

Guidelines on Implementing Successful Seamless Learning Environments

A Practitioners’ Perspective

<http://dx.doi.org/10.3991/ijim.v7i2.2467>

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Abstract—This paper describes implementation guidelines for ubiquitous seamless mobile learning featuring the learning-log system named SCROLL (System for Capturing and Reminding of Learning Log). This system helps users to share and remind ubiquitous learning experiences. We review recent researches on mobile assisted learning in order to set pedagogically-based guidelines for instructors, learning environment designers and the administrative end or decision makers including ICT coordinator, and local authorities. Main foci in our guidelines are for language teachers to practice SCROLL-based mobile learning in their classes for both in-class and out-class learning according to their situation or conditions. Our goal is to help educators to implement an effective seamless mobile learning environment with SCROLL.

Index Terms—mobile assisted language learning (MALL), mobile learning, m-learning, seamless learning, task-based learning

I. INTRODUCTION

Pervasion of high-efficiency mobile phones or smartphones has expanded the potential of mobile learning environments. Researches on this area have been very active during this decade [1] [2] [3]. Mobile learning has been recognized as one of the natural directions toward which CALL (Computer Assisted Language Learning) is heading [4] [5]. Reference [6], which indicated that the learners preferred mobile platform rather than PCs, endorsed this trend. Mobile and ubiquitous technologies have been expected to foster shifting from classroom-based learning to the one that is free from time and space boundaries, which is, what they call, mobile cloud-education [7]. It can provide smart anytime-anywhere learning that is customized and adapted to individuals, and delivered via personal portables devices.

In this paper, after overviewing the recent research tendencies on seamless mobile learning, we analyze how seamless the learning could be and categorize it into 7 types according to the facilities being afforded, and then we set implementation guidelines for those who are considering adopting seamless mobile learning in the new era of high performance smartphone.

There have been quite a few technology-driven researches on these fields, but however sophisticated systems (software) and devices (hardware) being developed, unless we have a good guidance so that practitioners can use them in a real educational environment, they might be useless, being left unused. But such guidelines have rarely been found out on any journals so far. Even if they exist,

since mobile technology is a rapidly and constantly advancing field, the guidelines which were set in the past are destined to get out of date soon. Therefore it is our aim to produce new guidelines on implementation of an effective seamless mobile learning environment. Though this is especially featuring SCROLL (System for Capturing and Reminding of Learning Log), we believe that it can help implementation of any seamless mobile learning environment.

The rest of this paper includes research updates on mobile learning in Chapter II. Chapter III presents keys to successful implementation of seamless mobile learning, and Chapter IV describes learning scenarios in mobile environment. Chapter V gives conclusions with our plans for further development of seamless mobile environment.

II. SEAMLESS MOBILE LEARNING

A. Mobile Learning

Reference [8] defined “mobile learning” as “any educational provision where the sole or dominant technologies are handheld or palmtop devices”. According to [9], “mobile” as in mobile learning encompasses both learning supported by mobile devices and also learning in an era characterized by mobility of people and knowledge. In this paper, “mobile learning” by which we mean “learning with its use of mobile and wireless technologies with the scope of the mobility of the learners and learning situation.

The new generation smartphones as represented by iPhone and the open sourced mobile OS Android provide users with such advanced functions as the multi-touch interface, full browser, and millions of applications. One of the key features of smartphones is that they are equipped with a range of sensors such as the accelerometer, ambient light sensor, GPS, microphone, camera, compass and so on. Aggregation of mobile devices with such multi-sensor systems would enable users to benefit from information gathered via other surrounded devices and users [10] [11]. It will significantly impact the future of education, providing new environment called surround learning or seamless learning and inducing more social interaction and collaborative learning among learners. Thus these mobile technologies will possibly play a critical role in the future CALL activities.

B. Seamless Learning

“Seamless learning” is used to describe 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 [12]. It allows learners to learn anytime, anywhere, and provides them with multiple ways of learning throughout the day. The term, seamless learning is also used to describe a lifelong learning in various environments across time and location seamlessly through the use of the technology as a mediating tool [13]. In this paper, by seamless learning, we mean learning which occurs with seamless transitions between in-class and out-class learning, between handheld use and desktop use.

How seamlessly we can carry out class (seamless rate) depends on the facility we afford. Fig. 1 shows the correlation between mobility enhancement and seamless rate. Higher the mobility we afford, higher the seamless rate we attain for our learning environment. ‘Mobile’ in Fig. 1 means a learning environment where one-to-one based internet connected mobile device such as smartphone, tablet, PDA is available. ‘Fixed’ in Fig. 1 means a learning environment where one-to-one based internet connected fixed computer is available. Learning activities according to each condition will be introduced later in Chapter III.

