks, like New Horizon, might be showing vocabulary found more frequently in written language because of the exam-focused and low-communicative nature of English as a Foreign Language (EFL) instruction in the country (McKinley, 2013). Brown (2010) suggests many English textbooks put too much emphasis on form and meaning, and neglect other areas of vocabulary knowledge, especially in terms of how often individual vocabulary occurs.

Another potential reason for the irregularity in frequency is what MEXT perceives as *necessary vocabulary* may be a result of cultural and regional variation; for example, certain words like "swim" might have a higher usage incidence in the Japanese language because swimming might be a more popular activity. Other factors, such as textbook themes, relevance to JHS education and students, and relationship with target grammar may also play a role. These postulations will however, require more thorough research.

## **VOCABULARY LEARNING STRATEGIES**

### **Difficulties learning vocabulary**

It has been established that learning vocabulary based on word frequency is crucial to successful L2 acquisition, and while New Horizon vocabulary appears to be generally adequate, there is room for improvement. Equally important to content is the means for successful information transfer, or learning strategy.

Nation and Meara (2010) stress that in addition to the usefulness of individual vocabulary items, the needs of learners must also be considered. Vocabulary teaching has been said to be one of the most neglected parts of L2 pedagogy in Japan, with some teachers expecting students to do this by themselves (Miyakoda, Kaneko, Ishikawa, & Shinagawa, 2010). Although not an altogether unreasonable request, some students might require more instruction in learning methods than others. Resultantly, due to a lack of time, Wang (2014) observes that foreign language (FL) learners simply do not have enough encounters with unfamiliar words in enough contexts. Japanese JHS students in particular have little time, in fact, more than sixty percent attend cram-schools after school in evenings and weekends (Lewis, 2015).

## **Implicit and explicit learning**

Learning strategies are crucial not only to successful L2 vocabulary retention, but learner success in general. To this effect, considerable research and debate about vocabulary learning strategies exists and continues to evolve. One of the most influential taxonomies divides the vocabulary acquisition process into two types. Ellis established a *learning continuum* which specifies that learning strategies are either implicit (incidental), or explicit (conscious) (1995a). The former may also be termed as meaning-focused input, or deliberate learning (Nation & Meara, 2010). Essentially, learners are either focused on word forms through conscious study, or absorbing them by chance exposure, such as through media and “picking up” vocabulary from daily life without noticing.

While some scholars argue that over-use of such explicit vocabulary learning techniques should be discouraged (Crow 1986; Krashen 1989), Schmitt (2008), Webb (2009), and Nikoopour and Kazemi (2014) support the case for more explicit vocabulary learning. This is because one of the largest drawbacks of implicit learning is that it is extremely slow. Laufer (2003) observed that to ensure 108 words are learnt incidentally, with a minimum repetition of 10 times each, a student would have to read as many as 200,000 words of text. This is already assuming that students have Nation’s (2014) ideal 95-98% comprehension rate, and thus is quite an unrealistic strategy for low level JHS students. After a thorough analysis of vocabulary learning strategies, Schmitt (2008) discerns more succinctly that “virtually anything that leads to more exposure, attention, manipulation, or time spent on lexical items adds to their learning... anything that leads to more and better engagement should improve vocabulary learning” (p. 339).

Thus, through repeated explicit exposure to target vocabulary using engaging methods, knowledge retention ought to improve. In the classroom, this might include word matching worksheets, intensive and speed reading, semantic mapping, word-detective activities, and repeating words aloud (Nation and Meara, 2010, p. 41-43). However, while undoubtedly valid strategies, of particular interest to the present study is the use of flashcards for vocabulary retention.

### **Productive and receptive learning with flashcards**

The use of flashcards is a common retention technique, usually achieved through word pair memorisation. Vocabulary learning which involves a user studying L2 words and attempting to recall the L1 meaning, is known as *receptive learning*; the opposite, when studying L1 words with the goal to recall the L2 meaning is termed *productive learning* (Zhong, 2011). Webb’s (2009) Japanese study of de-contextualised receptive and productive strategies, involving flashcards, found that both were effective. However, while productive learners gained greater knowledge of orthography, meaning, syntax and grammar, receptive learners scored higher in the “meaning metric” (p. 370). The assertion that can be drawn is that both receptive and productive strategies should be employed during flashcard utilisation.

