

# Supporting English Vocabulary Learning with SCROLL

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## Abstract

*This paper reports on a study on English vocabulary learning using SCROLL. The central research question was, 'Does SCROLL support an effective vocabulary learning?' The evaluation experiment was conducted in a university English class of 41 freshmen. They learned vocabulary of the target words without using SCROLL for the first two weeks and then learned vocabulary with SCROLL for the second two weeks and their pre- and post-tests were compared. The results showed that the subjects while using the system showed a larger improvement in the post-test than while not using the system. According to the result of the post-post-test which was conducted two-month after the experiment phase, it was found that it also supported retaining vocabulary in long-term memory.*

## 1. Introduction

English has been a dominant language in the world [1]. Therefore EFL (English as a Foreign Language) education is very important for non-English speaking countries. Japan is not an exception.

However, Japan is facing a serious problem in terms of English proficiency. In fact Japan ranked 3rd worst out of 30 Asian countries in TOEFL test (Test of English as a Foreign Language) [2]. One of the factors which have caused this disappointing situation is, as often pointed out, lack of vocabulary of Japanese EFL learners. In fact it is a formidable challenge for Japanese EFL learners to learn English vocabulary, because the phylogenetic origin of the Japanese language is totally different from that of English and so is its orthographic system. Since it is an essential component in language, it is pivotal to build up vocabulary to improve one's language skill. At the same time it has been pointed out that vocabulary learning is often considered boring [3].

One solution of these problems may lie in technology enhanced vocabulary learning, which has been gaining global attention in recent years. So our aim is to provide

EFL learners with a effective vocabulary learning support system, namely SCROLL.

## 2. Related Works

### 2.1. Life-log

One of the theoretical bases of our system is the idea of "life-log". Life log means to capture and record what we have experienced, and to store every piece of information we have ever learned. For example, MyLifeBits stores scanned materials as well as digital data such as emails, web pages [4]. Ubiquitous Memory system is a life-log system using a video and RFID tags [5]. Evernote ([www.evernote.com](http://www.evernote.com)) is a tool to save ideas using mobile devices or web browsers. Facebook([www.facebook.com/](http://www.facebook.com/)) can be used as a life log tool to record someone's whole life. One of the purposes of life logs is to use them for memory aid. Our system, SCROLL, however, aims to utilize life-log data for learning processes, more specifically vocabulary learning in this study.

### 2.2. Learning Log

The other theoretical basis lies in the concept of a "learning log". Learning logs were originally paper-based written notes which were used for personalized learning resources for children at school, often referred as learning journals [6]. The research findings indicate that journals of this kind enhance students' meta-cognition and reflective thinking skills because it helps them aware of their own thought processes [7] [8]. Our approach focuses on how to enrich learning logs and promote memory retention by using ubiquitous and context-aware technologies.

### 2.3. Technology Enhanced Vocabulary Learning

Vocabulary is one of the most important components of a language. As is often cited, "Without grammar, very little can be conveyed. Without vocabulary, nothing can be

conveyed” [9]. Unfortunately, researches on vocabulary learning strategies are in a lack of theoretical underpinning up to now [10]. Along with recent development of studies on technology enhanced learning, studies on vocabulary learning strategies have been gaining quite a few researchers’ attention [11] [12] [13] [14]. However, most vocabulary learning systems are pre-set or ready-made closed vocabulary learning systems which often specialize the textbook vocabulary or chosen vocabulary such as basic 3000 word-level etc. There are few which challenged self-constructing English vocabulary learning system. Therefore in our study, we on SCROLL functions as self-constructing vocabulary learning system and examine if it supports the students’ vocabulary learning.

### 3. System Design

#### 3.1. Learning Log System (SCROLL)

SCROLL (System for Capturing and Reminding of Learning Log) is a system designed to aid users to capture and store what they have learned as learning logs and, hence afterwards, to reuse them and share them among users (See details in [15]). Users register what they have learned, which we call “learning log objects (LLO)” to the system and view LLOs uploaded by themselves and others, then it supports recalling of their learning logs by giving them quizzes. The system lets them be aware of what they have learned before, and what other students are learning, and the teacher can grasp what the students are learning. The System also supports phonetic aspects of the language. When they click a speaker icon, they can listen to the pronunciation (Fig 4). A top ten upload ranking list (names of the learners who uploaded top most to 10th) is shown on each user’s top page, which is expected to stimulate them to upload more words.

