Influence of instant feedback on learning motivation of university students: Promoting out-of-class learning by developing ICT materials

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Abstract— In this paper, google apps were used to build an LMS-like environment with instant-feedback function for stimulating out-of-class study activities. 82 first-year university students who enrolled in an English course participated in the project. Reading comprehension sections from Eiken Pre-1 grade test (equivalent of CEFR level B1 to B2) were used for the assignment. To find the influence of instant feedback on learning motivation, two surveys were conducted at the end of the semester. The surveys asked students about their study hours and what types of feedbacks were effective for stimulating their learning motivation. On average, 10.1 assignments out of 13 were submitted. Average study hours were 72 minutes. The feedbacks students find most effective are the scores and the transitions of the scores of the assignment. Written comments from the teacher received polarized assessments; although the feedback received high score for motivating class assignment, it was perceived by some students to be not effective for motivating English learning at large.

Index Terms— ICT in education, reading skills, out-of-class study, programmed learning, feedback

I. INTRODUCTION

It is widely reported that the study hours of university students in Japan are significantly shorter compared to other countries. According to a survey conducted by National Institute of Educational Policy Research, undergraduate students from 1st year to 3rd year spent approximately 5 hours per week for their out-of-class studying [1].

In order to encourage students to study out of class with their own initiatives, professors need to arrange several educational designs. Typical designs include a quiz and a report assignment which are given to students in regular basis. The NIEPR survey showed that 88.8% of the students responded that they had a quiz and/or a report for the registered classes. On the other hand, only 36.7% of the students responded that they received a feedback from their professors [1]. Several studies have shown that providing appropriate feedback for the assignment is effective to maintain and to promote students' motivation for learning [2], [3].

However, university professors in Japan have already

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devoted significant amount of time to education by reducing hours for research activities [4]. Between 2002 and 2013, while a proportion of time spent on research activities over total activities have decreased from 46.5% to 35%, that of educational activities have increased from 23.7% to 28.4%. It is important to improve educational quality without adversely affecting professors' research activities. Utilizing ICT is a promising way to address this challenge.

ICT in education takes various forms and styles such as power point slides projections, electronic blackboards, electronic textbooks and LMS (Learning Management System). LMS is a comprehensive system which manage every aspect of learning activities and histories for individual student. The system allows teaching staff to give assignments and feedbacks to students.

An LMS-like environment was built by utilizing Google Apps to encourage out-of-class study and to reduce professors' time for scoring and feedback. This system was used for an English course in a public university in Ishikawa to investigate the effect of feedback to the students' motivation, which was measured by two surveys conducted at the end of the semester. This paper describes an educational activity by using google apps with quantitative analysis on students' study hours and the effect of learning motivation of several types of feedback provided through the LMS-like environment.

II. PROPOSED SYSTEM

A. Outline

2. Related studies

2.1 Utilizing Google Apps to build LMS like environment

There are many existing studies and reports on English teaching activities utilizing LMS [5]-[8]. However, there are few reports regarding educational activities using Google Apps. Tanaka et al. reported their activities in several universities by using Google Apps and concluded that using Google Apps enables to implement minimum function similar to LMS [9]. Their report does not include analysis on study hours. Suzuki report his experiences of using Google Apps [10]. However, there are no mention on how study hours are changed due to his activities. Nagaoka reports that although Google Apps have better user interface, because of its limited functions, it can be utilized mainly in smaller universities without LMS [11]. Fukui et al. compares Google Apps and Moodle and reports that the former lacks several functions such as scheduling the contents display timing [12].

To summarize, although the existing studies provide useful insight on how to utilize for LMS-like operations,

quantitative analysis of the effect on students learning motivation are not fully investigated.

2.2 Influence of feedback on learning motivation

In psychological discipline, numerous theoretical and practical studies have been conducted on the influence of feedback on learners. Skinner applied to education an operant conditioning theory which assumes that the probability of a voluntary behavior will be enhanced by giving proper reward to that favorable behavior [13]. He also proposed a successive approximation method in which target behavior was segmented to be learned in sequential order and a programmed learning which incorporated instant reinforcement method in which immediate feedback was given to a proper reaction by a learner. To implement the programmed learning, he developed a teaching machine. His research has formed a foundation of current educational engineering which facilitates the rapid implementation of the programed learning into educational field [14].

