The Japan Association for Language Education & Technology
Language Education & Technology 47（2010）51–74

The Cyclic Model of Learning: An Ecological Perspective on the Use of Technology in Foreign Language Education

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Abstract

The purpose of this study is to investigate the effect of a teaching practice based the "cyclic model of learning" in the Japanese EFL context. To this end, we designed and implemented a practice by means of a learning management system (LMS) to teach English in a Japanese public lower secondary school. The practice was tested on 93 students over nine months. The data collection methodology included tests, weblogs, classroom observation, and interviews. The results indicated that the practice had a positive influence on students' learning ability and the manner in which the teacher in charge conducted lessons. Furthermore, a moderate correlation was found between the improvement of students' English language ability and their use of materials on the LMS. Lastly, an ecological perspective on the use of technology in foreign language education is discussed.

Keywords: cyclic model of learning, ecological perspective, integration, context

1. Introduction

With the innovation and diffusion of information communication technology (ICT), the traditional CALL lab is no longer the only place where students are exposed to authentic resources for language learning (Taylor & Gisaki, 2003). Students now use new technology outside the classroom rather than inside (Warschauer, 2005). Warschauer (1998) thus asked for the reformulation of CALL and stated that "CALL is no longer adequate for framing considerations of how to best use technology in the language classroom" (para. 1). Kern (2006) also claimed to broaden the potential types of relationships between technologies and language learning. In the focus issue of *The*

Modern Language Journal featuring the latest CALL studies, Lafford (2009), for example, stressed the importance of searching for a way to integrate technology into teaching practices in a given local context beyond "the prevailing drill-and-kill exercises for learning vocabulary and grammar" (p. 676). As a result, CALL has been moving from simple comparative research toward more integrative (i.e., holistic) studies on the use of technology and teaching practices in given local contexts: this has come to involve investigating the interconnectedness of technology, theory, and pedagogy in an integrative manner (Garrett, 2009).

Influenced by these changes, CALL researchers and practitioners have been attracted by Web-based technology such as the learning management system (LMS), which they use as a tool to integrate many aspects of teaching practices, instead of using LL or CALL classroom. According to W. R. Watson and Watson (2007), LMSs have developed out of integrated learning systems (ILS) and are defined as "the framework that handles all aspects of the learning process" (p. 28). Although it seems impossible to quote a standardized definition of LMSs because of the growing number of sub-types, the main features of an LMS can be summarized as Web-based infrastructures that integrate instructional contents with lessons (Szabo & Flesher, 2002, p. 929). However, pedagogical models and practices that aim at attaining integration of technology in foreign language teaching have yet to be fully investigated (Parks, Huot, Mamers, & Lemonnier, 2003; van Deusen-Scholl, Frei, & Dixon, 2005), and no longitudinal studies in a real educational context have been conducted, especially in the Japanese EFL context to the best of the authors' knowledge.

2. Cyclic Model of Learning

This study has chosen the "cyclic model of learning" (hereafter CML, Takeuchi, 2007) as a mainstay in the design of a teaching practice. The CML's most distinctive feature is that it integrates in-class teaching practices with outside-of-the-class students' self-learning with the aid of technology. In addition, the CML attempts to elicit students' participation in lessons and to promote self-learning among outside-of-the-class students, both of which are indispensable for successful EFL learning (Takeuchi, 2002).

It is true that some CALL practices have adopted a concept similar to the CML. For example, van Deusen-Scholl, Frei, and Dixon (2005) identified the advantage of using online resources and used them for connecting one in-class activity with other

activities. Levy and Kennedy (2004) employed audio-conferencing tools for speaking in the target language outside the scheduled class time, a practice they call the "task-cycling approach." These studies aimed at increasing the time spent on tasks and enhancing the use of the target language beyond the classroom. The CML, however, is thought to be the best for this study because it is carefully conceptualized in the Japanese EFL context, examines how the process of foreign language teaching actually occurs at schools in Japan and has been designed based on an ecological perspective (Takeuchi, 2007).

According to Tudor (2003), "an ecological perspective involves exploring language teaching and learning within the totality of the lives of the various participants involved, and not as one sub-part of their lives which can be examined in isolation" (p. 4). Regarding the use of technology from an ecological perspective, Warschauer (1998) stated that "computers should not be treated as an isolated case, to be handled in special CALL labs, CALL courses, and CALL textbooks, but rather should be integrated into all aspects of language education and teacher training" (para. 11). Bax (2003) said that technology should not be the center of a lesson, but it should be integrated into all other aspects of classroom life, alongside course books, teachers, and notepads. An ecological perspective has thus become the key to the successful implementation of CALL and integration of technology into teaching practices. (Chambers & Bax, 2006; Lafford, 2009; Tudor, 2003). Taking these claims into consideration, Takeuchi (2007) proposed the CML and he and his colleague attempted to attest the effectiveness of this pedagogical model for the use of technology in foreign language teaching/learning (Sumi & Takeuchi, 2008).