Table 1 shows types of learning available according to each mobile/fixed condition. There are seven types of mobile learning based on the seamless rate: 1) full seamless learning, 2) semi-seamless learning, 3) in-class only non-seamless mobile learning, 4) in-class only non-seamless mobile learning, 5) outside-class only non-seamless mobile learning, 6) in-class only non-seamless fixed learning, 7) outside-class only non-seamless fixed learning.

When mobile is available for both in-class and outside-class, learning can be fully seamless, thus we call it “full

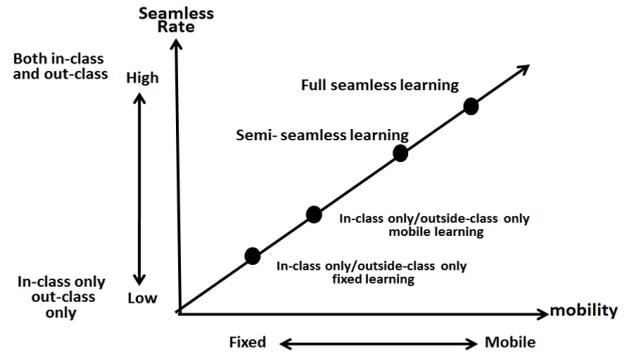


Figure 1. Correlation between seamless rate and mobility

seamless”. When either mobile or fixed computers are available for both in and outside-class, we call it “semi-seamless” because even though mobility gets lower, still in- and outside-learning can be connected through either fixed or mobile devices. If there is mobile/fixed available only in-class or only outside-class, it cannot be seamless anymore. Thus we call it non-seamless such as in-class only non-seamless, or outside-class only non-seamless.

C. SCROLL

1) System Overview

SCROLL is a client-server application, which runs on different platforms such as Android mobile phones and PCs (cf. <http://il.is.tokushima-u.ac.jp/learninglog/signin>) [14].

Users can register what they have learned anytime, anywhere. The registered object is called as a ubiquitous learning log object (ULLO). They can take quizzes made from their ULLOs for recalling them (cf. Section 2.C.2)). The System lets learners share their ULLOs. The learners are able to watch other learners’ ULLOs. 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.

TABLE I. SUGGESTED LEARNING STYLE ACCORDING TO THE SEAMLESS RATE

| Seamless rate | In-class | | Outside-class | | Type of Learning | |
|---------------|----------|-------|---------------|------------------------|--|--|
| | Mobile | Fixed | Mobile | Fixed | | |
| High | ✓ | ✓ | ✓ | ✓ | Full seamless learning --- cf. Chapter IV.A (It covers all learning activities described in Chapter IV) | |
| | ✓ | ✓ | ✓ | ✓ | | |
| | ✓ | | ✓ | ✓ | | |
| | ✓ | | ✓ | ✓ | | |
| | | ✓ | ✓ | ✓ | Semi-seamless learning---cf. Chapter IV.B, E | |
| | ✓ | ✓ | | ✓ | | |
| | | ✓ | ✓ | ✓ | | |
| | Low | ✓ | | | ✓ | In-class only non-seamless mobile learning --- cf. Chapter IV.C |
| | | ✓ | | | ✓ | |
| | | | | ✓ | ✓ | Outside-class only non-seamless mobile learning --- cf. Chapter IV.D |
| | | | ✓ | ✓ | | |
| | | ✓ | | | In-class only non-seamless fixed learning | |
| | | | | ✓ | Outside-class only non-seamless fixed learning | |
| | | | | Computer-less learning | | |

Using this system, teachers can grasp what their students have learned outside the class (informal settings). For example, they ask their students to record the words that they have learned into SCROLL as ULLOs. In the next class, they make a reflection using their students’ ULLOs. Through this process, they can check whether the ULLOs given by their students are correct or not, and allow their students to share their knowledge. In this way, SCROLL enhances and integrates both formal and informal learning.

2) Quiz Function in Learning Log System

According to [15], memories can stay in the short-term “buffer” only for a limited period of time while they are strengthening their associations to be stored in long-term memory. Therefore the System is designed to support retaining vocabulary in a long-term memory by giving them quizzes. The system gives learners quizzes to help them retain their vocabulary. It generates quizzes automatically based on ULLOs registered, relogged, and viewed by the learners. Quizzes will be generated until they give them correct answers. Four months after they made the correct answers, they will be given quizzes again to make sure if the learners retain them in their long-term memories. After a certain interval, the system gives them quizzes which they have answered correctly to make sure if they are retaining their vocabulary. By using this methodology, it is expected that their short-term memory will be reinforced into long-term memory. Logs of all the quizzes are stored to be analyzed and evaluated. Wrong-answer rates and difficulty-level choices from “too easy” to “too difficult” reflect the quiz generation. Difficulty level adjustment is made in order to facilitate their learning processes. If they challenge quizzes, they can accumulate the scores, which are shown in the right-hand side of the screen: Today’s Score and Your All Score. It is expected to motivate them to solve more quizzes.

