Chen, W. et al. (Eds.) (2017). Proceedings of the 25th International Conference on Computers in Education. New Zealand: Asia-Pacific Society for Computers in Education

Enhancing Seamless Learning Using Learning Log System

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Abstract: In this paper, we describe implementation of seamless language learning with a learning log system called SCROLL and an e-book system. Prevalence of high-performance mobile devices has enhanced the potential of seamless language learning environment. Seamless learning is an approach which enables learners to entwine various learning scenarios seamlessly. We have seen a good deal of technology-driven researches in this field. Our SCROLL project is among them. SCROLL is expected to facilitate learners to learn their target languages and language related knowledge in a seamless learning environment. The evaluation was conducted where SCROLL was introduced in Japanese language learning settings. The result of the evaluations revealed that the whole system had a high usability, and it helped users gain related knowledge seamlessly.

Keywords: Learning log, mobile assisted language learning, Japanese language learning, seamless learning

1. Introduction

According to Article 21 of Standards for Establishment of Universities, 45 hours are required to provide one credit. It is a common practice for Japanese universities to give 2 credits by taking 1.5-hour-class for 15 times for one semester. In this case inside-class learning time is 22.5 hours. It is apparent that inside-class learning time is far from sufficient. Therefore it is highly necessary to promote out-of-class learning.

Especially out-of-class learning is pivotal as for foreign language learning. According to the Foreign Service Institute (FSI) of the US Department of State, 2,200 class hours are necessary for English speakers to achieve general professional proficiency level of Japanese language. Obviously it is impossible to run class for 2,200 hours at any level of school education. Lack of learning time is one of the serious problems in the second language learning education. Seamless learning environment, which enables smooth transitions between any learning scenarios such as formal and informal; personalized and social learning; learning beyond time and space, is expected to enhance their out-of-class learning.

2. Related Research

2.1 Seamless Learning

'Seamless learning' describes the situations where students can learn whenever they want to in a variety of scenarios and that they can switch from one scenario to another easily and quickly using one device or more per student ('one-to-one') as a mediator (Chan et al., 2006). Wong and Looi (2011) identified ten salient features of seamless learning; (1) Encompassing formal and informal learning, (2) Encompassing personalized and social learning, (3) Across time, (4) Across locations, (5) Ubiquitous

knowledge access, (6) Encompassing physical and digital worlds, (7) Combined use of multiple device types, (8) Seamless switching between multiple learning tasks, (9) Knowledge synthesis, (10) Encompassing multiple pedagogical or learning activity models. More than 20 years ago when 'seamless learning' was hardly a well-known term in the field of pedagogy, American College Personnel Association (1994) stressed the importance of linking students' in-class and out-of-class experiences to create seamless learning and academic success (Wong and Looi, 2011).

Since seamless learning proposed, many researchers explored their seamless learning based projects. Milrad et al. (2013) introduced five different seamless learning projects researched in Taiwan, United Kingdom, Sweden, Singapore, and Japan. Uosaki et al. (2010) proposed a seamless learning system called SMALL System (Seamless Mobile-Assisted Language Learning Support System). Meanwhile, Wong et al. (2014) proposed a system called MyCloud (My Chinese Language ubiquitOUs learning Days), where they explored the integration of mobile and cloud technologies for self-directed, collaborative and seamless Chinese Language learning among primary students.

2.2 Mobile Assisted Language Learning

Mobile technologies have been expected to foster shifting from classroom-based learning to the one that is free from time and space boundaries. Therefore they play a critical role in implementation of seamless learning. Since our target domain is language learning, our research is closely related to mobile assisted language learning (MALL). Mobile technologies open the door for a new kind of learning called '*here and now learning'* that occurs when learners have access to information anytime and anywhere to perform authentic activities in the context of their learning (Martin & Ertzberger, 2013). It is often argued that mobile devices are particularly suited to supporting social interaction and collaborative learning - claims that have obvious relevance for language learning (Kukulska-Hulme & Shield, 2008). Viberg & Grönlund (2012) reviewed the literature on MALL research from 2007 to 2012 and reported that most studies supported the hypothesis that mobile technology could enhance learners' second language acquisition.