In the CML, the process of foreign language teaching cannot be divided into a series of single in-class lessons, but is considered to be a cumulative result of each in-class lesson and students' outside-of-the-class self-learning (cf. van Lier, 1996). This means that the teaching process has two kinds of flows: (a) a teaching flow within a lesson, which means how an instructor conducts one lesson, and (b) a teaching flow between lessons, which connects one in-class lesson with the next lesson via technology. These two teaching flows create the classroom context, in which actual language teaching and learning occur (Warschauer, 1998). Figure 1 presents an overall picture of the classroom context in this model.

In the CML, furthermore, the preparation and the reflection phases are placed before and after each lesson (Figure 2) (a) to facilitate "the teaching flow within a lesson," (b) to reinforce "the teaching flow between lessons," and (c) to connect these

two teaching flows. In the preparation phase, technology is used to provide resources that are related to the lesson in order to activate students' schema and ready students for the lesson. In the lesson, the instructor facilitates students' use of the target language and elicits students' participation in classroom activities. In the reflection phase, students are guided to review the lesson through the resources provided with the aid of technology. These two phases are connected to the lessons via technology.

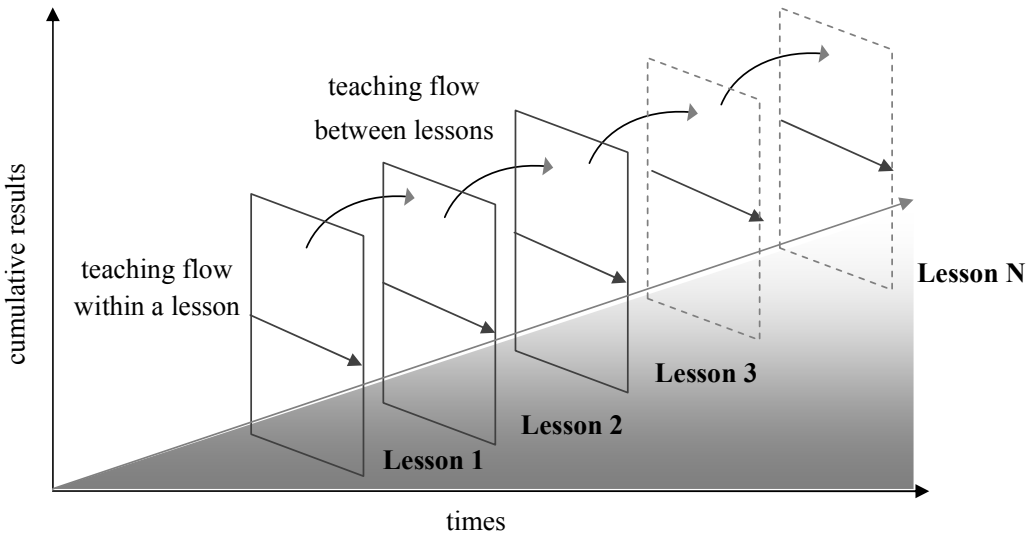


Figure 1. An overall picture of the classroom context.

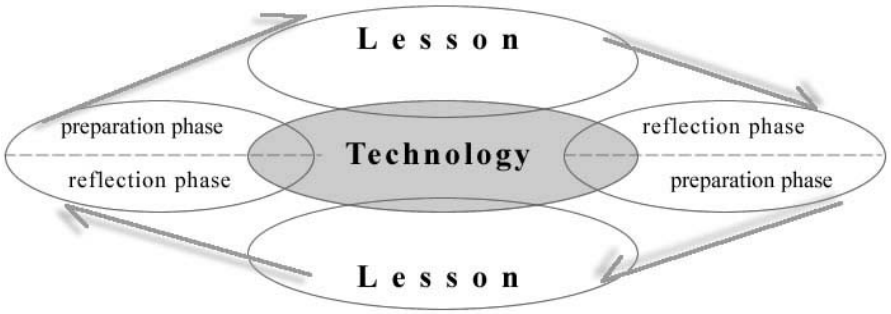


Figure 2. This figure shows a schematic representation of the CML.

The CML also makes it possible to expand time and space for teaching (Sumi, Takeuchi, Yamamoto, & Nabei, 2005). The extension can often reinforce students' commitment to the class and thus facilitate their voluntary learning outside the class.

