

Enhancing Outside-class Learning using Ubiquitous Learning Log System

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Abstract: In this paper, we have tackled one of the major problems in English education in Japan, the learning time shortage problem. In order to solve this problem, we have used the system called SCROLL (System for Capturing and Reminding Of Learning Log) developed by our team. We conducted an evaluation to examine whether our system could boost up outside-class learning time. We provided the participants, 24 university freshmen, with an *e-book* application as a reading material together with the system and encouraged them to learn outside-class. The result showed that outside-class learning time dramatically increased only when they read an *e-book* together with the System even though no statistically significant difference was detected since individual differences were so large. Though we expected that interesting outside-class learning materials would push them to learn more outside class, the result showed that it was the System that pushed them to study outside class. Whether they used *e-book* or not, the average learning time of without-SCROLL learning was almost the same. Therefore the use of the System could be one of the factors which contributed to the students' more involvement in outside-class learning. We believe that it will lead to compensation of a lack of learning time.

Keywords: mobile-assisted language learning, vocabulary learning, learning time, learning log

1. Introduction

English language has become a global common language of our age. Therefore EFL (English as a Foreign Language) education is crucial for non-English speaking countries. Educators in these countries have been struggling with various problems they face in their education system. Japan is not an exception. Our country is facing serious problems in terms of English proficiency. In fact Japan ranked the third worst out of 30 Asian countries in TOEFL test 2011 (cited from TOEFL official website)*

As one of the factors that have caused this disappointing result, it has been pointed out that learning time of English at school is not sufficient: 630–650 hours during 6 years of junior and senior high school education (Curriculum Guidelines by MEXT: Ministry of Education, Culture, Sports, Science and Technology), plus 135–180 hours, for instance, during college years at Osaka university (based on Osaka University enrollment regulations). Shortage is apparent when we consider the fact that 2,200 hours is necessary for English speakers to achieve general professional proficiency level** of Japanese language according to the Foreign Service Institute (FSI) of the US Department of State.***

* Test and Score Data Summary for TOEFL® Internet-based and Paper-based Tests (2011).
http://www.ets.org/s/toefl/pdf/94227_unlweb.pdf

** The ILR (US Government Interagency Language Roundtable) has guidelines for speaking, reading, listening, writing and translation. (cf. <http://web.archive.org/web/20071010042447/http://www.govtilr.org/ILRscale2.htm>)

*** The Foreign Service Institute (FSI) of the US Department of State has compiled approximate learning expectations for a number of languages based on the length of time it takes to achieve Speaking 3: General Professional Proficiency in Speaking (S3) and Reading 3: General Professional Proficiency in Reading (R3) (cf. <http://web.archive.org/web/20071014005901/http://www.nvtc.gov/lotw/months/november/learningExpectations.html>)

In fact, the Ministry of Education, Culture, Sports, Science and Technology introduced once-a-week English class (45 minutes for one class and 35 classes a year) for elementary school 5th and 6th graders from 2011. But it only added 52.5 hours to total learning hours. It is far from satisfactory to solve the lack of learning time. We need to cope with this shortage problem. If it is difficult to modify the school curriculum, and if it is impossible to increase in-class learning time, there is no other way but to encourage students to study outside-class. Some drastic measures need be found to cope with this problem and it is highly expected that the emerging mobile technology and its output, mobile assisted language learning or MALL are one of the key issues to solve the problem.

Our main objective in this study is to let learners get more involved in outside-class learning with our developed system called SCROLL (cf. Section 3). Our hypothetical question is: Does SCROLL contribute to the solution of lack of learning time? We had conducted an experiment to find an answer to this question in our previous study (Uosaki et al., 2012) (hereafter we call it Evaluation I). The result showed that their average outside-class learning time was extremely low (cf. Section 4.1). SCROLL has its original contents, but they are task-based learning contents for Japanese language learners. Basically SCROLL is for logging and sharing learning experience and not a learning material itself. Therefore we felt a strong necessity to find a good learning material for outside-class learning. It is possible to upload any learning contents to SCROLL technically but the copyright problem hampers its uploading. Therefore in this study we designed an outside-class learning scenario introducing some appealing reading materials together with SCROLL and examined how effectively SCROLL encouraged students' outside-class unsupervised self-learning. "Unsupervised", by which we mean the situation where learners are not attended by the teacher and it is up to learners whether they get involved in learning.