### **Spaced Repetitions**

In order to bolster productive and receptive flashcard learning, it is important to consider the scheduling of when new vocabulary words should be learnt and revisited, or to utilize spaced repetition. In terms of cognition, Ellis

(1995b) calls this part of a cognitive *spacing effect*, noting that revisiting vocabulary items in intervals is about twice as effective as studying vocabulary lists (massed learning). A systematic use of paper flashcards like this is effective, but it requires schedule management, self-monitoring, and is inefficient if easier words are studied too often, or harder words are not studied enough (Nakata, 2008). This is where computer-assisted language learning (CALL) can help mitigate these problems.

Given that engagement, exposures, attention, and time are key to accelerating the intake of new words, the use of CALL through electronic flashcards, or e-flashcards, can now be positioned as a prime candidate to meet or excel Schmitt's (2008) criteria for success. Used in conjunction with carefully selected vocabulary based on corpora frequency, as well as spaced repetitions chosen by a software produced algorithm, the solution has the potential to be the most efficient way to learn vocabulary.

### **E-flashcard learning**

Studies involving e-flashcards began to appear around the 1980s. Goldenberg and Turnure (1989) showed that basic receptive and productive learning of Japanese and English word drilling, through spaced repetition, was a highly efficient tool to both teachers and learners. Browne and Culligan (2008) used CALL software to identify high frequency vocabulary for Japanese students, and used interactive e-learning activities that included spaced vocabulary repetition that targeted more challenging words. By using an algorithm that adapts as the L2 user learns, more difficult flashcards were prioritised, eliminating many of the weaknesses of paper-based methods (2008). Miyakoda et al. (2010) also showed that compared to regular, paper-based learning, Japanese students that used an online vocabulary learning environment were not only better able to retain words, but they also strengthened their comprehension of word meaning.

More recent CALL studies have investigated the combination of smartphone use with e-flashcards. Watanabe (2012) showed that nearly half of all Japanese university students at an Australian university used e-flashcard and other e-learning smartphone apps (as cited in Mindog, 2016). Comparing paper-based flashcards, PC, and smartphone based e-flashcards, Nikoopour and Kazemi (2014) found that due to their portability and ubiquity, mobile phone based software provided the highest learning and retention gains. Clearly then, there is a case to be made for the incorporation of e-flashcards into the JHS English education system.

## **IMPLEMENTATION IN A JAPANESE JUNIOR HIGH SCHOOL**

### **Identifying a need for e-flashcards**

While CALL is sometimes used in Japanese JHSs in the form of slideshow (e.g., PowerPoint) vocabulary drilling, it has not been used for individual learner spaced repetitions, similar to those mentioned above. It is unreasonable to expect that all L2 learners in a classroom will progress at the same level, which is why a learner centred strategy for vocabulary retention ought to be implemented. With the time and pressure constraints Japanese JHS students face, more efficient learning activities should be considered.



## Types of e-flashcard software

There are several e-flashcard software programs that could be adapted to the Japanese JHS English education context. They vary in graphical representation, content, price, and ease of use, but the basic underlying mechanism and algorithms used are quite similar: words are shown based on automatic spaced repetition by a self-graded learner score for each item.

For the purposes of this study, one piece of software, Repetitions (Version 1.82; Tsai, 2018), was chosen since it is available as a free, multi-platform (e.g., PC, Mac, tablet, and smartphone) application, and includes the syncing of a user's vocabulary deck via the internet. There are three scenarios in which the use of this software could take place: as part of a regular classroom lesson, at home, or ideally, both. A potential process that JHS EFL teachers and NETs might use for Repetitions is outlined below.

### An implementation strategy using Repetitions

Implementation of Repetitions software in a blended learning environment could follow the procedure detailed below:

1. NETs conduct one lesson per week, if possible, in the Information and Communication Technologies (ICT) room, and dedicate approximately 10 minutes to e-flashcard learning. Students are encouraged to use the software at home and mobile devices if they have them. In this case they must create an account at the Repetitions website to enable synchronisation of learning data.
2. Students begin by selecting a pre- or self-created vocabulary deck corresponding to pages and units in the New Horizon textbook that they learn in regular lessons each week (Figure 1).