Ogata et al. (2004) proposed TANGO (Tag Added learNinG Objects) system which employed the physical objects using RFID tags for language learning. Stockwell (2007) developed a prototype of mobile-based intelligent vocabulary learning system called Vocab Tutor. Chen and Chung (2008) developed personalized mobile English vocabulary learning system based on Item Response Theory and learning memory cycle. Li et al. (2010) evolved an adaptive Kanji learning system using mobile phones. Underwood et al. (2010) developed a mobile-based self-initiated vocabulary learning application called m-iLexicon.

We have witnessed a growing presence of smartphones, tablets and other mobile devices for more than a decade. MALL has been recognized as one of the natural directions toward which CALL (Computer-Assisted Language Learning) is heading (Chinnery, 2006; Stockwell, 2007). Thornton and Houser (2005), who reported that the learners preferred mobile platforms over PCs, also endorsed this trend. However, there are some negative aspects reported in mobile learning. Mobility of learning was not necessarily synonymous with its unlimited flexibility or learning 'anytime anywhere;' neither was unlimited flexibility desirable in all learning situations and educational contexts (Palalas, 2015). There was often a complaint from users about the user-unfriendliness of small screens on mobile devices (Uosaki & Ogata, 2009). The small screen issue is what we still need to consider.

3. SCROLL

Learning can happen anytime, anywhere. When we come across new knowledge, people may take notes. However, the notes will not remind us of what we have learned. SCROLL has been developed in order to support learners to record what they have learned in both informal and formal setting using a web browser and mobile device as a log and to share them with other learners anytime and anywhere beyond space seamlessly, and link their past learning with their future learning (Ogata et al. 2011). SCROLL is a client-server application. The server side runs on Linux OS. It runs on different platforms such as smart phones, PCs, and tablets. This on-going project is still in progress with new functions being added to the system one after the other. Our latest addition is an e-book system. The past studies

show that the system is effective for learners with their vocabulary learning, it contributes to linking in-class learning with outside of class learning, to boosting outside-of-class learning and to enhancing learners' learning opportunities (Uosaki et al, 2012; Uosaki et al. 2014, Mouri et al, 2015). Fig. 1 shows its log-in and home interface on mobile. Its functions are designed to support implementation of seamless learning environment.

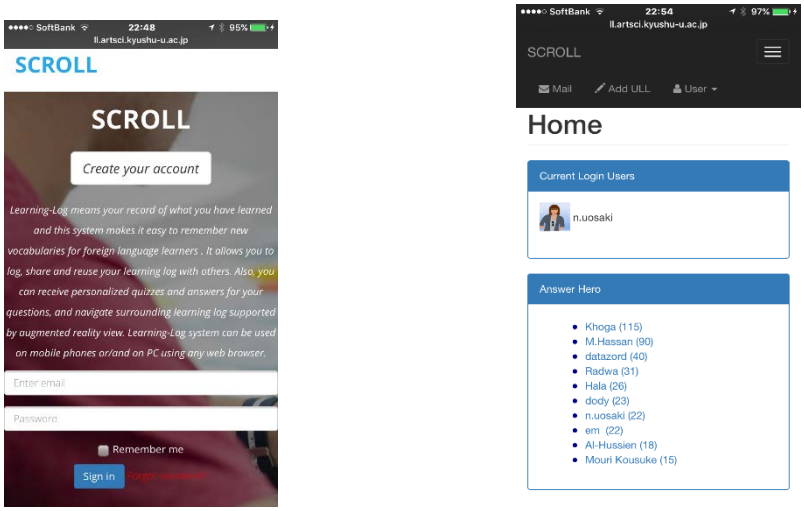

Figure 1. SCROLL Log in Interface (right) and its Home Interface (left).

3.1 Functions

3.1.1 Recording

It facilitates the way learners record their newly learned terms to the server. For example, when a learner comes across a new term, '御社'(honorific language meaning 'your company', one of typical business Japanese) while he was reading job-search related contents (Fig. 2 left), he can upload it to the system with texts, images, video, or pdf files. Translation is facilitated by Google translator (Fig. 2 right).

Figure 2. New word, '御社' while Reading (left) and SCROLL Supports Logging (right).