2. Related works

2.1 Learner Autonomy and Learning Motivation

There are very few studies in which they challenged to boost up outside class learning. In most cases their research topics are learner autonomy, coined word by Henri Holec, which is defined as "the ability to take charge of one's own learning" (Holec, Henri, 1981) or learning motivation especially in the field of language learning since a language is a subject which takes a substantial amount of time to master. Shirono (2009) reported that by letting their students keep their learning reports and submit them to their teacher, it helped them get more committed to outside-class learning. Tan (2012) explored the pedagogy of blended language learning to promote learner autonomy. But we could find no research studies where they challenged it with mobile ubiquitous technology-enhanced learning even though it is one of the most active research areas on educational technology at present described as below.

2.2 Mobile Assisted Language Learning

MALL is a growing research area attracting the attention of scholars all over the world. Mobile language learning has always been among top research topics in mobile learning since early 2000s (the epoch of mobile learning). (Ogata et al., 2008; Ogata et al., 2009; Kukulska-Hulme, 2010; Read et al., 2010; Starostenko et al., 2010; Lumsden et al., 2010).

In the earlier days, it often focused on the simple use of SMS (Short Message Service) and mobile e-mails as a means of delivering learning contents, most often for the vocabulary learning or facilitating interactions between learners. Along with the use of SMS and e-mails, there appeared quite a few studies exploring L2 learners' listening skill using iPods or podcasting (Kiernan and Aizawa, 2004; Thornton and Houser, 2005; Levy and Kennedy, 2005; Gromik, 2008).

Then, there followed researches into developing more sophisticated systems such as context-aware, user-customized systems using PDA, then subsequently smartphones (Ogata et al., 2004; Stockwell, 2007; Chen and Chung, 2008; Li et al., 2010; Underwood et al., 2010). Since mobile and ubiquitous technology is a fast-evolving, constantly advancing field, its infinite potential is inevitably expected to contribute to boosting up students' outside-class self-learning.

3. SCROLL

Since 2009, we have developed a system called SCROLL (System for Capturing and Reminding of Learning Log) as one of the Sakigake projects (cf. Ogata et al., 2010). SCROLL helps learners log their learning experiences and share them with others. Users register what they have learned, which we call “ubiquitous learning log objects (ULLOs)”, to the system and view ULLOs uploaded by themselves and others. Then the system automatically generate quizzes to help learners to recall their past ULLOs and to shift them from short-term memory to long-term one.

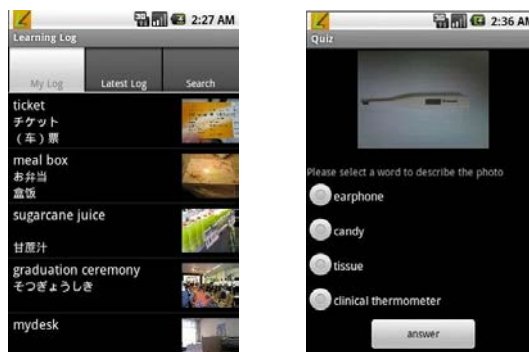


Figure 1. SCROLL interface of Android mobile phone (My Log List (left) and Quiz (right))