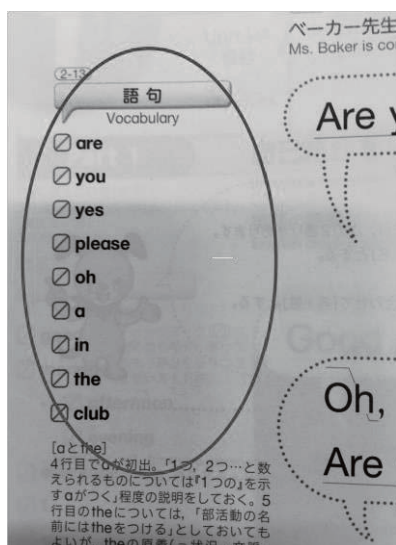


Figure 1: A vocabulary list from New Horizon 1

3. The NET can create additional decks and provide both the English and Japanese meaning (whether lemma, grammatical components, or even whole sentences), which can then be automatically reversed to create both productive and receptive cards. Three-sided cards can be produced, in situations where hints or mnemonics are desired. To increase engagement, pictures and sounds may also be added. Students may add other vocabulary items as they wish (Figure 2).

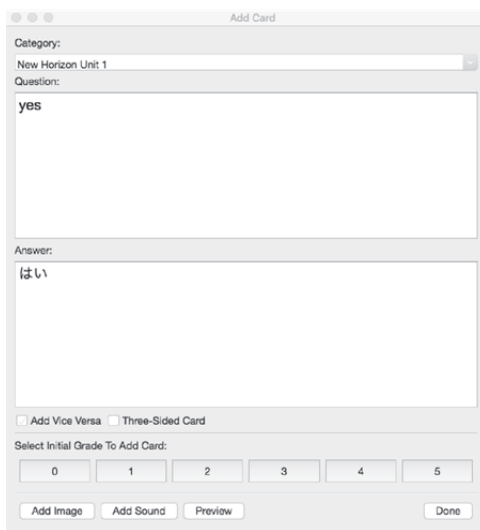


Figure 2. Creating a deck and adding New Horizon Vocabulary

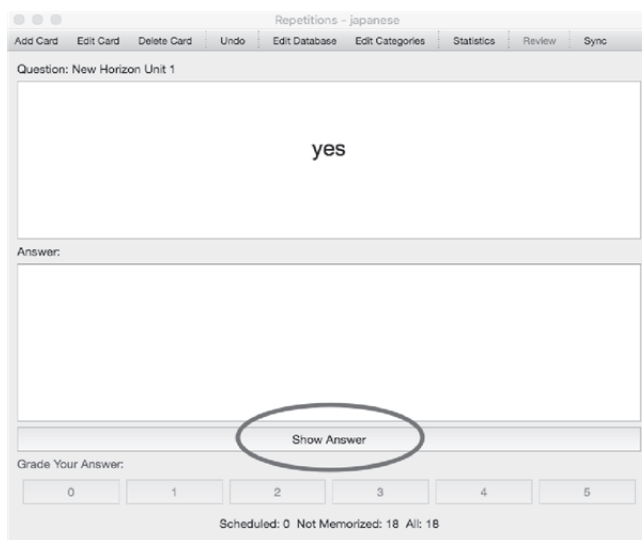


Figure 3. The learning process (receptive example).

4. During the learning process, the first part of a flashcard is shown. The student clicks or taps to reveal the answer (either an L1 or L2 item) (Figure 3).