Feedback is reported to affect intrinsic motivation of learners [15], which suggests that the introduction of feedback to educational activities have high salience in supporting and stimulating out-of-class study activities for university students. The effect of the feedback has been investigated from various perspectives. Natori reported that giving positive feedback was more effective than giving negative one in enhancing learner's motivation [16]. The result suggests the importance of considering the reward value of the feedback. Also, subjective value of the feedback is reported to be lowered by several factors including the time having elapsed between an action taken and the time reward given and the probability of the feedback to be given. This phenomenon is called discounting [17], which should be factored into when considering the timing of the feedback to the learners. After reviewing the existing studies on feedback, Toyama et al. pointed out that the most of the studies have investigated the result feedback which focused on the achievement of the learners [18]. They proposed a necessity of a further study on process feedback which put more emphasis on the learning process. These related studies have shown the necessity to sufficiently consider the appropriateness of the method and contents of the feedback.

There are many practical studies which reported the effect of feedback on university students. Uno and Unegawa developed and tested a feedback system which notify the grading of the learning outcome in real time for their programming practicum in order to enhance motivations of the students enrolled in the course [19]. The result showed a significant improvement in the commitment level both in in-class practice and out-of-class non-mandatory assignment. Makino reported a practical study in which peer-feedback activities were introduced in speech training for his remedial English course [20]. During group speech trainings, a speech by one student was recorded by a video camera and the student watched the recorded video with the member of the group who gave a feedback on where to improve. The result of the questionnaire survey showed that all the students in the course found the peer feedback productive in improving their speech skills. In Kyushu University, an e-portfolio system has been utilized for daily reflection for the courses. The professors checked the daily report of the students and gave individual support through writing comment online [21]. These practical studies have shown that more universities and professors are interested in

the feedback since it is expected to be an effective strategy for improving educational effect.

III. EXPERIMENT 1

A. Participants

First year students (n=82) in the Faculty of Intercultural Communication of Komatsu University participated in this project. In fall semester of 2018, they were required to take "English III" course. The aim of this course was to help students improve reading skills in English. The course was divided into three classes held in Tuesday, Wednesday and Friday. The students were free to decide which class to take (Table 1).

Table 1. Course name, days and students registered

Class	Date	Male	Female	Total
English IIIa	Tue.13:00-	3	20	23
English IIIb	Wed.13:00-	12	12	24
English IIIc	Fri.13:00-	2	33	35
Total		17	65	82

B. Material for the assignment

Written tests of EIKEN grade P1 level conducted and published by Eiken Foundation were used. A written test is composed of multiple-choice section (41 questions) and composition section (1 question). Out of 41 questions, 10 questions in reading sub-section were printed and distributed to the students. The sub-section is divided into three question sets, as shown in Table 2.

According to Eiken Foundation's evaluation criteria, the intended examinees of the Grade P1 are second to third year university students. Successful examinees are expected to fully understand and use English required in actual social life situations. The difficult level of the test is equivalent to CEFR B1 to B2.

Table 2. words size of each question set.

	QS1	QS2	QS3	Total
Number of questions	3	3	4	10
Words in texts	312	412	494	1,218
Words in questions	241	239	343	823
Words in total	553	651	837	2,041

C. Systems

The LMS-like environment proposed in this paper utilizes Google Apps and analyzes students' study hours. Table 3 summarize the applications used and their functions.

One of the authors used Google Sites to build a web site for the course taught in a university. The top page of the site contains several information such as site structure, instruction about assignment and other necessary information (Fig.1). Under this top page, a page for each week is added which include links to the assignment, the page for registering the answers, and the comment page (Fig.2).

The page for registering the answers are constructed by

Google form (Fig.3.1 and 3.2). After registering the answers, the student receives a link to the page containing the result and commentaries.