III. KEYS TO SUCCESSFUL IMPLEMENTATION OF MOBILE LEARNING

A. Four Influential Factors for Successful Seamless Learning

What factors will influence successful mobile learning? In this section, we will pick out four influential factors and

show guiding principles to assess the feasibility of successful mobile learning implementation. The assessment checklists for implementation possibility of mobile-based learning are shown in Fig. 2 and Fig.3.

Factor 1: Management and facilities

In order to manage mobile learning initiative effectively, obtaining senior level buy-in is inevitable. As [16] has pointed out, the cost of the technology, the infrastructure and the services and applications are important issues when implementing mobile learning. As a general advice, institutions should try to make use of what is already in place in order to keep costs down. If every student reports smart phone owners, then it is easy to carry out mobile learning without budget difficulties. Since smart phones are prevailing rapidly, it is expected most students in classroom own them. In this case, purchasing some devices and lending them only to those who do not own them might be another possibility with low-cost performance.

Fig. 2 shows you whether your budget and students’ device condition fit for mobile-based seamless learning. According to [17], “smartphones account for half of all mobile phones”. Although smartphone penetration is incredibly high, there must be some population who do not want to own mobile phones in any time. Thus we cannot expect every student owns one in class. Therefore some budget is necessary to purchase some extra mobile phones to lend the students who do not own them.

Factor 2: Instructors’ abilities

For successful implementation of mobile-based seamless learning, one of the most important things is the instructors’ motivation whether they are really for mobile-based seamless learning. Without their willingness, it is hardly possible. In fact many instructors are not highly motivated to use ICT technology [18]. Therefore computer literacy of teachers is an important issue to be dealt with. However since our focus in this study is not on enlightening teachers, this problem is to be discussed at another opportunity in the future.

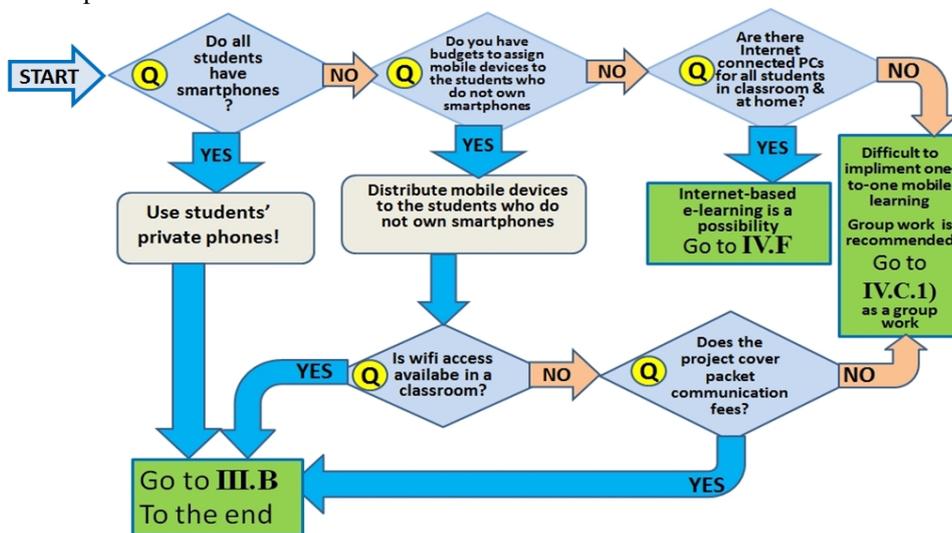


Figure 2. Devices/budget checklist

In order to reinforce entwining in-class learning with outside-class one, SMALL system (Seamless Mobile-Assisted Language Learning Support System) has been developed [19] (cf.III.C.1). Still teachers’ active involvement is inevitable. What the students learned outside-class should be introduced during class. For instance, if one of the target words in class is “contemporary” and somebody already uploaded this word to the System, let him talk about how he encountered the word. The word context is important to learn vocabulary as mentioned. Students’ presentation in turn as either solo work or group work is recommended as another activity to link outside-class learning to in-class learning (cf. IV.A).

Factor 3: Flexibility of curriculum and class setup

Even though teachers are highly motivated, if they have to follow the strict teaching guidelines including teaching methods, teaching materials, implementation is difficult. They need to have a flexibility in making decisions of what kind of class they run including learning approaches, teaching materials, seating arrangement and so on. Generally mobile learning fits task-based, interactive and collaborative learning. It is reported that traditional seating arrangement (desks all lined up and all the students face the teacher and a blackboard) makes students less active, less cooperative, less engaged in learning. In order to maximize the learning opportunities, traditional lecture style class is not recommendable.