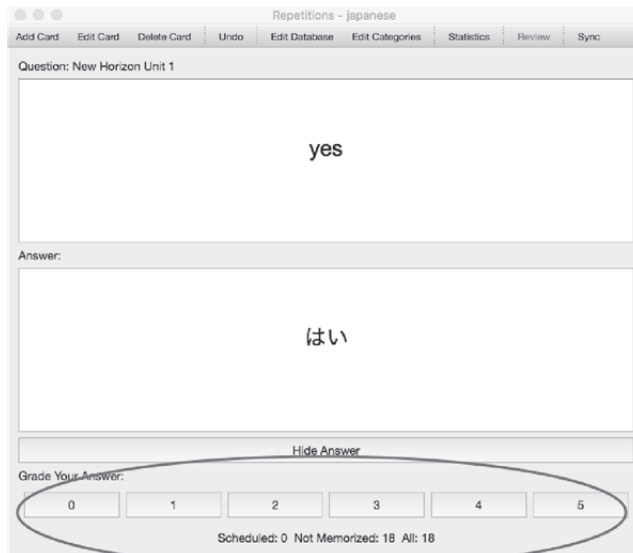


Figure 4. Self-grading in Repetitions

5. Finally, the difficulty of the card must be graded by the learner. After this, a new flashcard is shown and must be graded, and so on, until all cards are shown (Figure 4).

6. In Repetitions, a self-graded card of 0 or 1 will be re-shown in the same learning session. Grades 2-5 will be re-shown at longer intervals. Thus, if a user studies everyday, a card graded 5 might be shown only once every two weeks, whereas a card graded 2 might be shown the next day of study. With an internet connection, the decks and learning data will synchronise with any other version of Repetitions regardless of platform (Figure 5).

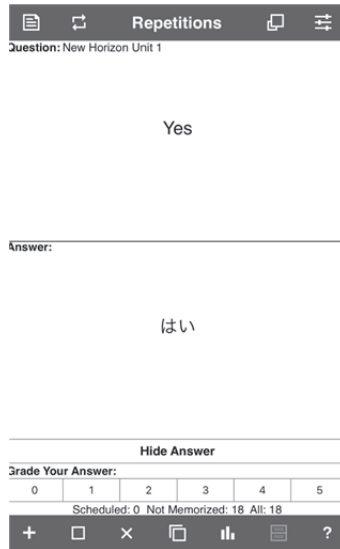


Figure 5. The smartphone version of Repetitions using wireless synchronisation

## DISCUSSION

### Advantages

As mentioned, since rote learning is common in Japanese schools, it could be speculated that the use of software, such as Repetitions, should not be conceptually difficult for students and teachers to use on a regular basis. The algorithm used in Repetitions analyses user scores, failure rates, and duration between sessions. As more vocabulary and decks are added with time, the software systematically displays more proportionally difficult words at intervals that evolve along with the L2 learner's rate of retention. This requires self-grading, but it is advantageous compared to paper flashcards or lists, which might simply be separated into learned and unlearned categories, a pitfall that Ellis (1995b) mentions. Essentially, software like Repetitions creates a personalised experience progressing with the learner.

It is suggested an ICT classroom is used to allow students access to the software, but due to scheduling conflicts, this is not always possible; however, in such situations vocabulary decks can be distributed via email, or be student-created as a learning strategy. In cases where students have smartphones or tablets, study can take place anytime outside of the classroom.

Ideally, if New Horizon's vocabulary lists were structured more in line with the word frequency lemma such as those in the COCA corpus, English proficiency might increase even more. However, as it stands, the current vocabulary frequency is likely sufficient, and the process would provide a valuable and efficient pedagogical addition to the L2 learning process.

## **Challenges**

It must be stressed that this explicit spaced vocabulary learning method is only one facet of EFL learning, and should not be used to replace other aspects of L2 study focused on speaking, pronunciation, writing, and listening. This is why it is suggested teachers dedicate approximately 10 minutes of a once-per-week lesson to the activity, and encourage students to continue study at home, as Mindog (2016) suggests.

In contrast to previously mentioned e-flashcard studies, Nakata (2008), while acknowledging the advantages of the algorithm used in such software, found no statistical superiority of CALL compared to word cards. While reporting higher retention rates with software, compared to standard massed vocabulary lists, he failed to find an advantage over paper flashcards, and speculated that not all learners were suited to, or were comfortable with computers. However, Nikoopour and Kazemi (2014) refute this stance given the rise of smartphones since 2008, particularly with young learners, who are the target demographic of the present paper, and who will undoubtedly be more comfortable with the technology.