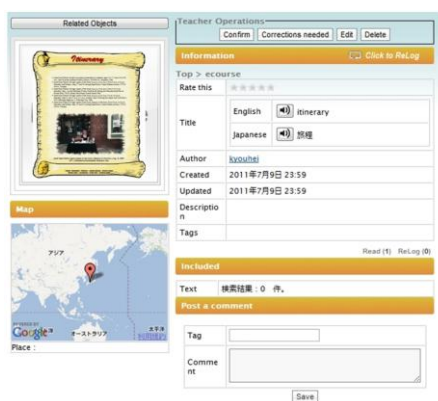


Figure 1. Learning log interface

#### 3.2. Quiz in Learning Log System

The students register their newly acquired words to SCROLL and it gives them quizzes. Quizzes will be generated until they give them correct answers. They are provided with quizzes of the words they have already answered correctly after a certain interval to make sure if they are retaining them. That way it is expected that their short-term memory will be reinforced into long-term memory. In order to motivate them to learn more, the System shows each student his degree of advancement by counting his correct answers out of total number of target words.



Figure 2. Quiz interface

### 4. Evaluation

#### 4.1. Method

The study group consisted of 41 Japanese university freshmen majoring dental science at the University of Tokushima. They all reported they had internet connected PCs at home. The evaluation design is shown in Table 1. They were given Pre-tests before the evaluation started. The evaluation lasted four weeks from November 8 to December 13, 2011. For the first two weeks (Phase 1), they learned vocabulary without SCROLL, using spread sheets to make their own vocabulary books using home PCs and classroom PCs. After making their own vocabulary books on spread sheets, they uploaded their files to the university’s LMS (Learning Management System) at least once a week. We chose to let them use spread sheets for vocabulary learning because that way, the instructor could watch their status. At the end of the Phase 1, they took Post-test 1. Most students printed out their vocabulary books for preparing the test. For the second two weeks (Phase 2), they learned vocabulary with SCROLL. At the end of the Phase 2, they were given Post-test 2. Two months after the evaluation, Post-post-test, the same test as Post-test 1 and 2 was conducted to see if they retain their memory. The students were given a questionnaire afterwards.

Table 1. The evaluation design

Pre-test	Phase 1			Phase 2			2 mos after
	Wk1	Wk2	Post-test 1	Wk3	Wk4	Post-test 2	Post-post-test
	Spread sheet			SCROLL			

**4.2.1. Pre-, Post-tests, and Post-post-test results.** Pre-, Post-tests, and Post-post-test were made from vocabulary in the textbook. They were designed to translate the target words into Japanese. Table 2 shows the Pre- and Post-test results and Table 3 shows Pre- and Post-post-test results. In both cases, the students while using SCROLL show more dramatic improvement than while using spread sheets (cf. Increase rate). Figure 3 shows the transition from Pre- to Post-post test results and it was found that the students while using SCROLL learned more words and retain more words after two months than while using spread sheets though no statistically significant difference was detected.

Table 2. Pre- & Post-Test Results

	Pre-test mean, (SD)	Post-test mean, (SD)	<i>t</i>	Increase Rate (%)	Size Effect (d)
Phase 1 spread sheets	10.96 (4.67)	19.12 (5.86)	6.64*	<b>74.4</b>	1.55 (Large)
Phase 2 SCROLL	8.09 (4.40)	18.63 (6.76)	7.88**	<b>130.3</b>	1.87 (Large)

Fullmark : 30 \**p*= 1.42E-11 \*\**p*=1.42E-11

Table 3. Pre- & Post-Post-Test Results

	Pre-test mean, (SD)	Post-post-test mean, (SD)	<i>t</i>	Increase Rate (%)	Size Effect (d)
Phase 1 spread sheets	10.96 (4.67)	13.59 (5.02)	2.39*	<b>23.9</b>	0.54 (Medium)
Phase 2 SCROLL	8.09 (4.40)	14.77 (4.42)	6.32**	<b>82.6</b>	0.84 (Large)

Fullmark : 30 \**p*= 0.0097 \*\**p*=7.61E-09

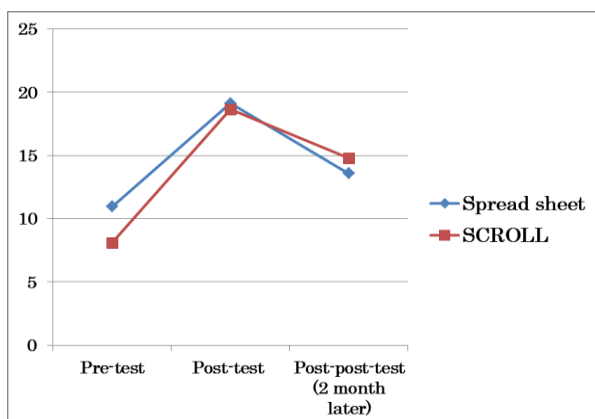


Figure 3. Pre-, Post- & Post-post Test Results

**4.2.2. Fun factor.** Figures 3 & 4 show the result of the questionnaire by which they were asked about fun factor. About 80% SCROLL users answer 'yes' to the question if vocabulary learning was fun using SCROLL. More than 80% chose SCROLL when asked which was fun. We believe using the system added some fun factor in vocabulary learning which is likely to be monotonous and boring.