This is endorsed by the study from [20], which reported that only about 5 percent of the information delivered through lecture was retained. Compare that with retention rates at 50 percent for discussion group and 70 percent for practice by doing. Even higher, at 80 percent, was retention by students teaching others. Thus successful mobile learning depends much on instructors’ flexibility in running class.

Fig. 3 shows if your condition fits for seamless mobile learning based on your flexibility to choose teaching/learning materials. If you are totally free go to Section III.C.1) and if the flexibility is limited, go to III.C.2) accordingly.

Factor 4: Learners’ motivation

Even though schools have budget (Factor 1), teachers are highly motivated (Factor 2) and have a flexibility (Factor 3), we cannot expect effective learning without learners’ active participation. Things which hinder their active participation could be their low computer literacy and low motivation.

As for the former factor, according to [21], it is reported “students say that these environments (blended-learning environments) best support how they learn.” Compared with the situation in late 20th century when ‘computer literacy’ is popularly used, students’ computer literacy has been dramatically improved and most students have a favorable attitude IT-based learning. Therefore the second factor is most important and most difficult. Learning motivation has been a major research topic since early 20th century in the field of pedagogical psychology.

Reference [22] categorized motivation into two types: intrinsic and extrinsic motivation. It is argued that Deci and Ryan’s Self-determination theory (SDT) could describe one’s motivation in more understandable way.

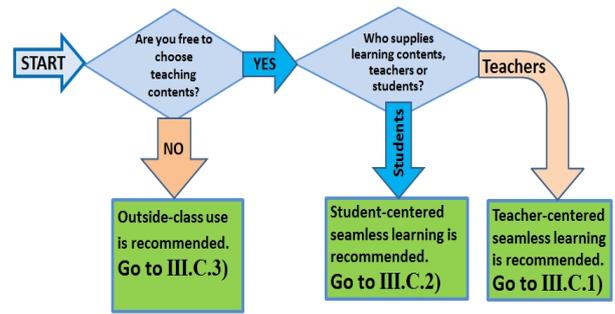


Figure 3. Content checklist

Reference [23] contended that there is a self-determination continuum ranged from non-self-determined to self-determined which is subdivided into three parts: motivation, extrinsic motivation and intrinsic motivation.

It is explained that the more self-determined, the more motivated. Thus, it is recommended to let students think that learning is not forced and that it is determined by themselves. First ask them why they learn and let them make a practical goal setting of their learning (eg. TOEIC 600 points). This process is important. Without active use of mobile learning system, any ideal m-learning environment could be useless. It is also important to let them keenly sense that in order to achieve their goal in-class learning is not sufficient and that outside-class, anytime-anywhere-based ubiquitous learning is inevitable. Generally speaking, students are busy, small-step style where the task can be achieved for a short period of time is recommended. Though it is believed that intrinsic motivation is better than extrinsic one, still it might be necessary to inspire some extrinsic motivation such as introducing a reward system where students’ hard works would reflect their grades. Putting these factors into consideration, an effective mobile learning would be realized.

B. Nine Considerations in practice

In order to carry out a successful seamless learning, it important not only to grasp the environment: what is available, what is not available, and learners’ computer literacy and mobile literacy, but also to grasp some techniques to conduct a class. This section suggests 10 vital things for practitioners to keep in mind

1) Conduct questionnaires

At the beginning of the semester, it is highly recommended to conduct questionnaires to grasp learners’ computer literacy and mobile environment. Web tools such as Google document can facilitate this process. The followings are sample questions:

1. Do you have mobile phones? Is it smartphone?
2. Do you have computers at home? Is it internet connected?
3. Do you share computers with your family? Do you have one of your own?

2) Initial registration

Create students accounts beforehand and make a user list with the name, email address, password, username, device number because it is so time-consuming that without this process it is difficult to carry out anything in the first m-learning class. Note that you should print out the student

account list and cut into each piece and hand them to the students on the first day.

3) *Numbering of devices to be distributed*

If you are going to deliver devices to the students, it is highly recommended to number the devices to be used and to make a list with student numbers, names, device numbers, and seat numbers. It is very convenient to make device numbers and seat numbers identical if possible. If the students are going to use their own devices, skip 4) to 6).

4) *Prepare Lend Out Equipment Forms*

Distribute lending forms when you distribute devices asking the students to fill in the form with their contact information such as their e-mail addresses and cellphone numbers.

5) *Prepare the contact information slip for each device*

It is highly recommended to post or insert the contact information slip with the name of the project leader, his/her e-mail address and cellphone number in case someone lost his/her device. There will be a possibility that the finder may get contact with the project leader.

6) *Charge devices*

If the mobile devices are to be provided to all students, it is important for the practitioners to charge devices before distribution. It means lots of electrical outlets needed. After being distributed, we need to ensure them to charge the device every day. When students use their private smartphones, it will be their routine work to charge them every day.