Learning progression cannot be monitored by a teacher in Repetitions at the time of writing, and the ability to cheat by self-grading could be tempting for some students. Furthermore, as time passes, the number of vocabulary items will increase, which will require more revision time, particularly if a student is not diligent with their studies.

Admittedly, not every JHS student will own a smartphone, giving those who own one a potential advantage. A recent study by Tran (2016) explored the use of e-vocabulary learning exclusively with mobile phones. By using a combination of in-class activities and an external e-learning application through Facebook, Tran (2016) noted an initial positive response, but stressed that strategy training was important, as motivation to use the app faltered with time. Keeping young learners engaged is key, thus interesting pictures and sounds ought to be included with vocabulary items, as hints, where possible. For JHS students, emphasising habitual learning, as well as assessment through short vocabulary tests might be necessary to facilitate this.

One way of increasing e-learning motivation is through more of a visual representation of the memorisation process. For example, awarding points for successful memorisation and competing against classmates as vocabulary tasks are completed. This can be seen on the website Memrise, which awards points for quicker retention, and envisions vocabulary as seeds, eventually growing, and “flowering” after enough successful repetitions (Appendix B). The service was not included due to a lack of customisation and cost considerations, but it serves as an example of how engagement can be increased in spaced vocabulary learning.

## **Ramifications**

In analysing which vocabulary to learn, it was suggested that choosing words, based on corpora frequency, is a streamlined means to structure learner materials. The vocabulary of the New Horizon textbook in Japan showed signs of being arranged to some degree based on frequency, with some abnormalities potentially from regional variation and degree of exam focus.

The difficulties students faced were considered, and judged on how they ought to be addressed. Explicit flashcard learning was noted as a solution, in particular, learning vocabulary via strategically spaced flashcards was proven to increase retention. Due to more recent technological advancements in CALL, it was suggested that electronic flashcards had an even greater potential due to the ubiquitousness of PCs and portability of smartphones in Japan. International and local studies proved the effectiveness of their combination.

Acknowledging this, this paper postulated a potential scenario where the vocabulary from the New Horizon textbooks might be applied using the e-flashcard software, Repetitions, in a junior high school context. There could be difficulty in ensuring students remained engaged, diligent, and honest when using the software. Yet, if implemented and taught skilfully, the potential learning efficiency would alleviate some of the learning burdens that Japanese JHS students endure.

The current MEXT-approved list indicates some irregularities in word frequency that suggest improvements could be made more in line with corpus data. More research should be conducted into e-flashcard implementation in JHSs. E-flashcards have uses outside of vocabulary, and there is scope to research the potential for other aspects of EFL learning.

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# Appendix A

## New Horizon English Course 3 (2016) Sample Vocabulary

### 1 Word List

- 1～3年生の教科書の本文に出てきた語と意味を一覧にしています。
- 3年生の Tool Box や練習問題、Presentation of the Challenge に出てきた語で、そのページまでに習っていないものについては、p.131 に一覧にしています。
- 太字の語は特に覚えたい語です。
- 数字は、3年生でその意味がはじめて出たページを示します。数字が斜体になっているものは、その意味が1・2年生ですすでに出ていることを、①②は、その意味が1・2年生で出ているが3年生では出なかったことを示します。

