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VOCABULARY LEARNING THROUGH COMPUTER ASSISTED LANGUAGE LEARNING

Tomonori Ono*

Abstract

As the level of technology increases, an increasing number of U.S. and U.K. universities are incorporating Computer Assisted Language Learning (CALL) into their curricula. This study investigates the potential value of an online vocabulary learning system called *Memrise* for memory retention and the learning of difficult, foreign vocabulary. To determine the potential value, twenty-six undergraduate English as a Foreign Language (EFL) students in a TOEFL iBT preparation course were requested to study the 400 Words of TOEFL data set on *Memrise*. Fifty-one most incorrectly identified words were categorized according to accuracy, and frequency. An average acquisition accuracy rate of above 75% was obtained for the majority of difficult foreign words. Although longer foreign words tended to be harder to memorize than shorter foreign words, shorter, obscure foreign words tended to be equally challenging for students. This suggest that both word length and prior language experience has an effect on memory retention. Overall, repeated exposure of difficult foreign words through spaced intervals seemed to aid memory retention and vocabulary acquisition highlighting the value of using *Memrise* for vocabulary learning.

I. *Introduction*

Most online vocabulary learning systems tend to use spaced repetition software (SRS) involving the creation of digital flashcards by manually entering question-answer pairs into the program. Notable examples of this type of system include: *Anki, Brainscape, Cerego, Cram.com, Fresh Memory, iKnow!, Memrise, Mnemosyne, OpenCards, Quizlet, SuperMemo,* etc. According to a study by Nakata (2011), the majority of SRS are designed in such a way so as to maximize the vocabulary learning experience. Although each SRS has some differences in terms of functionality and usability, the value of using SRS for vocabulary learning has been emphasized in several foreign language studies. In a large-scale (n＝140) study, Hirschel and Fritz (2013) found that long-term vocabulary gains were higher amongst Japanese university students who used a SRS compared to those who used a traditional vocabulary notebook. Similarly, in a smaller (n＝60) study, Bower and Ruston-Griffiths (2016) found that increased vocabulary knowledge though SRS resulted in TOEIC score gains amongst Japanese students.

A key feature of any good SRS is the need to combine what Hattie and Donoghue (2016)

* Hitotsubashi University & Tokyo University of Foreign Studies

define as the three core elements for promoting successful learning: (1) prior achievement, (2) attention on task, and (3) stimulating motivation. This finding was based on a comprehensive study examining the basic framework of over 400 learning strategies that enhance learning. In this respect, *Memrise* (www.memrise.com) integrates all three elements to a high degree due to its learner-paced interface and gamified approach. Furthermore, *Memrise* incorporates a number of advanced features not found in some SRS. For example, *Memrise* SRS users can be tested under different formats (e.g. matching, typing, and listening) for any single activity. Moreover, each word is tested randomly several times to check whether the learner has actually learned the word. If the learner made a mistake, the software notifies the learner of the mistake, and re-tests the mistaken word at spaced intervals. This immediate feedback system addresses a common flaw in basic SRS systems which require learners to answer all questions before receiving feedback (see Figure 1).

FIGURE 1. BASIC SRS VERSUS *MEMRISE* SRS FLOWCHART

Basic SRS system:

Start → Word + Definition → Recognition Activity → Result → End

***Memrise* SRS system:**

Start → Word + Definition → Recognition Activity → Error Review → Spaced Repetition → Result → End

A small-scale (n=24) cognitive study by Potts and Shanks (2011) at the University College London found that immediate feedback was more effective for memory retention than delayed feedback. Furthermore, *Memrise* automatically increases the difficulty level over time which helps improve memory retention. This correlation between memory retention and test difficulty is known as the Testing Effect, and is derived from a series of psychological experiments starting from the mid 1970s (Roediger, Putnam, & Smith, 2011). From this, it can be hypothesized that *Memrise* is beneficial for memory retention and the learning of difficult, foreign vocabulary. To test this, the study aims to answer the following two research questions:

1. Are longer foreign words more difficult to memorize than shorter foreign words as highlighted in the Takeno, Tamai, & Takatsuka (2016) study?