Table 3 Specification of the environment

Apps	Function	Figure
Google Sites	Course page	Figs. 2 & 3
Google Forms	Answer registration	Figs. 4.1 & 4.2
	Scoring and analysis	Fig.6
G-mail	Send link to feedback page	Fig.5

Fig.1. Course top page

Fig.2. Page for each assignment

Fig.3.1. Answer Form1   Fig.3.2. Answer Form 2

D. Process of assignment

3-page assignments were distributed and processed according to Table 4. The students were instructed to access this page to register their mail address, student number, names, study hours for each question set, and answers.

Table 4. Process of assignment

Phase	Who / When / How
Distribution	Professor to students / At the end of the class / 3-page
	hand-out
Answering	Student / Out of class hours / Off-line.
Registering	Student / Prior to due date / Google Apps
Feedback	Automatic / After answer registering / Google Apps
Scoring & analysis	Automatic / after answer registering / Google Apps

E. Scoring and analysis of the answers

After registering the answers, a message notifying the completion is sent to the registered e-mail address. The message contains the link to a page with score information and commentary. Fig. 4 partially shows the commentary page.

Google Forms automatically process all the data registered by the students, including making a scatter diagram, extracting questions with low accuracy rate, and storing all the data in Google spreadsheet format into Google drive with time stamp data (Fig. 5).

Fig.4. Feedback page (partial)

Fig.5. Auto response-analyzing page

F. Questionnaire Surveys

Two types of questionnaire surveys were conducted at the end of the semester. One is designed by the university (hereafter called University Survey) and the other is developed for this study (hereafter called Research Survey).

The University Survey was conducted on February 6th, 2019. The survey was composed of 12 questions of which two were the items for the students.

The Research Survey was conducted online through Google Forms until February 13th. The students received the instruction in the classroom on February 6th. The survey was

composed of 69 items, of which 41 were on the assignments (Table 5).

Table 5 Comparison of the surveys

	Survey by university	Survey for the study
Number of questions	12	69
identification	anonymous	student number
format	paper	web
date	February 6, 2019	February 6 to February 13, 2019
Number of students answered	81	15

IV. RESULTS

Table 6 shows the number of students enrolled in the course, the number of students who took the TOEIC Bridge test, the number of students who submitted the assignment at least once, and the number of respondents to the survey. As shown in the table, the number of respondents to the research survey was small (n=15). The survey was conducted on the internet and this could lower the incentive for responding.

Table 6 Student numbers for relevant items

enrolled student	82
those who took TOEIC Bridge	76
those who submitted assignments at least once	78
those who answered University survey	81
those who answered Research survey	15

A. Submissions and study hours

Table 7 shows the descriptive statistics for the course grade, assignments (the times of submission, score and study hours), and TOEIC Bridge reading score. The average number of submissions was 10.6 out of 13. The average score was 5.1 over 10 points. Average study hours were 72 minutes (SD=28 minutes). 4 students did not submit single assignment at all.

The Research Survey was conducted with student numbers. Difference in the learning outcomes between the respondent and non-respondent indicate those who responded were highly motivated and skilled compared to those who didn't.

Table 7 Learning outcomes of the students

		all	respondent	non-respondent
course test score	M	69.94	75.72	68.73
	σ	14.43	11.58	14.85
assignment (times of submission)	M	10.13	12.07	9.88
	σ	3.71	1.14	3.77
assignment (score)	M	5.09	5.99	4.89
	σ	1.75	1/58	1.74
assignment (hours)	M	1:12:19	1:21:39	1:10:16
	σ	0:28:41	0:32:42	0:27:35
TOEIC Bridge Reading score	M	76.95	79.29	76.42
	σ	8.39	9.27	8.17

B. University Survey

In the survey, one item was related to out-of-class study activities (Table 8). 54 students out of 81 responded that they did a review and/or a preparation "always" or "often", indicating most of the students have developed a favorable learning habit.

Table 8 self-evaluation on out-of-class study activities (N=81)

Q2. How well did you prepare/review for this course?				
Always	Often	Sometimes	Rarely	Never
19	35	25	2	0

20 students wrote a comment for free descriptive item. Two were related to the assignment as follows:

• I am satisfied with the course because I can understand how well my English reading skills are through Eiken P1 assignment. Also explanations in the classroom were very clear.

• I am satisfied with the weekly assignment of Eiken test.

It was hard for me but at the same time, I believe through the assignments, my skills have been improved.