3.1.2 Recommendation

SCROLL recommendation function goes as follows: If he/she uploaded '御社' to the system, the system checks if the same log or related logs were already uploaded or not and show them as the related terms (Fig. 3). Human beings are likely to forget. Even though he thought it was new to him, he might have already learned it before in the past and uploaded it to the system already. Then the system links his new log with his past log. This recommendation function powerfully assist the implementation of seamless learning: to link e-textbook learning with learning though real life experience, to link learners' present learning with their past learning and to link a learner's learning with other learners' learning.

3.1.3 Re-logging

Re-logging function assists to link one learner with other learners beyond time and space seamlessly. When a learner sees other learners' log and find it useful, he/she can 're-log' it to make it his/her own log just like 'retweet' in Twitter. For instance, if they want to learn 'B to C', which was uploaded by someone else, they click 'Click to re-log' button as shown in Fig. 4. Then it appears in their 'My Logs' page. Therefore, learners can obtain knowledge from others without having experienced it themselves. Using this function, knowledge can be shared by users seamlessly beyond time and space.

Figure 3. Related terms.

Figure 4. 'Re-log' button of SCROLL.

3.1.4 Quizzes

It is reported that quiz function is effective to reinforce their memory (Li et al. 2013; Uosaki et al. 2013). The quiz function also assists to link their present learning with their past learning. Four types of quizzes (combination of image and text, multiple-choice and yes-no quiz) are generated automatically by the system. Fig. 5 shows interfaces of a multiple-choice image quiz and its result. These quizzes are generated according to the learner's profile, location, time and the results of the past quizzes they took.

Figure 5. SCROLL multiple-choice quiz and after-quiz interfaces (image quiz).

4. E-book System

The Japanese government has announced that it plans to introduce e-books in all K-12 schools by 2020. Therefore, it is a natural direction to introduce the e-book system to various kinds of learning environments. In our research, we try to link e-textbook learning with learning though real life experience (Fig. 6), to link learners' present learning with their past learning and to link a learner's learning with other learners' learning using our developed system.

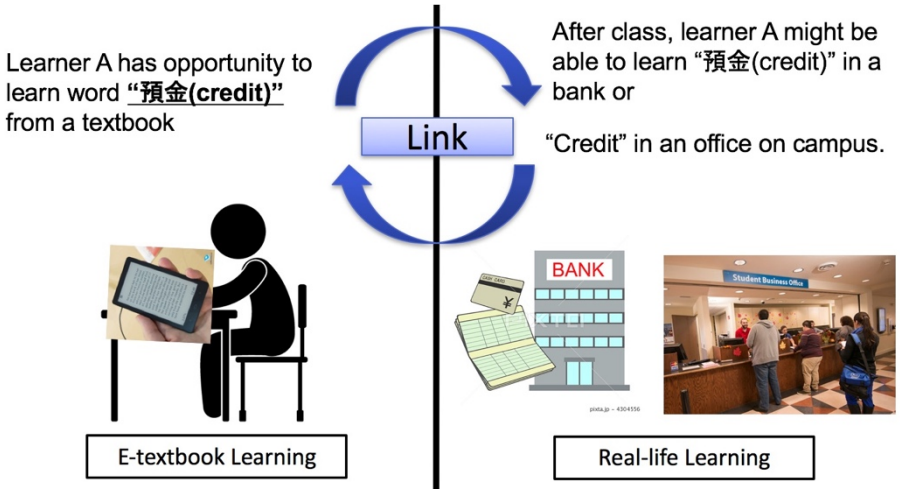

Figure 6. Encompassing e-textbook learning and real-life learning

4.1 Architecture

E-book system is an additional system implemented to SCROLL. It runs inside SCROLL. It consists of database and EPUB files. EPUB (Electronic PUBlication) is one of the e-book formats. Fig. 7 shows its architecture. EPUB-viewer is a main function. This function shows e-Book contents to viewers, record learners' actions as action logs, and record what learners learned from e-Book as learning logs. On EPUB-viewer, learners can take various actions, such as page turning, page jumping, bookmarking, highlighting, adding logs, taking memos, looking into the web dictionary and searching by keywords. For instance, when they come across a new word '勤続 (continued service)' while reading an article on mobile (Fig. 8 left), then click 'Add log' button, then it jumps to SCROLL upload interface to support their upload (Fig. 8 right).