2. Is the *Memrise* SRS beneficial for the acquisition of difficult vocabulary?

II. *Method*

The participants in the study were (n = 26) undergraduate EFL students enrolled in the spring semester test preparation course for the TOEFL iBT at Hitotsubashi University, Kunitachi campus. Students were requested to study the 400 Words of TOEFL (Intermediate English) data set on *Memrise* for the duration of the course. A total of 192 words were incorrectly identified, of which, 51 words were incorrectly identified by three or more students. These words were categorized according to accuracy (number of times the word was correctly identified over the number of attempts), and frequency (number of students who incorrectly identified the word). For each word, the accuracy mean was calculated and tabulated using MS

Excel software. The mean word length was calculated by selecting the three words with the lowest accuracy rate, and the three words with the highest accuracy rate for each frequency grouping.

III. *Results*

In Table 1., the average acquisition accuracy rate for words identified incorrectly by 6 or more students was 76.5%. The words "a denominator" (71.8%), "ecclesiastical" (74.2%), and "to persevere" (74.8%) had the lowest accuracy rate. The average word length for the three words with the lowest accuracy rate was 12.33 letters. In contrast, words with the highest accuracy rate were "to deplete" (79%), "precipitation" (78.9%), and "to intensify" (78.6%). The average word length for the three words with the highest accuracy rate was 11 letters. The word "precipitation" was identified incorrectly by the most number of students.

In Table 2., the average acquisition accuracy rate for words identified incorrectly by 5 different students was 79.3%. The words "exponentially" (68.1%), "an installation" (71%), and "to permeate" (72.9%) had the lowest accuracy rate. The average word length for the three words with the lowest accuracy rate was 12.33 letters. In contrast, words with the highest accuracy rate were "cultivation" (88.2%), "to unleash" (87.6%), and "to collide" (87.2%). The average word length for the three words with the highest accuracy rate was 9.66 letters.

TABLE 1. WORDS IDENTIFIED INCORRECTLY BY 6 OR MORE STUDENTS

No.	Data Set No.	Data Set	Accuracy	Frequency
1	13	a denominator	71.80% (Low1)	6
2	76	ecclesiastical	74.18% (Low2)	7
3	95	infinitesimal	76.65%	7
4	116	precipitation	78.94% (High2)	9
5	138	to aggregate	77.80%	6
6	154	to deplete	78.98% (High1)	6
7	170	to intensify	78.61% (High3)	7
8	179	to persevere	74.84% (Low3)	7

Note: High=78.98% Low=71.80% Avg.=76.48%

TABLE 2. WORDS IDENTIFIED INCORRECTLY BY 5 DIFFERENT STUDENTS

No.	Data Set No.	Data Set	Accuracy	Frequency
1	25	a proportion	75.98%	5
2	49	an eruption	76.00%	5
3	53	an installation	71.02% (Low2)	5
4	64	catastrophic	79.38%	5
5	68	cultivation	88.18% (High1)	5
6	83	exponentially	68.06% (Low1)	5
7	107	maintenance	80.14%	5
8	147	to collide	87.18% (High3)	5
9	162	to fertilize	86.18%	5
10	178	to permeate	72.86% (Low3)	5
11	191	to unleash	87.64% (High2)	5

Nete: High=88.18% Low= 68.06% Avg.=79.33%

In Table 3., the average acquisition accuracy rate for words identified incorrectly by 4 different students was 79.8%. The words “to corrode” (69.8%), “to sacrifice” (73.4%), and “an intermediary” (75.3%) had the lowest accuracy rate. The average word length for the three words with the lowest accuracy rate was 11.33 letters. In contrast, words with the highest accuracy rate were “to gut” (87.1%), “irrigation” (85.8%), and “adversely” (85.2%). The average word length for the three words with the highest accuracy rate was 8 letters.