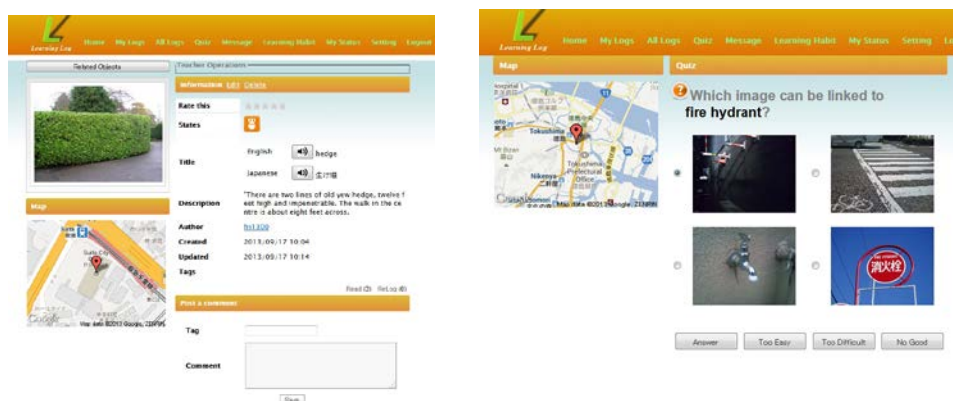


Figure 2. SCROLL interface on the Web (My Log (left) and Quiz (right))

Learners are able to watch other learners’ ULLOs and if they like other learners’ ULLOs, they can “relog” them to their own pages just like “retweet” in Twitter so that ULLOs uploaded by other learners can be their own ULLOs. This system is implemented both on android smartphone platforms (https://play.google.com/store/apps/details?id=jp.ac.tokushima_u.is.ll&hl=ja) and on the web (<http://ll.is.tokushima-u.ac.jp/learninglog/signin;jsessionid=4ED1BCA735AA1FD9A922C77A1FFFD7DC>). It is designed to support learners’ autonomous self-learning.

4. Evaluation

4.1 The average outside-class learning time in our previous evaluation (Evaluation I)

In order to find the answer to our hypothetical question: Does SCROLL contribute to the solution of lack of learning time?, we had conducted an evaluation with university freshmen in terms of English vocabulary learning with/without SCROLL in Evaluation I (Uosaki et al., 2012). Table 1 shows the average outside-class learning time for both groups for three weeks. The average learning time of SCROLL group was 142.3 minutes (47.4 minutes per week / only 6.8 minute per day), while

without-SCROLL group was 130.7 minutes (43.6 minutes per week / only 6.2 minute per day). This indicates that the test group more committed to vocabulary learning than the control group, though the difference was small and not statistically significant. In fact it was far from saying our system contributed to the solution of lack of learning time.

Table 1: Average outside-class learning time in Evaluation I.

	Outside-class Learning Time (min) Mean (SD)	<i>t</i>	Effect Size (<i>d</i>) ¹
A (with System)	142.25 (106.14)	0.391*	0.53 (Medium)
B (without System)	130.7 (105.2)		

Since we learn words from contexts, we need contexts, in other words, we need some reading materials for gaining new vocabulary. Since the copyright problem hampers uploading contents to SCROLL, we looked over some appealing outside-class learning materials, such reading materials as it is so tempting that students cannot help but feel like reading more. And we found an *e-book* application which runs on Android smartphones with a good collection of mysteries. In this study, we conducted an evaluation (hereafter, we call it Evaluation II) with a combination use of SCROLL and *e-book* application to find answers to the hypothetical question mentioned above.

4.2 Method

Twenty-four university freshmen of Basic English class majoring health sciences at the University of Tokushima participated in the experiment. They all reported they had Internet-connected PCs at home. We employed a crossover research design involving two comparison groups, with 12 students in each group, counterbalanced by scores at Pre-test. Each group of students engaged in learning under the following two conditions: study in-class with a textbook and study outside-class with 1) reading *e-book* contents and uploading new words to SCROLL, and 2) reading *e-book* contents and making a vocabulary book on spreadsheets. The order of the conditions will be rotated, so that each group will have a different start condition. The evaluation was carried out over 4 weeks. Each group had experience of each of the two learning modes for 2 weeks, as indicated in the Table 2

Table 2: The evaluation design.