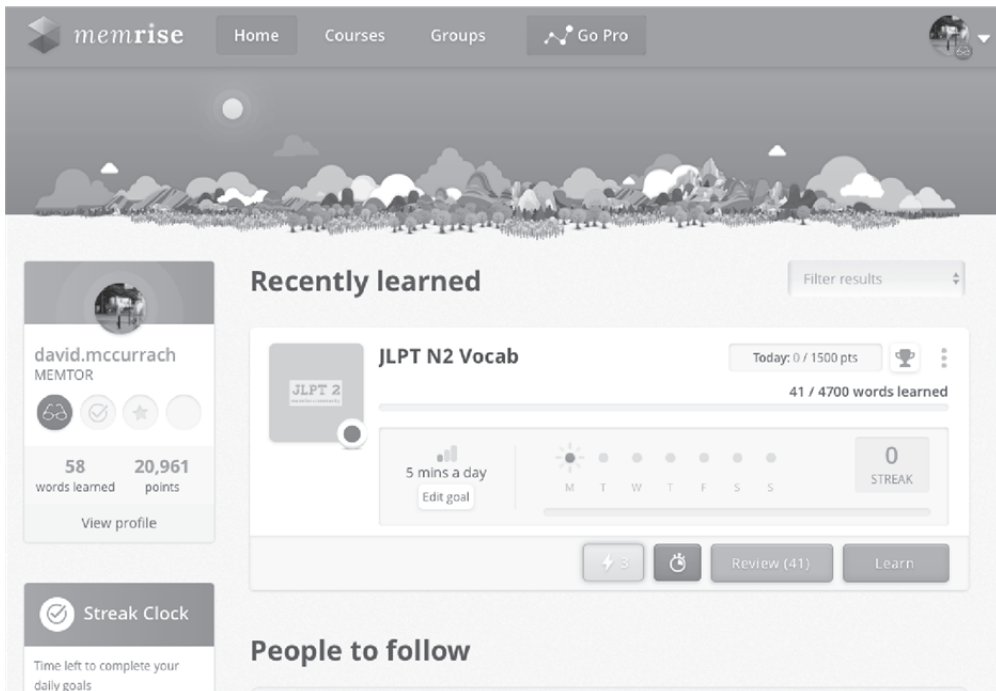
This gives simple definitions for the words that have appeared in the main text of Books 1-3. For words appearing for the first time in "Tool Box," exercises, and Presentation Challenge, see p.131. Words in bold are especially important to learn. Numbers show the page where the word first appeared with that meaning in Book 3. Italic numbers show meanings introduced in Book 1 or 2. ① or ② shows that the meaning was in Book 1 or 2, but not in Book 3.