To learn English in the Japanese EFL context, self-learning beyond school lessons is essential. According to Saegusa (1985, 1993), in order to reach Level 3 on the Foreign Service Institute Scale,[1] 1,920 to 2,280 hours of learning English is mandatory. This means that if a student starts learning English from the first year of lower-secondary school (7th grade) and finishes doing so at the end of university, the number of learning hours needed to reach Level 3 would be 2.5 times that required in schools in the Japanese EFL context. However, if we can effectively utilize time between lessons, and use the resources provided by means of technology outside the class, we can expand the learning hours manifold. The authors thus believe that the CML may be an effective solution for ameliorating the major disadvantage of learning English in the Japanese EFL context, that is, a dearth of learning hours.

3. The Study

3.1 Purpose

The purpose of this study is to investigate the effect of a teaching practice based on the CML in the Japanese EFL context. To this end, the following two research questions are addressed:

1. *How does the teaching practice based on the CML influence the improvement of students' English ability?*
2. *How does the teaching practice based on the CML influence the manner in which the teacher conducts lessons?*

3.2 Participants

The participants in this study were 50 male and 43 female second-year public lower secondary school students aged 13–14 years. Their school is located in southern Osaka, western Japan, in the center of a newly developed residential area. The students had been learning English for one year prior to the study. Extrinsic motivation for learning English seemed to be moderate, because there was still one year before the entrance examination to high schools. Eighty-three students (89.25%) had Internet-connected computers at home as of 2008 when the study was conducted. According to data from the Ministry of International Affairs and Communications (2004), 68.5% of households in Osaka have Internet-connected computers, and hence the number of students who have Internet-connected computers was slightly higher than the average

of Osaka. During the research period, the school's computer room was opened for five days after school hours. The availability of computers thus was guaranteed for all the participants. The teacher who participated in this research had been teaching English at the school for ten years and had seven years of teaching experience at other schools. His basic attitude to teaching English was relatively student-centered. He often participated in workshops or seminars for teacher development.

3.3 The Teaching Practice

3.3.1 Classroom context

The process of carefully exploring the classroom context was conducted prior to the administration of the model. In the process, the authors investigated the teacher's concerns, how lessons were designed and conducted by him, and what difficulties he had experienced in delivering lessons. A teaching cycle, which means how one in-class lesson connects with the next, was also investigated.

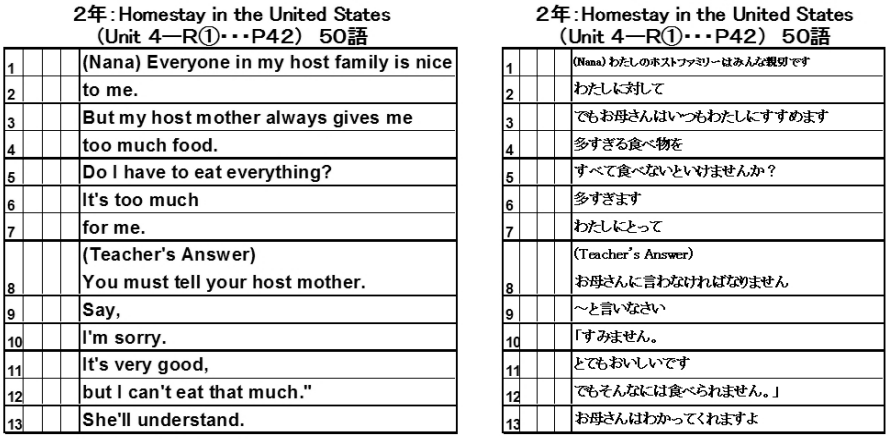
Through the classroom observations, it became clear that the teacher was trying to cram many exercises into one 50-minute lesson. For example, in a lesson, the teacher needed to explain the pronunciation of new words and to give the Japanese meaning of them. In addition, the teacher was asked by his students to explain the materials in the textbook in English and Japanese. As a result, the lesson seemed to be overloaded with exercises, and, as a result, one-way instruction occupied a greater part of the lesson.

In the Japanese EFL context, teacher-centered instructions derived from the grammar translation method are still common (Fenton, 2006). As a result, one-way instruction for imparting Japanese translations of the textbooks to students tends to absorb the greatest part of the lesson, and students are accustomed to learning in a passive manner. To avoid spending time on giving just one-way instruction and to permit the students to speak up in English as much as possible, the teacher in charge had started using an original material called a "Chunk-Sheet" in the lesson. The sheet was developed by the teacher for oral reading activities.

To make the Chunk-Sheet, the teacher extracted important sentences from the textbook and divided them into chunks in line with a group of words. English sentences extracted from the textbook were printed on the left side of the sheet and Japanese translations were printed on the same line to the right of the English sentences. Figure 3 shows an example of the sheet. With the sheet, the teacher conducted reading-aloud activities during the lesson and allowed the students to read out the sheet in a variety of ways. For example, in the "Read and Look-Up" activity,

the students looked briefly at one English sentence on the sheet and then read the sentence aloud without looking at the sheet, so that they could increase their retention of English sentences.