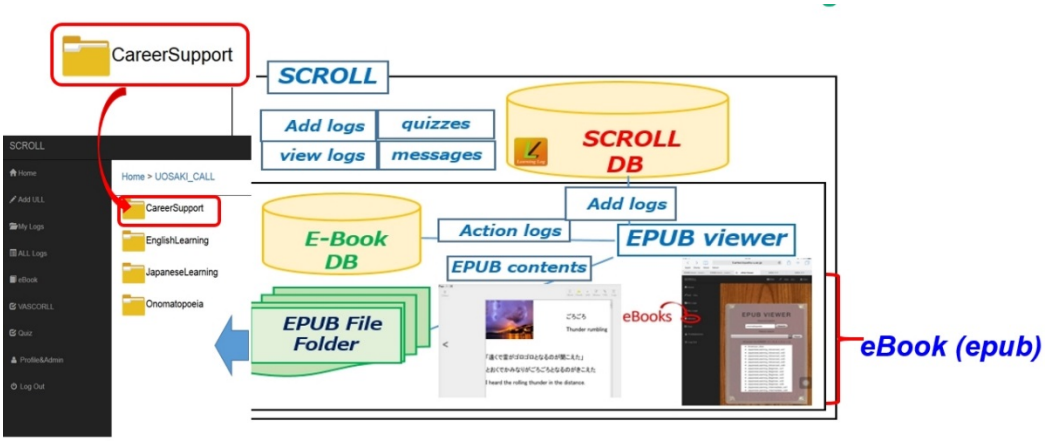

Figure 7. Architecture.

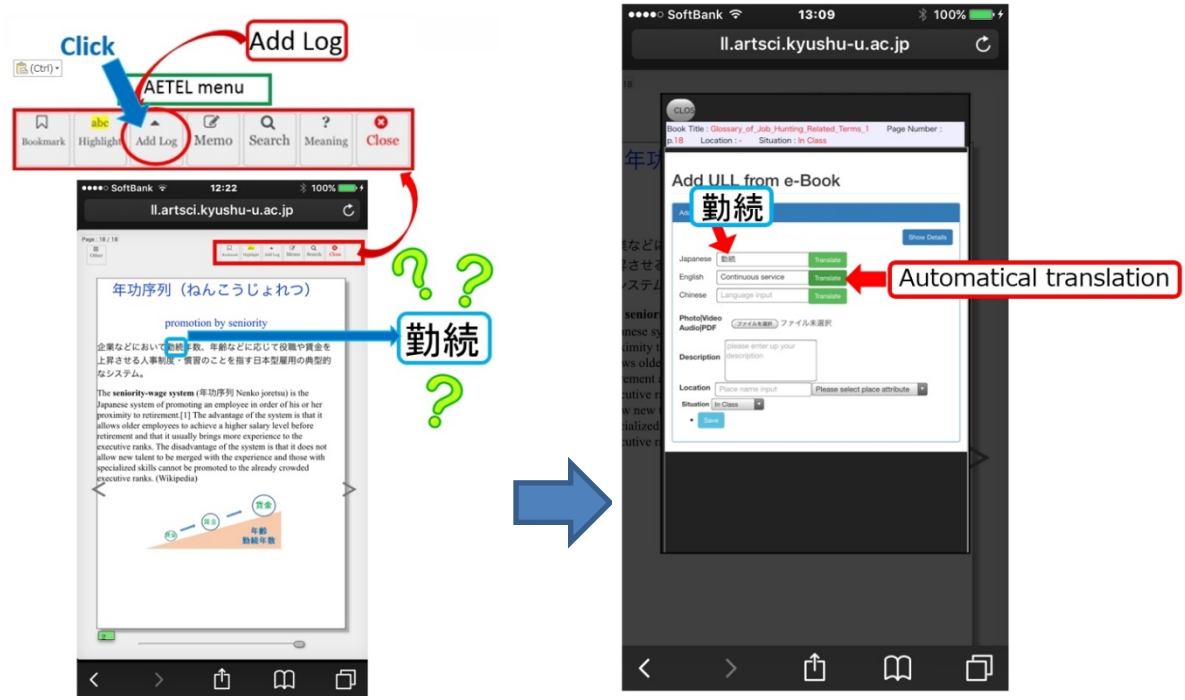

Figure 8. EPUB-viewer: Viewer window (left) and Add log window (right).