#### A

<b>a</b> [ə] 冠 【数】1つの、1人の【数えられる名詞の 前に置く。ふつう訳さない】 4	<b>able</b> [eɪbəl] 形 (…することができる be able to …することができ 76	<b>about</b> [əbaʊt] 前 副 前 ①【関連】…について 4 ② all about …次第 ② 副 約…、およそ 24	<b>above</b> [əbʌv] 前 …の上に【へ】 104 abroad [əbrɔ:d] 副 外国で【に、へ】 ② accept [əksept] 動 (…を)受け入れる 86	<b>across</b> [əkɾɔ:s] 副 …を横断して、…を横切って ② actually [æktʃuəli] 副 実には 20 add [æd] 動 増す、増大させる add to …を増す、増大させる ② adventure [ədventʃər] 名 冒険 100 advertisement [ədvərtáizmənt] 名 広告、宣伝 100	<b>advice</b> [ədvaɪs] 名 助言 ② afraid [əfráɪd] 形 こわがって be afraid of …をこわがって 76	<b>after</b> [æftər] 前 副 前 ①【時間】…のあと 57 ② → look ② 副 …したあとで 62	<b>afternoon</b> [æftərnú:n] 名 午後 ① <b>again</b> [əgeɪn] 副 再び、また 51 <b>against</b> [əgeɪnst] 前 …に反対して 70 <b>ago</b> [əgəʊ] 副 (今から)…前に not long ago つい最近 72	<b>agree</b> [əgrɪ:] 動 賛成する、意見が一致する agree with …に賛成する 74	<b>Alaska</b> [ələsksə] 名 アラスカ【米国北西部の州】 106 <b>Alaskan</b> [ələsksən] 形 アラスカの 107 <b>Alex</b> [əleks] 名 アレックス【男性名】 36	<b>all</b> [ɔ:l] 形 代 副 形 すべての、全部の 33 代 全部、全員、すべて、みな 36 副 ①全く、すっかり、すべて 55 ② → right 形 55	<b>almost</b> [ɔ:lmu:st] 副 ほとんど 28 <b>alone</b> [ələʊn] 副 1人で、ただ…だけで 108 <b>along</b> [əlɔ:ŋ] 副 前 副 → get 98 前 …にそって ②	<b>already</b> [ɔ:lɹɛdɪ] 副 すでに、もう 36 <b>also</b> [ɔ:lsoʊ] 副 …もまた、さらに 8 <b>aluminum foil</b> [əlu:mínəm fɔɪl] 名 アルミホイル ② <b>always</b> [ɔ:lweɪz] 副 いつも、いつでも 33	<b>am</b> [æm, m] 動 助 動 ①…です、…である 4 ②(…に)いる ① 助 【現在進行形やbe going toを作る】 4 a.m. [éém] 副 午前 ① amazing [əmeɪzɪŋ] 形 驚かせるような、びっくりするような 74 Amazon [éeməzən] 名 the Amazon アマゾン川 26 America [əmeríkə] 名 アメリカ合衆国【正式名称は the United States of America】 ① American [əmeríkən] 形 アメリカの、アメリカ人の 92	<b>among</b> [əməŋ] 前 …の中に【で】、…の間に【で】 107 <b>amusement</b> [əmjú:zmənt] 名 amusement park 遊園地 ① <b>an</b> [ən] 冠 【数】1つの、1人の【母音で はじまる数えられる名詞の前に置く。 ふつう訳さない】 19	<b>and</b> [ænd, ənd] 冠 ①…と… 4 ②【goやcomeのあとに用いて】 go and … …しに行く 4 come and … …しに来る 34 ③そして、それから 20 ④ますます【同一語をくり返し用いて】 weaker and weaker ますます弱く 57 ⑤【命令文のあとで】そうすれば ① ⑥ …, and so on …など ② <b>angry</b> [æŋgrɪ] 形 怒った ② <b>animal</b> [ænəml] 名 動物 28 <b>anime</b> [æniméi] 名 (日本の)アニメ 28 <b>Ann</b> [æn] 名 アン【女性名】 ② <b>another</b> [ənəðər] 形 代 形 ①別の、異なった、ほかの 10 ②もう1つの、新たな 16 代 もう1つのもの【こと】、もう1人 40	<b>answer</b> [ænsər] 動 名 動 …と答える 103 名 答え、応答、返事 ① <b>any</b> [eni] 形 ①【肯定文で】どんな…でも 60 ②【疑問文で】いくつかの、いくらかの ① ③【否定文で】何も(…ない) ② <b>anyone</b> [eniwʌn] 代 疑問・否定文で 今(で)はもう…(でない) ② <b>anyone</b> [eniwʌn] 代 疑問・否定文で だれか、だれも(…ない) 82 <b>anything</b> [eniθɪŋ] 代 疑問・否定文で 何か、何も、どれも 19 <b>anyway</b> [eniwei] 副 とにかく 104 <b>anywhere</b> [enihwɛər] 副 ①【肯定文で】どこでも、どこへでも 19 ②【否定文で】どこへも、どこにも(…ない) ②	<b>appearance</b> [əpiərəns] 名 外見、外観 ② <b>apple</b> [æpl] 名 リンゴ ① <b>April</b> [éɪprəl] 名 4月 12 <b>aquarium</b> [əkwɛəriəm] 名 水族館 ② <b>Arctic</b> [árktɪk] 名 形 名 北極圏、北極地方 106 形 北極(地方)の 109 <b>are</b> [əz, ər] 動 助 動 ①(…が)ある【いる】、(…に)ある【いる】 4 ②…です、…である 18 助 ①【受け身の文を作る】 6 ②【現在進行形やbe going toを作る】 20 <b>area</b> [éəriə] 名 面積 4 <b>arm</b> [ɑ:rm] 名 腕 56
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## Appendix B

### Memrise (2016) example



*Figure 1.* Courses are chosen from pre-created decks. In this case, the author used Japanese vocabulary.