	Pre-test	Phase 1		Phase 2		Survey and focus groups
Group A		<i>e-book</i> with SCROLL	Post-test (1)	<i>e-book</i>	Post-test (2)	
Group B		<i>e-book</i>		<i>e-book</i> with SCROLL		

¹Effect size is a measure of the strength of the relationship between two variables in a statistical population. Effect sizes are calculated as shown below and usually described as "small", "medium" and "large".

$$d = \frac{M_{group1} - M_{group2}}{SD_{pooled}} \quad SD_{pooled} = \sqrt{(SD_{group1}^2 + SD_{group2}^2)/2}$$

According to APA Publication Manual 5th edition (2001), reporting effect sizes is required when submitting research papers to academic journals:

For the reader to fully understand the importance of your findings, it is almost always necessary to include some index of effect size or strength of relationship in your Results section. (p. 25)

Android *e-book* application was installed to each Galaxy Tab SC-01C produced by Samsung before evaluation. They were delivered to all the participants on one-to-one basis. They could use the Tabs anywhere anytime during the evaluation. They studied with Galaxy Tabs as well as home PCs and classroom PCs. Since most participants had never used the device, they were delivered to them one week before the experiment started for letting them get used to it and the System. On the delivery day, they had a briefing on how to use the Tabs, *e-book* and SCROLL (cf. Figure 3).



Figure 3. Briefing on the delivery day

Before Phase 1 started, the students took a pre-test, which is a web-based vocabulary test with multiple-choice style quizzes. During the phase without SCROLL, they used a spreadsheet software to make their own vocabulary books using home PCs and classroom PCs. After making their own wordbooks on spreadsheets, they uploaded their files to LMS (Learning Management System) at least once a week. We chose spreadsheet vocabulary learning + LMS because by doing so, the teacher had the ability to watch and evaluate their learning status. During both phases, the students were assigned to read mystery novels with *e-book* for outside-class learning. They were informed that their commitment to vocabulary learning directly reflected their grades. At the conclusion of each phase, the subjects underwent a post-test, the same type of web-test as Pre-test. Further data was collected from the participants by means of questionnaires and the log data stored in the server. Focus group session was held at the end of the whole evaluation in order to attain more detail information on how they got committed to vocabulary learning with SCROLL and *e-book*.

4.3 Results

(1) Outside-class Learning Time

The students reported their vocabulary learning time outside the class to the teacher every week by means of answering questionnaires on the web. Table 3 shows the average outside-class learning time for both groups. The average learning time of SCROLL session was 141.04 minutes, while that of without SCROLL session was 91.9 minutes. This result indicates that the students during SCROLL System learning more committed to vocabulary learning than during without SCROLL learning, though the *t*-value (1.28) did not indicate its statistical significance. This result agrees with that of Evaluation I.

Table 3: Average Outside-class Learning Time(/two weeks).

	Outside-class Learning Time (min) Mean (SD)	<i>t</i>	Effect Size (d)
With SCROLL	141.04 (151)	1.28*	0.37 (Small)
Without SCROLL	91.88 (115)		

**p* = 0.11

(2) Test Results

The Pre-test and Post-test (1) (2) were the same test as the one used in Evaluation I, a web-based vocabulary test called V-check test (<http://www.wordengine.jp/vflash/levelcheck>). Test-takers take the test for about 10 minutes and the system predicts each test-taker's command of English vocabulary. The full mark is 20,000 points and each test taker's result represents that he is estimated to know that amount of English words out of 20,000 basic English words. The test contents differ every time they take the test.

The results of Pre-test, Post-test with-SCROLL session, and Post-test without-SCROLL session are shown in Table 4. Pre-test average was 5,603 (SD: 1,439). The average score of Post-test conducted right after with-SCROLL session was 7,310 (SD: 3,058). The average score of Post-test conducted right after without-SCROLL session was 5,970 (SD: 1,383). With-SCROLL session shows a large improvement (Mean: 5,603⇒7,310), while during without-SCROLL session they did not make much progress (Mean: 5,603⇒5,970) though the highest *t*-value was 2.31 and no statistically significant difference was detected in any case.

Table 4: Pre-test and Post-test results (full mark: 20,000).

	① Pre-test Mean (SD)	② Post-test with SCROLL Mean (SD)	③ Post-test without SCROLL Mean (SD)	① vs. ② <i>t</i> Effect Size (<i>d</i>)	① vs. ③ <i>t</i> Effect Size (<i>d</i>)	② vs. ③ <i>t</i> Effect Size (<i>d</i>)
Group A+B	5,603 (1,439)	7,310 (3,058)	5,970 (1,383)	2.31 * 0.72 (M)	0.74** 0.26 (S)	2.26 *** 0.57 (M)

p*=0.01 *p*=0.23 ****p*=0.0167

V-check test (<http://www.wordengine.jp/>)

4.4 Discussion

(1) Outside-class Learning Time Reconsidered

One major aim of this study was to examine whether the System could increase out-side learning time to solve one of the problems in English education in Japan, lack of learning time at school. In order to enhance the level of average learning time, we used an *e-book* application for outside-class learning.

