INTRODUCTION

Mobile and ubiquitous technologies have been applied to a wide range of learning fields such as science, social science, sport, history and language learning. Learning supported by ubiquitous technologies is called ubiquitous learning.

Nowadays, the challenge of future computer systems is not only to supply information “anytime and anywhere”, but also to recommend optimal content to the user as a proper way at right time.

The word “ubiquitous” means being or existing everywhere at the same time. Poslad describes that “ubiquitous computing” enables information to be made available everywhere and supports human usage of ICT (Information and Communication Technology) systems (Poslad, 2011).

Ubiquitous computing evolution has recently been accelerated by improving the emergence of flexible software architecture, open networks, Wi-Fi technologies, advanced electronics, continuous increasing in computing power and improved battery technology. Using those technologies, an individual learning environment could be embedded in daily real life (Ogata & Yano, 2004).

This paper mainly describes the design of a learning log dashboard (L2D) and its development. The L2D works together with SCROLL (System for Capturing and Reminding Of Learning Log) system, which supports language learning for overseas students. SCROLL helps learners log their learning experiences with several types of media such as photos, audios, videos, and sensor data. Moreover, it provides a sharable space of them with other students. Each recorded object in SCROLL is called ubiquitous learning log object (ULLO). A UULLO indicates a digital record of what a learner has learned in the daily life using ubiquitous technologies. For instance, a UULLO can be an English word or a piece of Japanese sentence taken down by a language learner. The system developed as a first version focuses on how to apply UULLOs regarding analysis and feedback for students. In addition, how to track learning activities and analyze them in traces of reflection thereof are proposed. However, there are little contributions directly follow these motivations. Therefore, this study originally proposes a learning log dashboard model in the study to improve the first version. The main objective of this paper is to design and implement the L2D model applied for a ubiquitous learning environment. It reuses, analyzes and visualizes traces of learning activities in order for learners to promote awareness and enable them to reflect on their own activity and induce them to recall what they have learned [1].

Learning log analytics dashboard

How to reuse learning logs and how to track and analyze traces and reflection of the learners’ activity are two main issues to explore in this research. Therefore, L2D system enables learners to reflect on their own activity and helps to recall some of the learning logs that they have learned. L2D system also focuses on both statistical data and contexts on every learner’s usage of the system. In other words, this paper focuses on developing L2D system that visualizes the traces in ways that help learners to steer the learning process. L2D system shows the number of (1) learning logs; (2) completed quizzes; (3) memorized learning logs and (4) incorrect answers of the quizzes. It is an easy way to see incorrect answers on a word and control the information on the dashboard.
Figure 1 shows the information of learning logs that a learner answers a quiz incorrectly (once twice, or more than 3 times). Learners are also able to see their progress at a glance such as their achievements, statistics, their progress and the number of learning logs they need to practice. Thus, a learner will repeatedly practice words by the quizzes and eventually the learner will be greatly motivated. At that time learners are able to concentrate upon the words answered incorrectly [1].

![Figure 1: Screenshot of L2D](image)

Figure 1. Screenshot of L2D. Adapted from “Dashboard For Analyzing Ubiquitous Learning Log” by Erdenesaiikh Lkhagvasuren, Kenji Matsuura, Kousuke Mouri, Hiroaki Ogata. International Journal of Distance Education Technologies (IJDET),14(3), (2016). Copyright 2016 by IGI Global.

If a learner clicks on the “Enjoy the quiz” button in green color, L2D system automatically provides a set of quiz. The set of quiz contains learning logs of a learner who answered incorrectly once. According to the colors of the buttons a learner can work on quizzes. For example: red color button provides the set of quiz that contains learning logs of a learner who answered incorrectly 3 or more times. If the learner skips the set of quiz without completing it, L2D system reminds her/him about the necessity of completion of the task via a message to encourage her/him to study. The learner eventually will know all of the words by heart.

**Evaluation and results**

An evaluation is conducted to evaluate the usability of L2D and influence for learners through the experiment. The subjects consist of 14 international students who enrolls in Tokushima University. Through the evaluation, the following things are found out: 1) The experimental setting shows a larger improvement in both tests (Post test 1, Post test 2) than the control setting. It means that experimental setting students actually upload fewer words, but learns more words than control setting students.
2) Therefore, it can be said that L2D system is more effective and supportive than normal SCROLL by way of its quiz function. According to the questionnaire result by subjects, it is found out that the system adds some efficient way in vocabulary learning.

3) There is a statistically significant difference between Pre-test, Post test (1), (2) for Group B as determined by one-way ANOVA (p < 0.05). It means Group B shows improvement. Moreover, experimental and control settings are compared to pre-test by one-way ANOVA (p < 0.05). There is a statistically significance. Then, further analysis (multiple comparison) is made according to Bonferroni method. The author found a pair (pre-test and experimental setting (p < 0.05). It means that L2D system is more useful in vocabulary learning.

4) During the experiment, 1,339 learning logs (mean = 47.82, SD = 46.99) are uploaded and 4,439 quizzes (mean = 158.53, SD = 81.09) are done. For a student, his or her records are 2.27 learning logs and 7.54 quizzes in average every day. It means that they engage in the system well.

5) The correlation between the number of uploaded logs and each student’s times of quiz taking is examined. The coefficient of correlation between the two factors is 0.3184. It means that the result is detected statistically significance in correlation between the number of uploaded words and times of quiz taking. Moreover, students are less active when they use SCROLL with L2D than the normal SCROLL from uploading activity viewpoint. Nevertheless, when students use SCROLL with L2D, quiz activity is higher than using normal SCROLL.

6) Besides open-ended comments from students, most part of their comments are positive. Especially contents with dashboard gained good reputation. L2D seems to enhance students’ motivation of learning Japanese [1].

Conclusion

This paper is a contribution to the solution of the major problems faced in the ubiquitous learning environment. Specially, studies in the ULA haven’t been realized yet to display, analyze and trace self-reflection of their own learning activities with their contexts in accordance with their learning situations in the real world. In order to solve the problems, learning log dashboard (L2D) is developed. The main objective is to provide learners with the L2D system which reuses, analyzes and visualizes traces of learning activities in order to promote awareness and enables learners to reflect on their own activity and helps to recall what they have learned.

In the future work, it is important to recommend and present past learning logs on the system in accordance with each learner’s condition.

REFERENCES