C. Research Survey

15 students responded to the survey. One student could not submit the assignment at all due to technical trouble. Tables 9 to 13 show the result of the survey from 14 students.

5 students wrote a comment for free descriptive item. Following three were related to the assignment:

• Weekly assignments were necessary because it was not easy to continue out-of-class study only by myself.

• It was good to know instantaneously my score for each assignment. I would like to read the translation in full, instead of partial translation, since I would like to understand not only sections related to the question but whole text. I think if full translation is provided, more students would read the comment more carefully.

• It would have been better if the teacher had explained

not the textbook but the assignment in the class.

Table 9 Inquiries on out-of-class assignment

	Strongly Agree	Agree	Disagree	Strongly Disagree
Q01 . My English skills have been improved through the assignments.	3	11	0	0
Q02 . I feel some pressure for the weekly assignments.	2	8	2	2
Q03 . I worked on the assignment with positive attitude.	4	8	2	0
Q04 . I enjoyed working on the assignment.	1	5	8	0
Q05 . The level of the assignment was appropriate.	4	7	3	0
Q06 . The amount of the assignment was appropriate.	5	8	1	0
Q07 . The contents of the assignment was appropriate.	7	7	0	0
Q08 . Reading comprehension skills have been improved.	7	6	1	0
Q09 . Reading speed has been improved.	6	4	3	1
Q10 . I got used to the Eiken P1 grade test.	8	5	1	0

Table 10 Evaluation on explanations for assignment shown upon answering

Q Explanations shown immediately after answering	Strongly Agree	Agree	Disagree	Strongly Disagree
was helpful.	7	4	3	0
motivated me for the assignment.	6	7	1	0
motivated me for reviewing.	4	3	7	0
motivated me for learning English.	4	3	6	1

Table 11 Evaluation on scoring for assignment shown upon answering

Q Scores shown immediately after answering	Strongly Agree	Agree	Disagree	Strongly Disagree
was helpful.	13	1	0	0
motivated me for the assignment.	10	3	1	0
motivated me for reviewing.	6	4	4	0
motivated me for learning English.	8	4	2	0

Table 12 Evaluation on time-sequence scores sheet distributed on regular basis

Q The score sheet	Strongly Agree	Agree	Disagree	Strongly Disagree
was helpful.	10	3	1	0
motivated me for the assignment.	7	6	1	0
motivated me for reviewing.	4	5	4	1
motivated me for learning English.	6	6	2	0

Table 13 Evaluation on comments written on the time-sequence score sheet

Q Comments from the teacher	Strongly Agree	Agree	Disagree	Strongly Disagree
was helpful.	9	4	1	0
motivated me for the assignment.	8	5	0	1
motivated me for reviewing.	6	2	3	3
motivated me for learning English.	6	5	1	2

学籍番号　18134100
氏名　　　クラス平均

回数	テスト番号	総合点	回答時間
1	2009_1	4.9	1:07:49
2	2009_2	5.0	1:12:12
3	2009_3	5.8	1:06:17
4	2010_1	4.8	1:12:22
5	2010_2	5.7	1:11:42
6	2010_3	5.3	1:14:37
7	2011_1	5.2	1:07:00
8	2011_2	5.8	1:11:12
9	2011_3		
10	2012_1		
11	2012_2		
12	2012_3		
13	2013_1		
14	2013_2		
15	2013_3		
	平均点	5.3	1:10:24

学籍番号　18134100
氏名　　　クラス平均

回数	テスト番号	総合得点	大問1	大問2	大問3
1	2009_1	4.9	1.6	1.7	1.6
2	2009_2	5.0	1.7	1.4	1.9
3	2009_3	5.8	1.9	1.8	2.1
4	2010_1	4.8	1.5	1.4	2.2
5	2010_2	5.7	1.6	1.4	2.8
6	2010_3	5.3	1.7	2.0	1.6
7	2011_1	5.2	1.3	1.7	2.1
8	2011_2	5.8	2.1	1.5	2.2
9	2011_3				
10	2012_1				
11	2012_2				
12	2012_3				
13	2013_1				
14	2013_2				
15	2013_3				
	平均点	5.3	1.7	1.6	2.1