Table 5: Comparison of average outside-class learning time between Evaluation I and II.

Evaluation I				Evaluation II			
	Outside-class Learning Time per week (min) Mean (SD)	<i>t</i>	Effect Size (<i>d</i>)		Outside-class Learning Time per week (min) Mean (SD)	<i>t</i>	Effect Size (<i>d</i>)
With SCROLL without <i>e-book</i>	47.4 (35.38)	0.39*	0.11 (None)	With SCROLL & <i>e-book</i>	70.5 (75.26)	1.25**	0.37 (Small)
Without SCROLL & <i>e-book</i>	43.6 (35.07)			With <i>e-book</i> Without SCROLL	45.9 (57.27)		

p* = 0.69 *p* = 0.22

In Evaluation I, the average outside-class learning time of the test-group (with-SCROLL System group) was 47.4 minutes per week, while that of the control group (without-SCROLL System group) was 43.6 minutes. In Evaluation II, the average outside-class Learning time of with-SCROLL session was 70.5 minutes per week, while that of without-SCROLL session was 45.9 (cf. Table 5).

We had expected that the average outside-class learning time would increase for the both learning modes in Experiment II, whether they used SCROLL or not, because we looked over the whole

collection of *e-book* contents and picked out some interesting stories for outside-class learning materials. The result, however, was not what we had expected. Whether they used *e-book* or not, the average learning time of without-SCROLL learning was almost the same (43.6 minutes without the System in Experiment I and 45.9 minutes without SCROLL in Experiment II).

However, the average outside-class learning time of with-SCROLL and with-*e-book* session increased from 47.4 minutes to 70.5 minutes per week. Since the participants of Experiments I and II were different, there is a possibility that other factors made outside-class learning increase. Though we expected that interesting outside-class learning materials would push them to learn more outside class, the result shows that it was the System that pushed them to study outside class.

Even though the increase rate was as high as 48.7% (47.42 minutes $\Rightarrow$ 70.52 minutes), as the SD values shows in Table 5, individual differences were so large that no statistically significant differences were detected. Therefore we examined furthermore about what factors had influenced their outside-class learning time by analyzing the questionnaire and focus group.

From the open-ended comments of the participants whose outside-class learning time was short, some factors which had decreased their outside-class learning time were found as follows:

- 1) I prefer paper books to *e-book*, because it is not easy for me to handle (plurality opinion).
- 2) I had to prepare some tests for other classes and did not have enough time to read (plurality opinion).
- 3) Before I noticed, it was running out of battery and I could not read when I wanted to (plurality opinion).
- 4) I was busy with my club activity (plurality opinion).
- 5) It was difficult to handle Galaxy Tab.
- 6) I do not like *e-book* because I cannot put annotations.
- 7) It was hard to find time to read.
- 8) *E-book* was not easy to handle, which made me hesitant in reading.
- 9) It was bothering to charge the device.
- 10) The story was difficult to read.
- 11) I do not like to read in the first place.
- 12) Even though I set it manner mode, it produced some beep sound and I got surprised and I did not like it.

Apparently, some participants did not like the *e-book*, and some extra activities such as test preparations, club activities prevented them from learning at home. On the other hand, we see some open-ended comments from the participants who got involved in more outside-class learning, and had favorable opinions on the *e-book*:

- 1) It was easy to consult the dictionary, so it was easy to go on reading.
- 2) When I touched an English word, then its Japanese translation appeared and I liked it very much.
- 3) I prefer tablets for reading.
- 4) I liked the illustrations.
- 5) The story was very interesting, so I could get absorbed in reading.

They used the same *e-book* application, but their reactions were quite opposite. Therefore the individual differences such as preference, lifestyle, and motivation reflected the results of outside-class learning time. And it is very difficult to eliminate these factors.