7) *Privacy*

Privacy is an important issue to be considered when taking photos and upload them as ULLOs. It is recommended to advise students not to take a photo with someone’s face in it or the ones which are considered too private.

8) *Make use of Description Column or images*

We learn words from the context [24] [25] [26]. When the students upload the words they learn to the system, they should be encouraged to input its context in which the word appears or just take a photo of the article and upload as image. Since students often do not like to be bothered with uploading contexts, teachers should keep encouraging them. It often works if they are informed that context uploading will reflect their grades.

9) *Comment column*

A comment column in each ULLO interface is for asking questions or exchanging information. Therefore let students note that when they write comments on ULLOs, they should not write things off-topic.

C. Creating Contents

1) *Creating teacher-centered contents for inside- and outside-class learning*

SMALL System proposed by [19] is based on SCROLL and linking function between inside- and outside-class learning is newly added (<http://ll.is.tokushima.ac.jp/ecourse/>). Its aim is to entwine in-class learning with out-of-class learning. When learners upload what they have learned outside-class to the System, then it links it with the one used in the textbook and vice versa.

First, teachers upload textbook data (PDF or text) to the system. Students can read textbook files anytime anywhere for previewing and reviewing with mobile devices just like a paper book. In the electronic textbook, registered words are hyperlinked and when the teacher clicks them, a side bar pops up and it shows names of the students who registered them so that the teacher will be able to know how many students and who have registered them.

The electrical textbook can be accessed through internet-connected PCs and smartphones. They can use during class and at home. Teachers registered the target words of each chapter before class and let them view target words as a preview assignment. Students can “relog” them if they are unknown words and challenge quizzes.

As mentioned, this system aims to entwine out-of-class learning with in-class learning. Fig. 4 shows how in-class vocabulary learning and out-of-class vocabulary learning are linked. When a student registers “credit” during his out-of-class learning, the system shows him the textbook context where it appears as well as Chapter title and line number. Then he can realize that he has already learned it in the textbook during his in-class learning. That way it reminds him of what he had learned but forgotten already. The System also entwines students’ self-learning with that of the others.

Fig. 5 shows how the “contemporary” object is connected to those registered by other classmates. When he clicks them, he can learn other contexts where “contemporary” is used. This linking function is significant because, as mentioned earlier, students need to encounter as many different contexts as possible to grasp the true meaning of the word. For another reason, as a general concept, people are likely to forget what they have learned. In fact forgetting learned vocabulary is a serious problem during learning English vocabulary [27]. Even though the student felt “contemporary” was totally new to him, the system lets him know that he has learned it before in the textbook.

Fig. 5 shows how the “contemporary” object is connected to those registered by other classmates. When he clicks them, he can learn other contexts where “contemporary” is used. This linking function is significant because, as mentioned earlier, students need to encounter as many different contexts as possible to grasp the true meaning of the word. For another reason, as a general concept, people are likely to forget what they have learned. In fact forgetting learned vocabulary is a serious problem during learning English vocabulary [27]. Even though the student felt “contemporary” was totally new to him, the system lets him know that he has learned it before in the textbook.



Figure 4. Link between in-class learning and out-of-class learning

2) *Creating student-centered contents for inside- and outside-class learning*

Students can upload contents just as teachers do on the textbook upload page shown. Looking for some articles which they get interested in (any topic will do such as music, sports, movies, TV shows) and upload them so that

they can share. They are supposed to present concerning the material they chose and the vocabulary which was linked to the textbook vocabulary during class in turn. It is recommended to do it as a group work.

3) *Creating contents for outside-class informal learning*

When teachers should follow the teaching guideline strictly and do not have a flexibility to choose teaching/learning materials, SCROLL would be mainly for outside-class learning. Either According to [28], 5 to 16 exposures are necessary to fully acquire a word. SCROLL is a good tool to assist learners to reinforce word-meaning connection by giving them a quiz and recommending ULLO where they come across the place where they learned it



Figure 5. Link between one's learning and other classmates' learning

In order to stimulate students to learn/upload more words, a top ten upload ranking list (names of the learners who uploaded top most to 10th) is shown on each user's top page. As mentioned before, they can accumulate the scores when they challenge quizzes. The score display is expected to motivate them to solve more quizzes. Let them note that their commitment to SCROLL learning reflected their grades.

IV. LEARNING DESIGNS IN SEAMLESS MOBILE ENVIRONMENT FEATURING SCROLL

Some of the learning scenarios suggested in this section are based on 'experiential learning' proposed by [29]. This learning theory contends that it is effective to make students active and learn by doing. For the sake of the instructors' convenience, lists of things necessary, and things to do before class are provided. In recent years many educational institutes have introduced LMS (learning management system) such as Moodle. Combination of SCROLL and LMS will make seamless mobile learning more effective. If there is no system available, Edmode is a possibility. Edmode, founded by Nicolas Borg and Jeff O'Hara in 2008, is an educational social networking site to connect teachers, students, and parents, connect teachers with other teachers, and connect class with other classes. Teachers can post assignments, create polls for student responses, embed video/sound clips to support students' learning. Facebook, Twitter or Dropbox have similar functions. Therefore, the learning activities introduced

below are based on the combination use of SCROLL and LMS or any form of sharable holders.