5. Evaluation

5.1 The Target Class

The class was one of 'international exchange subjects' which was targeted mainly for international exchange students. Japanese students who are interested in class held in English can also join it. The target class was held 14 times once a week in a CALL (computer assisted language learning) room during the fall semester, 2016. The class language was mainly in English. The objectives of the target class were (1) to improve the skills of their target languages, which were Japanese or English and (2) to enhance cross-cultural understanding.

5.2 Method

An evaluation was conducted in one of the authors' class at university in the western part of Japan. It consisted of 17 students (4 Japanese, 3 Germans, 2 Chinese, 2 Indonesians, 2 Taiwanese, 1 American, 1 Egyptian, 1 Hong Konger, 1 Vietnamese). All the participants were owners of mobile phones.
The learning scenario is described as follows:

(1) Creating contents
The administrator/instructor, creates eBook contents for reading, as well as multiple-choice-quizzes using, before class.
(2) User registration
Students create SCROLL account. It is free.
(3) User activities
- i) They were assigned to upload what they have learned out-of-class to the system as learning logs.
- ii) As an inside-class activity, they presented in turn what they learned out-of-class. That way their out-of-class learning was entwined with their inside-class learning through SCROLL.
- iii) As Another inside-class activity, they read e-books which were implemented inside SCROLL. Since it is in SCROLL system, it powerfully support them to upload their learned words to SCROLL. E-book system

They were instructed that the number of uploaded logs reflected their grade. They were also instructed to report their out-of-class learning time and the activities they did for their target language learning to the teacher weekly. It is 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 (Shirono, 2009). The number of SCROLL uploads and the out-of-class learning time were visualized in bar graphs weekly and shared with the whole class anonymously (Fig.9). The class was run under student-centered learning. Their presentation activities were focused in class because Dale (1946) emphasized the importance of 'teaching others' in terms of retention of memory (Kovalchick and Dawson, 2004). By using the term, 'Cone of Experience', he showed that the retention rate increased from passive learning to active learning.

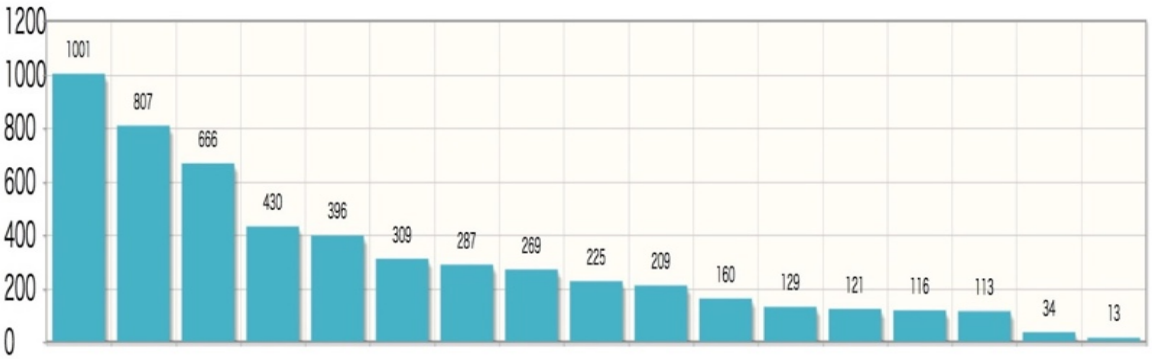

Figure 9. the number of SCROLL uploads in bar-graph.