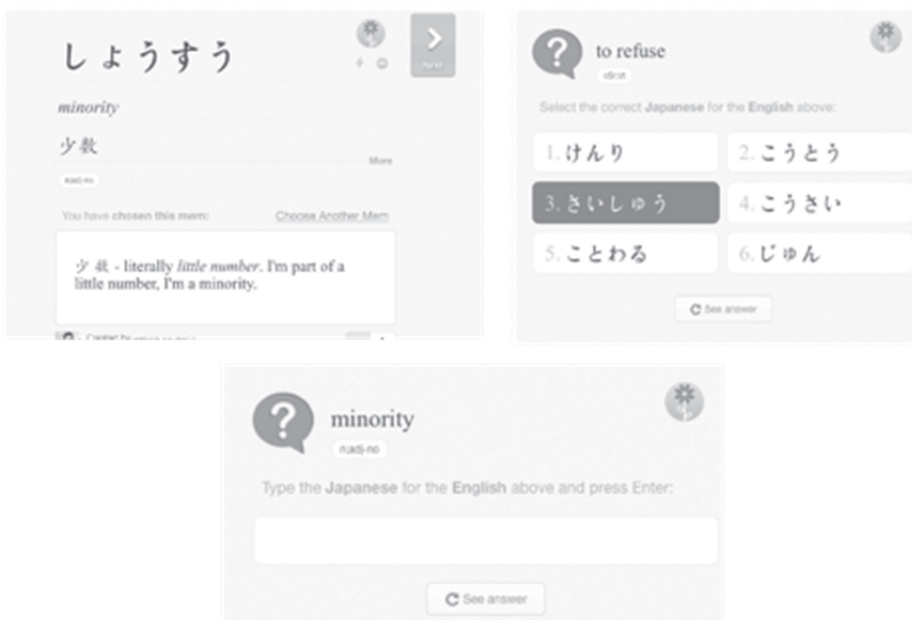


Figure 2. New Vocabulary are accompanied with mnemonics and tested through multiple choice questions as well as keyboard input.

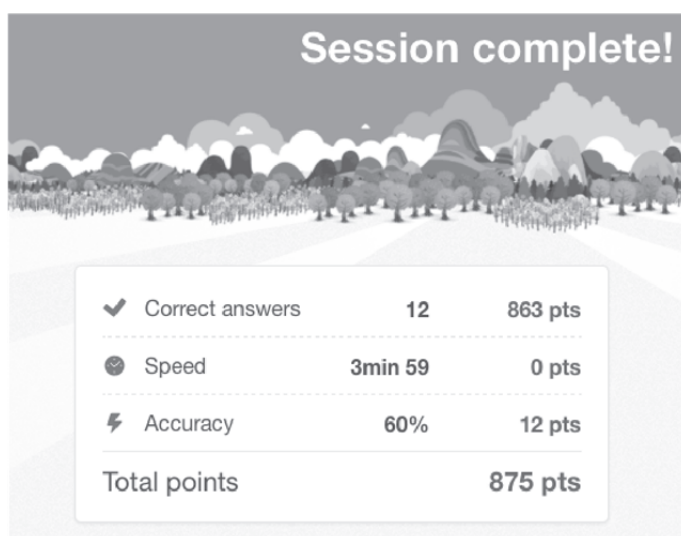


Figure 3. Correct answers are awarded points based on speed and accuracy.

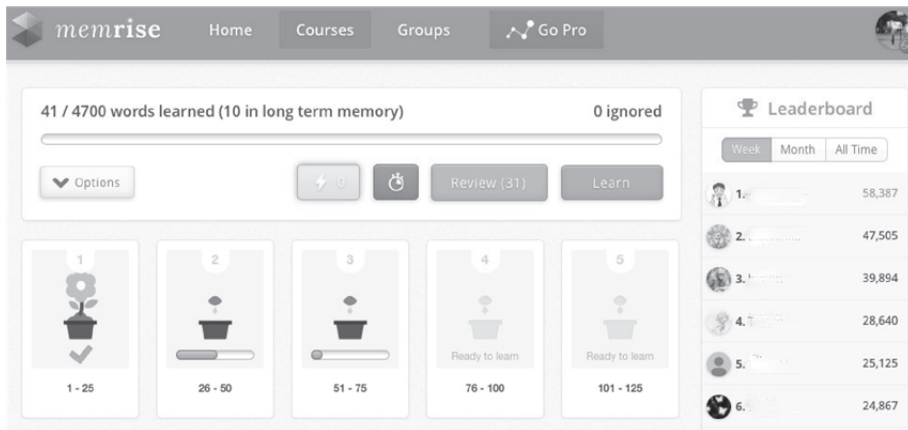


Figure 4. Learning data is visually represented as seeds and flowers, in addition to leaderboards comprising of other learners.