In Table 4., the average acquisition accuracy rate for words identified incorrectly by 3 different students was 77.9%. The words “parochial” (53.1%), “privileged” (59.2%), and “erudite” (63.66%) had the lowest accuracy rate. The average word length for the three words

TABLE 3. WORDS IDENTIFIED INCORRECTLY BY 4 DIFFERENT STUDENTS

No.	Data Set No.	Data Set	Accuracy	Frequency
1	28	a reconciliation	80.45%	4
2	29	a reservoir	76.72%	4
3	39	adversely	85.15% (High3)	4
4	42	agnostic	80.67%	4
5	54	an intermediary	75.25% (Low3)	4
6	103	irrigation	85.80% (High2)	4
7	114	photosynthesis	79.82%	4
8	123	self-perpetuating	82.50%	4
9	148	to contemplate	81.05%	4
10	150	to corrode	69.80% (Low1)	4
11	164	to gut	87.10% (High1)	4
12	184	to sacrifice	73.42% (Low2)	4

Note: High= 87.10% Low= 69.80% Avg.=79.81%

TABLE 4. WORDS IDENTIFIED INCORRECTLY BY 3 DIFFERENT STUDENTS

No.	Data Set No.	Data Set	Accuracy	Frequency
1	4	a component	78.66%	3
2	8	a constraint	82.33%	3
3	15	a famine	83.80%	3
4	48	an emission	85.36%	3
5	56	anesthesia	76.63%	3
6	58	arbitrary	71.36%	3
7	59	associate	84.40%	3
8	74	divination	85.06%	3
9	77	elementally	82.50%	3
10	81	erudite	63.66% (Low3)	3
11	94	indisputable	87.93% (High1)	3
12	113	parochial	53.10% (Low1)	3
13	118	privileged	59.23% (Low2)	3
14	120	psychic	73.56%	3
15	133	to abandon	80.70%	3
16	134	to accuse	87.50% (=High2)	3
17	163	to fossilize	87.50% (=High2)	3
18	167	to implement	69.23%	3
19	186	to sequence	80.90%	3
20	190	to trigger	83.70%	3

Note: High=87.93% Low=53.10% Avg.=77.85%

with the lowest accuracy rate was 8.66 letters. In contrast, words with the highest accuracy rate were "indisputable" (87.9%), "to accuse" (87.5%), and "to fossilize" (87.5%). The average word length for the three words with the highest accuracy rate was 10.33 letters.

IV. *Discussion*

Findings from this study seems to suggest that word length has an impact on memory retention with longer words being more difficult to recall than shorter words. This largely corroborates findings by Takeno, Tamai, & Takatsuka (2016) which suggests that lists of long, foreign words tend to be more difficult to memorize than shorter, foreign words. However, results from Table 4 also seem to suggest that short, obscure words such as "parochial" and "erudite" can be more difficult to memorize than longer, more frequent words such as "indisputable" and "to fossilize". This seems to suggest that past exposure also has an effect on memory retention to some degree (Ellis, 1995). A recent scientific study seemed to support this view by showing that memory retention of new vocabulary under foreign language contexts is affected by prior individual language experience (Kimppa, Kujala, & Shtyrov, 2016). Overall, the implications seem to suggest that repetition through spaced intervals and immediate feedback is necessary for the acquisition of difficult vocabulary. In particular, repetition is crucial for the learning and production of foreign words (Ellis & Beaton, 1993). According to Nation (1990), an average of between 5 to 16 exposures are needed in order to acquire a word completely. Through repetition, students become more familiar with difficult words and they are less prone to make mistakes. This seems to be reflected by the relatively high average acquisition accuracy rate of over 75% for difficult words that were incorrectly identified by students on *Memrise*. It can be postulated that *Memrise* is beneficial for the acquisition of difficult vocabulary though further studies examining vocabulary acquisition across different disciplines and data sets on *Memrise* are needed to validate this statement. It is hoped that this study would provide an initial step in that direction.

V. *Conclusion*

This study explored the effects of using *Memrise* to promote the learning of vocabulary under EFL contexts. It was found that repeated exposure of difficult foreign words through spaced intervals seems to aid memory retention and vocabulary acquisition. Although longer foreign words tended to be harder to memorize than shorter foreign words, shorter, obscure foreign words tended to be equally challenging for students. This suggest that both word length and prior language experience has an effect on memory retention. Overall, the *Memrise* SRS seemed to be beneficial for the learning of difficult, foreign words with an average acquisition accuracy rate of over 75%.

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