5.3 Results

SCROLL was introduced in the 3rd class and it was used until the last class. The average number of SCROLL uploads was 327.5 (Table 1). As the standard deviation, 275.1 shows, the individual difference was large. The average out-of-class target language learning time was 1.3 hour per day. Their reported out-of-class learning activities included *updating SCROLL, learning how to write emails (using online resources), writing reports, reviewing basic Japanese grammar material, talking to*

Japanese native speaker, practicing presentation in Japanese etc. We examined if there was a correlation between the number of SCROLL uploads and the average out-of-class target language learning time. Unlike our expectation, correlation coefficient was -0.21. Therefore as far as correlation coefficient is concerned, it could hardly be said that SCROLL contributed the enhancement of out-of-class learning time in spite of the fact that most students included SCROLL activities as their out-of-class learning activity. The average out-of-class target language learning time of the most SCROLL uploader (Student #1) was as short as 0.4 hour a day and the average learning time of the least but one SCROLL uploader (Student #16) was as long as 2.5 hours a day apparently show that there was no correlation. As for low uploaders such as Student #16 and #17, they reported that they were already using other mobile app for their target language learning, they did not feel like to use SCROLL. Their passive participation influenced the whole results.

Table 1: Number of SCROLL uploads and average out-of-class target language learning time

	Number of SCROLL uploads	Average out-of-class target language learning time /day (hrs)
Student #1	1001	0.4
Student #2	823	0.7
Student #3	743	1.8
Student #4	444	0.8
Student #5	396	0.9
Student #6	347	0.9
Student #7	332	1.2
Student #8	309	0.6
Student #9	225	1.4
Student #10	212	1.5
Student #11	209	5
Student #12	130	0.1
Student #13	121	1
Student #14	116	1.3
Student #15	113	1.2
Student #16	34	2.3
Student #17	13	0.7
Mean	327.5	1.3
SD	275.1	1.1

At the end of the phase, they were asked to answer the questionnaire as shown in Table 2. Q1 and Q2 were created based on the technology acceptance model proposed by Davis (1989). Q3 was created to examine the fun factor of our system. Q4 was created to examine the effectiveness of the quiz function of our system. Q5 was created to examine the effectiveness of the relog function. Q6 and Q7 were created for examining the user acceptance of its interface and the whole system. Q8 was created for examining the effectiveness of showing them the number of uploads weekly. Q9 was created for examining the effectiveness of SCROLL to enhance out-of-class learning

The result of the five-point-scale survey is shown in Table 2. The highest point was given to Q8 asking about the effectiveness of showing them the number of uploads (Mean=4.2). Therefore only by showing them how many they uploaded during the week in graph encouraged them to get more involved in learning. The second highest point was given to Q1 asking about its usability (Mean=4.0), which reveals its high usability.

Table 2: The result of five-point-scale questionnaire

	Question	Mean	SD
Q1	Was it easy for you to use SCROLL?	4.0	0.6
Q2	Was the system helpful for you to learn Japanese words?	3.2	1.2
Q3	Was it fun for you to use the SCROLL?	3.2	1.3
Q4	Was the quiz function helpful for your learning?	3.5	1.1
Q5	Did the relog function facilitate your learning?	3.0	1.3
Q6	Please rate how much you liked or disliked its interface.	3.5	1.3
Q7	Please rate how much you liked or disliked the whole system.	3.5	1. 3
Q8	Knowing the number of uploads by your classmates, did it stimulate you to upload more words to the system?	4.2	1.5
Q9	Did SCROLL contribute to increase of out-of-class learning time?	3.7	1.4

6. Conclusions and Future Work

The result of the evaluation showed that the whole system had a high usability. However it could hardly be said that SCROLL contributed the enhancement of out-of-class learning time. By running the student-centered active learning class, out-of-class learning could be entwined with in-class learning through SCROLL. The linking functions developed for implementation of seamless learning, such as to link e-book digital learning with real life learning by experience, to link their learned logs with related knowledge learned by other users beyond space as well as knowledge learned by themselves in the past beyond time, are expected to play an important role as a seamless learning facilitator. However, it is not in the stage where we can safely say our system facilitated Japanese language learners' learning in the seamless learning environment. The system with enough good contents, we believe that it will attract more users and will enhance its efficiency. With the refinement of e-book function, more detail examination of effectiveness of our system will be conducted. In order to examine its effectiveness, a comparison between the pre-test and post-test will be conducted to find out if there is a statistically significant difference between them in our next evaluation experiment.

Acknowledgements

This research work was supported by Grants-in-Aid for Scientific Research No.16H06304, and No.16H03078 from the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan.

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