回数	テスト番号	総合時間	大問1	大問2	大問3
1	2009_1	1:07:49	0:20:56	0:20:43	0:26:09
2	2009_2	1:12:12	0:21:07	0:23:55	0:27:10
3	2009_3	1:06:17	0:21:17	0:20:28	0:24:32
4	2010_1	1:12:22	0:23:13	0:22:32	0:26:38
5	2010_2	1:11:42	0:22:57	0:23:04	0:25:41
6	2010_3	1:14:37	0:22:36	0:23:14	0:28:47
7	2011_1	1:07:00	0:21:01	0:20:38	0:25:21
8	2011_2	1:11:12	0:21:02	0:22:27	0:27:42
9	2011_3				
10	2012_1				
11	2012_2				
12	2012_3				
13	2013_1				
14	2013_2				
15	2013_3				
	平均点	1:10:24	0:21:46	0:22:08	0:26:30

Fig.6 Feedback sheets

V. DISCUSSION

A. Average study hours

The average out-of-class study hours of the students who submitted the assignments exceeded 70 minutes. The course has two credits, which on regulatory basis requires the enrolled students to study 240 minutes per week. Compared with this requirement, 70 minutes study for the assignment was not sufficient. But it should be noted that the students could have studied for the course in addition to the assignments.

Compared to the average study hours of the university students in Japan (5 hours per week), 70 minutes study for the assignment of one course can be positively evaluated. The participating students in this paper were in the first year and they had many registered courses in the second semester. Specifically, every student took two-class-per-week Chinese course, which required long preparations for the class and frequent tests.

B. Attitude toward assignments

From Table 9, a typical attitude of the student can be described as follows. They felt psychological pressure from weekly assignment whose difficulty they perceived to be higher than their current skills. And this perceived difficulty prevent them to enjoy answering the assignment. However, by solving the assignment with positive attitude, they felt their overall English comprehension skills and reading speed improved.

C. Influence of feedback on learning motivation

The commentary prepared by the teacher and displayed upon registering the answers was evaluated as useful for itself but not effective for motivating to review the assignment or for overall English learning (Table 10).

On the other hand, the score displayed upon registering the answer was evaluated as not only useful but also an effective motivating factor for future assignment and overall English learning (Table11).

A feedback sheet (Fig. 6) prepared by the teacher every 5 week was evaluated as useful and effective for future assignment. It received lower evaluation as a motivating factor for assignment review but still evaluated as an effective motivating factor for overall English learning (Table 12).

A handwritten comment on the feedback sheet received a polarized evaluation for its effect on their learning motivations (Table 13).

To summarize, the students evaluated instant feedback of scores and feedback sheet with time-series score transition as effective motivating factors but found written commentary and instant display of the commentary as not so effective.

It is natural for the students to recognize the score as the most effective motivating factor since unless they don't find out their answers are correct or not, they can't find their strength and weakness.

On the other hand, written commentary on feedback sheet didn't receive high evaluation. In fact, it received the largest negative evaluation as shown in Table 13. One possible reason can be that the commentary was short and hence insufficient for motivation. Making the written commentary effective motivating factor was challenging in a course with more than 80 students.

The commentary displayed upon registering the answers also received lower evaluation. In the commentary, full translation was not included. Summary and relevant sections were selectively translated. This could be one of the reasons for the lower evaluation.

VI. CONCLUSION

In this study, LMS-like environment was developed by using open-source applications to give the students assignment platform through which they can register answer and receive the feedback. Also, they receive periodical feedback based on their assignment data. The data collected through the assignments and two surveys were used to analyze the effect of the feedback on their learning motivation. Although the number of the respondents were small, the overall results have shown the assignment and the feedback were highly evaluated by the respondents. The students who responded to the two surveys shows that the

feedback has positive influence on their learning motivation. Specifically, the feedbacks students find most effective are the scores and the transitions of the scores of the assignment. Written comments from the teacher received polarized assessments; although the feedback received high score for motivating class assignment, it was perceived by some students to be not effective for motivating English learning at large.

However, the number of the respondent to the research survey was too small to draw a conclusive finding. Continuing this survey for several years and expanding the students to other faculties are the next step for the study.

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