A. *Full seamless learning*

1) *Full-seamless vocabulary learning with SMALL*

(1) Environment: in-class and outside-class mobile/fixed

(2) Activity outline

Students preview target words in the textbook before class and take quizzes. They receive lecture from a teacher during class. They were assigned to learn vocabulary and uploaded what they have learned out-of-class to the System. Teachers introduce their students' outside learning in class or students present what they have learned outside-class. The vocabulary they learn outside-class will be linked to the vocabulary in the textbook by the system (cf. Fig. 4 & Fig. 5).

(3) Target language skill: reading, vocabulary building

(4) Level: beginner to intermediate

(5) Activity style: solo work

(6) Before class: Prepare reading contents for outside-class learning. Register target words to the System.

(7) Procedures

1) Before class, as a preview, students see "all logs" registered by the teacher, relog them and answer quizzes at home.

2) During class they read and comprehend the contents with the help from the teacher.

3) Students upload words they have learned and answer quizzes both inside- and outside-class. Teachers evaluate their status watching their logs and quiz logs.

(8) Points in practice

1) It is necessary to keep encouraging students to do learn vocabulary outside-class. It sometimes works just to let them keep record of the hour they spent for vocabulary learning (cf. Appendix 1). The System teaches us how long they logged in, but it does not necessarily show the time they spent for vocabulary learning.

2) Reference [19] shows that the group with the system felt more fun in vocabulary learning and learned more words than the group without the System. Therefore informing them of its significant effectiveness will motivate students to use the System.

B. *Semi-seamless learning*

1) *Semi-seamless vocabulary learning with SMALL*

(1) Environment: in-class and outside-class fixed (+in-class mobile)

In this condition, it is less-seamless since there is no mobile device out-side class. It is hard to get access to the System when they are not home nor classroom. Still it is possible to link in-class learning with outside-class one using fixed computers, though it would be less effective.

(2) Activity Outline to (8) Points in practice are the same as A.1).

C. In-class only non-seamless mobile learning

Two In-class Task-based Learning activities are introduced in this section. Task-based language learning or TBLL is a popular learning method based on ‘experiential learning’. Much emphasis is put on learning by doing.

1) Orienteering on campus using mobile devices

- (1) Environment: in-class mobile and PC
- (2) Activity outline

Students go outside classroom with mobile devices such as smartphones, tablets and do orienteering-based activities. If the class is not in one-to-one condition, one-to-group work is recommended.

- (3) Target language skill: speaking, reading
- (4) Level: beginner to intermediate
- (5) Activity style: pair work / group work
- (6) Before class: Register ULLOs on campus. Register questions on “description” area on the registration interface (cf. Fig. 6).
- (7) Procedures

- 1) Make pairs or groups and let them go to the places instructed by the teacher.
- 2) Then the students receive push mode messages which inform them that there are some ULLOs around them. Read “Description” and do the task as instructed. They input an answer in a comment column (cf. Fig. 7). Another possibility is to

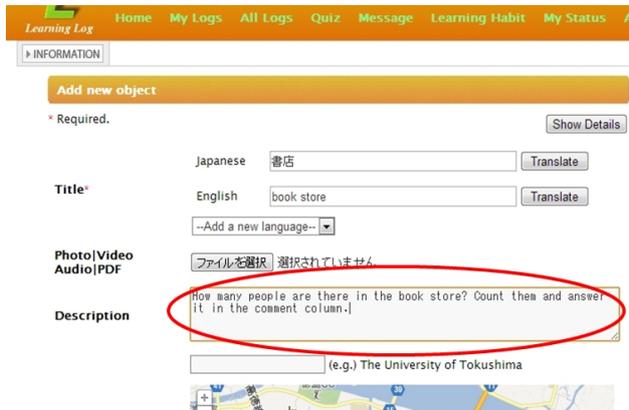


Figure 6. Description area in Learning log upload interface

answer the question orally using voice recorder and upload the sound files to some instructed sites such as LMS, Edmode, and dropbox. Then go to another object that instructs next task. They are not allowed to use their native language. (cf. Appendix 2).

- 3) The number of the task should be the same with the number of the group members so that every single member could be a leader of at least one task.
- 4) If they have some problem or trouble, they make a call to the teacher, who gives them some advice or new instruction according to their situation. As a rule they are supposed to use the target language while communicating with their teacher.
- 5) The teacher checks the e-mails/voice mails sent by the students and give them the next task

- 6) The pair/group who finished all the tasks first will be awarded and it reflect their grading.
- (8) Points in practice
 - 1) Make pairs or groups and let them go to the places instructed by the teacher. It is appropriate to give them four to five tasks during one class. Accordingly, make a group with 4 to 5 students each.
 - 2) Drawing can be one of the tasks.