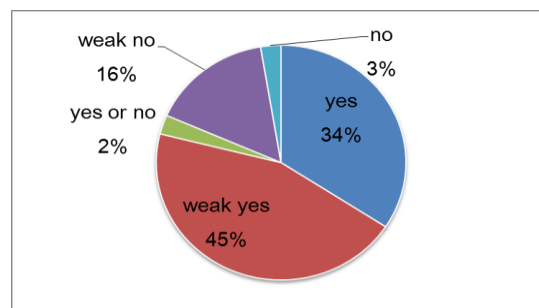


Figure 4. Was vocabulary learning fun using SCROLL?

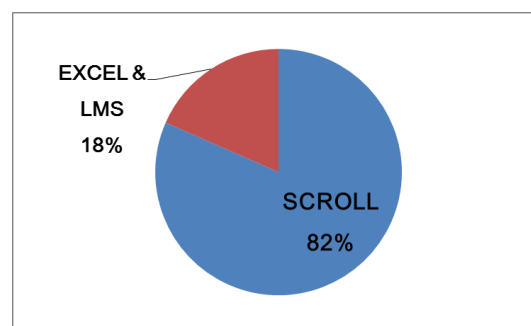


Figure 5. Which was more fun, SCROLL or EXCEL?

## 5. Discussion

The students showed notable improvement during both phases (Table 2). The students in Phase 2 (with SCROLL) show dramatic improvement (mean: 8.09 → 14.77), while the students in Phase 1 (with spread sheets) show less improvement (mean: 10.96 → 13.59). Statistically significant difference between the increase rates of post- and pre-test results was detected, and so was the increase rate of post-post- and pre-test (Table 4 & 5), though no statistically significant difference was detected between the two methods. Since target words during Phase 2 (with SCROLL) were more difficult, the pre-test average was lower than that of Phase 1 (without SCROLL) (Phase 1: 10.96 vs. Phase 2: 8.09). However, though they learned more difficult words during Phase 2, they almost caught up at the post-test in terms of the post-test average and surpassed at the post-post-test in terms of the post-post-test average (cf. Fig. 3). These

results show that the SCROLL was more supportive than spread sheet vocabulary learning and helped them retain their vocabulary in long-term memory.

Table 4. Increase Rates Between Pre-to-Post-Test results of SCROLL and Spread sheets

	Phase 1 Spread sheets (%)	Phase 2 SCROLL (%)	<i>t</i>
mean, (SD)	112.01 (133.3)	225.82 (222.38)	2.538*

\*p= 0.0135

Table 5. Increase Rates Between Pre- & Post-post-Test results of SCROLL and Spread sheets

	Phase 1 spread sheets (%)	Phase 2 SCROLL (%)	<i>t</i>
mean, (SD)	35.1 (56.39)	131.76 (141.84)	3.90 3**

\*\*p= 0.0002

## 6. Conclusion

This paper reports on a study on English vocabulary learning using SCROLL. The evaluation experiment was conducted to examine the effectiveness of two types of vocabulary learning (with System vs. without System). The results showed that the subjects while using the System showed a larger improvement in the post-test than while not using the system. According to the result of the post-test which was conducted two-month after the experiment phase, it was found that it also supported retaining vocabulary in long-term memory. Therefore, it can safely be said that the System was more effective and supportive than listing vocabulary to the spread sheets.

According to the questionnaire result, it was found out that the System added some fun factor in vocabulary learning which is likely to be monotonous and boring.

As one of our future works, we will consider the fact that we usually have only one instructor per class and what the teacher can do is limited. So peer-to-peer collaboration is necessary for successful learning. Therefore, we are planning to add an appealing message and Q & A system, a social network type of function, in order to promote the students' interaction and out-class learning.

## Acknowledgment

This research work was supported by Japan Science and Technology Agency, PRESTO, and the Grant-in-Aid for Scientific Research No.21650225 from the Ministry of Education, Science, Sports, and Culture in Japan.

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