We see some open-ended comments which were in favour of SCROLL from the participants who got involved in more outside-class learning:

From the results of the questionnaires and focus group, some factors by which SCROLL had boosted up their outside-class learning time have also been found. Followings are some open-ended comments in favour of SCROLL:

- 1) It was good because I could learn words from other classmate uploaded words.
- 2) The words which I uploaded appear as a quiz, and I think it is a good way to memorize words (plurality opinion).
- 3) I thought it was convenient.
- 4) It was easy to remember by answering quizzes.
- 5) It was fun to answer quizzes (plurality opinion).
- 6) Answering quizzes reminds me of the words forgotten.
- 7) I did not like to make a vocabulary book on spreadsheets.
- 8) “Re-log” function was very convenient.
- 9) I forget new vocabulary very easily, but it was a good way to review by answering quizzes.
- 10) It was easy to handle.

From these favourable comments, it is assumed that SCROLL had boosted up their outside-class learning time.

On the other hand, some weak points have been found such as:

- 1) There came out a quiz of a word which I did not upload and I did not like it.
- 2) Sometimes, some weird translation came out. So, a dictionary function as a translator of an uploaded English word was not good enough.
- 3) Some distractors in quizzes are so simple that it was very easy to choose right answers.
- 4) It was troublesome to log into the system and input new vocabulary

These negative opinions were almost about a quiz function. The quiz function of SCROLL has now been under improvement. Especially Comment #3) is expected to be solved soon.

Figure 4 shows the result of the questionnaire by which they were asked if vocabulary learning using SCROLL was effective. Together with ‘yes’ and ‘weak yes’ answers, about 60% admitted the effectiveness of SCROLL. This result shows good consistency with those of Evaluations I and II.

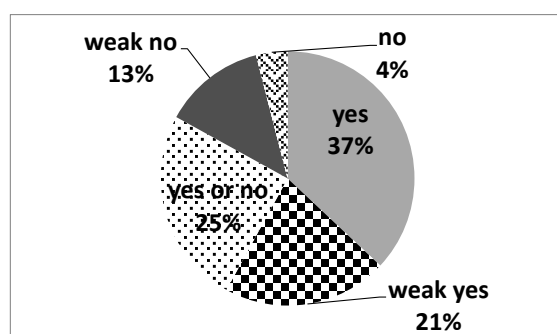


Figure 4. Was vocabulary learning effective using SMALL System?

Therefore the use of the System could be one of the factors which contributed to the students’ more involvement in outside-class learning. We believe that it will lead to compensation of a lack of learning time, which is one of the serious problems of English education in Japan.

5. Conclusion and Future Works

This study is aiming for contributing to the solution of one of the major problems we are facing in English education in Japan: lack of learning time at school. In order to solve the problem, we have used SCROLL. Our main objective was the promotion of outside-class learning. The evaluation was conducted to find an answer to the following hypothetical question. 1) Does SCROLL contribute to the solution of lack of learning time? In our previous study, it turned out that the students hardly learned outside-class (Evaluation I). Therefore in Evaluation II, we introduced an *e-book* application for outside-class learning in order to boost up outside-class learning time. Outside-class learning time increased only when they read an *e-book* together with the System even though no statistically significant difference was detected. During without-System session, outside-class learning time did not increase. In fact there were a lot of participants who expressed favorable opinions about the System. Therefore the use of the System could be one of the factors which contributed to the students' more involvement in outside-class learning. We believe that it will lead to compensation of a lack of learning time, which is one of the serious problems of English education in Japan.

As one of our future works, by utilizing sensor technology, customized learning recommendation system is under development so that the system can give learners recommendations actively and aggressively at an appropriate timing and an appropriate place. The system does not just wait for a learner to upload a new word, but it autonomously lets a learner learn new word by recommending him/her according to their situation. It is expected that the smartphones will be equipped more sophisticated sensors in the future and the device will know learners better to catch their learning habits more accurately. Since we usually have only one teacher per class and what the teacher can do is limited, peer-to-peer collaboration is necessary for successful seamless learning. Therefore as another future work, we are planning to add an appealing social network type of function, in order to promote the students' outside-class learning.

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