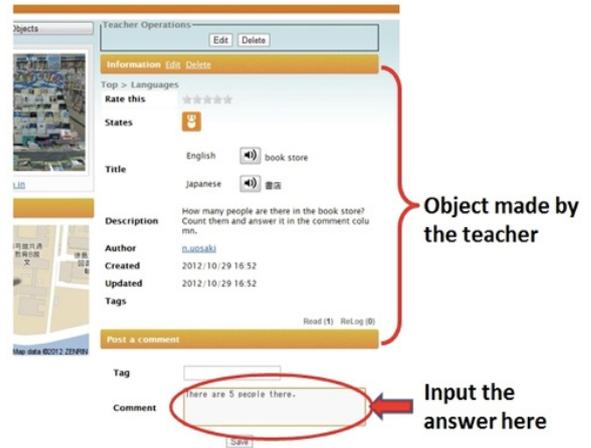


Figure 7. Comment column in Learning Log Object interface

- 3) Use “describe ...” in instructions so that the students can learn how to describe the situations which they encounter in
- 4) We can make it a competition-style where the group who finished all the tasks first is awarded.
- 5) We can make the students create tasks themselves.

2) Interviewing using smartphones

- (1) Environment: in-class mobile and PC
- (2) Activity outline

Interview activity: Peer-to-peer interviews and if possible, interviews with international students using smartphones. The students uploaded the recorded files of interviews to SCROLL, LMS, or Edmode, and shared the files by listening and made summary reports which were also uploaded to the LMS. (2) Target Language Skill: speaking

- (3) Level: intermediate to advanced
- (4) Activity style: pair work
- (5) Before class: Make pairs.
- (6) Procedures
 - 1) Make pairs and let them interview with each other on a given topic. Prepare questions before interview sessions. Make recording interview session using voice recorder function of smartphones and upload the recorded file to the System.
 - 2) After the interview session, let them make a summary of the interview and submit the file to the System.
 - 3) It is easy to share uploaded files by SMALL. So listen to other classmates’ interviews and vote for

the best interviewer. The best interview might deserve an add-on to his/her grade.

(7) Points in practice

- 1) If the students are beginners and feel it hard to make conversation continue, one solution is to deliver them sample dialog video clips (or sound clips) and let them practice in a pair-work style (cf. ‘deliver’ can mean ‘upload files to LMS, Edmode, Google+, Dropbox, Youtube etc.).
- 2) Delivering useful phrases for interviewing, either it is digital or analog, might help.(cf. Appendix 3).
- 3) It will stimulate other students to upload best performers’ video clips or recorded files to LMS, Edmode, dropbox, or any form of sharable holders

D. Outside-class only non-seamless mobile learning

1) Outside-class Task-based Learning

When teachers do not have a flexibility to choose teaching/learning materials, it is difficult to carry out task-based learning during class. In such a case, task-based learning for outside-class use is recommended. SCROLL is about to add a function to let learners to get involved in a task-based learning so that they can actually experience learning situations such as shopping, asking the way, visiting a doctor and so on (cf. Fig. 8 and Fig. 9).



Figure 8. Task-based learning Interface (1)

(1) Environment: out-class mobile

(2) Activity outline

Learners choose the task and proceed as instructed. They can learn useful vocabulary and expressions during the task.

(3) Target language skill: Japanese language learning, speaking, vocabulary

(4) Level: intermediate to advanced

(5) Activity style: solo work / pair work

(6) Procedures

Learners choose the task such as shopping, opening an account at the bank and so on as they want. They proceed the task according to the System guidance. It is an informal learning. Therefore basically it is all up to learners’ autonomy.

2) Outside-class Context-aware Vocabulary Learning

(1) Environment: out-class mobile

(2) Activity outline

When learners come across the place where an object was registered, SCROLL lets them know and let them learn it.

(3) Target language skill: Japanese vocabulary building

(4) Level: beginner to intermediate

(5) Activity style: solo work / pair work

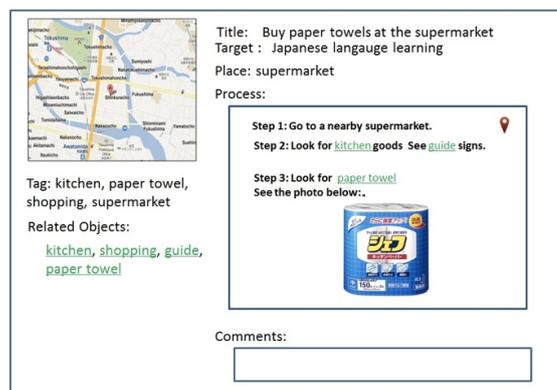


Figure 9. Task-based learning Interface (2)

(6) Procedures

1) When learners get cross to a registered object (Japanese word), the System lets them know that the learning object is near them and encourage them to learn Japanese vocabulary throughout their daily lives. The System also generates the quizzes to reinforce their vocabulary learning.

2) Reference [30] shows that the learners benefited from the system and the context based recommendation and learning habit based prompting also motivated them to study more. Therefore informing them of its effectiveness will motivate students to use the System.

E. PC-based vocabulary learning using SCROLL

This method is recommended when smartphone penetration rate is low and no budget is available. In this case, it is practically impossible to carry out seamless mobile learning. It should be used only as a last resort.

(1) Environment: in-class PC / outside-class PC

(2) Activity Outline

Students read books and learn vocabulary using SCROLL.

(3) Target Language Skill: reading, vocabulary building

(4) Level: beginner to intermediate

(5) Activity Style: solo work / group work

(6) Before class: Prepare reading contents or just use textbook. Register target words to the System.

(7) Procedures

1) Before class, as a preview, students see “all logs” registered by the teacher, relog them and answer quizzes at home.

- 2) During class they read and comprehend the contents with the help from the teacher.
 - 3) Students upload words they have learned and answer quizzes both inside- and outside-class. Teachers evaluate their status watching their logs and quiz logs.
- (8) Points in practice
- 1) In order to encourage students to do home assignment, teachers need to use carrot and stick policies: carrot (some rewards or extra points at the end of the semester) and stick (extra assignment or detention). Outside-class learning is important because they are in lack of learning time at school.
 - 2) If the teachers want to encourage students to read what they are interested, “noredink” is recommendable (cf. <http://www.noredink.com/>). This site aims mainly for practice and master of grammar. When they make an account, students choose their interested fields and then, they can read sentences from their chosen fields.

V. CONCLUSIONS AND FUTURE WORKS

This paper has set practice-based guidelines for instructors or any kind of parties who are interested in ubiquitous seamless learning to implement an environment using SCROLL. Some sample learning scenarios for both formal and informal learning have been suggested in order to help teachers to prepare class and to promote learners’ autonomous learning.

We insisted earlier the necessity of setting new guidelines for implementation of seamless mobile learning environment by saying that however sophisticated systems and devices being developed, unless we have a good guidance, they might be useless. We are earnestly hoping that our guideline will meet the demand in the age of rapidly-growing mobile and wireless technology and helps implementation of seamless mobile learning environment in any level of education from K-12 to higher education all over the world.

As our future work, utilizing sensor technology, more customized learning recommendation system is under development so that the system can give the learners more recommendation at more appropriate timing and more appropriate places. We believe that the smartphones will be equipped more sophisticated kinds of sensors in the future and the device will know learners better to catch their learning habits more accurately.

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APPENDIXES

Appendix 1

Daily Vocabulary Learning No. () Name()

| Date | min./total | Date | min./total | Date | min./total | Date | min./total |
|-------|------------|-------|------------|-------|------------|-------|------------|
| 11/15 | min. | 11/22 | min./ min. | 11/29 | min./ min. | 12/6 | min./ min. |
| 11/16 | min./ min. | 11/23 | / | 11/30 | / | 12/7 | / |
| 11/17 | / | 11/24 | / | 12/1 | / | 12/8 | / |
| 11/18 | / | 11/25 | / | 12/2 | / | 12/9 | / |
| 11/19 | / | 11/26 | / | 12/3 | / | 12/10 | / |
| 11/20 | / | 11/27 | / | 12/4 | / | 12/11 | / |
| 11/21 | / | 11/28 | / | 12/5 | / | 12/12 | / |
| Sign | | Sign | | Sign | | Sign | |

Appendix 2: Sample Instructions

- 1) Go to the gymnasium and describe what people there are doing.
- 2) Go to the tennis courts and count the number of people who are playing tennis and describe them
- 3) Go to the roof and describe what you see.
- 4) Go to the café “XXX”, count the number of people who are sitting at tables and report today’s special lunch.
- 5) Find some international students and ask them where they are from and their majors and so on
- 6) Find at least three things which are orange, and name them.

Appendix 3: Useful expressions for interviewing

- 1) Where are you from?
- 2) What is your hometown famous for?
- 3) What are your hobbies?
- 4) Do you belong to any club or circle?
- 5) What kind of sports do you like?
- 6) What is your favorite food?
- 7) What kind of music do you like?
- 8) Do you have your favorite artist or bands?
- 9) Do you have any plan for next weekend?
- 10) What did you do during the holidays?

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

Received 17 December 2012. Published as resubmitted by the authors 20 March 2013