Initial classroom observation suggested the sheet was effectively used and the students were making progress on the activity. However, several subsequent interviews and e-mail exchanges with the teacher revealed that he was experiencing difficulty in eliciting students' self-learning through preparation and review of the Chunk-Sheets at home. He was also experiencing difficulty in making a linkage between in-class lessons and out-of-the-class students' self-learning.



2年：Homestay in the United States
（Unit 4—R①・・・P42） 50語

1	(Nana) Everyone in my host family is nice
2	to me.
3	But my host mother always gives me
4	too much food.
5	Do I have to eat everything?
6	It's too much
7	for me.
8	(Teacher's Answer) You must tell your host mother.
9	Say,
10	I'm sorry.
11	It's very good,
12	but I can't eat that much."
13	She'll understand.

2年：Homestay in the United States
（Unit 4—R①・・・P42） 50語

1	(Nana) わたしのホストファミリーはみんな親切です
2	わたしに対して
3	でもお母さんはいつもわたしにすすめます
4	多すぎる食べ物を
5	すべて食べないといけませんか？
6	多すぎます
7	わたしにとって
8	(Teacher's Answer) お母さんに言わなければなりません
9	～と言いなさい
10	「すみません。
11	とてもおいしいです
12	でもそんなには食べられません。」
13	お母さんはわかってくれますよ

Figure 3. A sample of the "Chunk-Sheet." In the lesson, the students fold it in half and ready orally from the sheet.

In addition, through classroom observations, the authors found a teaching cycle that incorporated an in-class lesson with the next lesson by means of the Chunk-Sheet. The teacher conducted reading-aloud activities with the Chunk-Sheet in the lesson, and the students' retention and understanding of the sheet's contents were tested by an in-class quiz in the following lesson. After the quiz, a new Chunk-Sheet was given to students. In this manner, the Chunk-Sheet played an important role in the classroom context and functioned as a medium that bridged an in-class lesson with the next lesson, creating successive teaching cycles. The classroom observations also showed that the presentation activities were conducted several times during the lessons in each trimester to increase students' ability at self-expression in English. In the activities, the teacher recorded students' presentations, intending to use them for possible future

reference. The recordings, however, were rarely used as references or resources, despite the teacher in charge urging his students to do so.

Lastly, students' learning efforts with each lesson were found to be examined in the midterm and end-of-term tests in each trimester. All tests, including quizzes and the midterm and end-of-term tests, were given by the teacher. Figure 4 illustrates the overall picture of the classroom context.

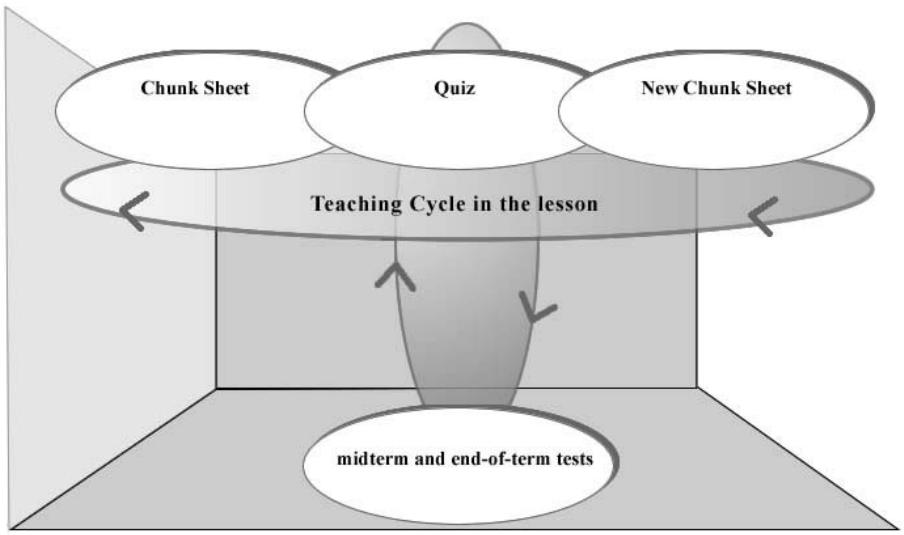


Figure 4. A quiz is given after the "Chunk-Sheet" is completed. A new "Chunk-Sheet" then is then given to students. The rotation of the "Chunk-Sheet" and the quiz constitutes a teaching cycle in the classroom context.

3.3.2 Technology

An LMS named *CEAS* (*Coordinated Education Activation System*) was used in this study. *CEAS* is one of the most famous major open-sourced LMSs and is used by many universities in Japan (Arakawa, Ueki, & Fuyuki, 2004). The system was developed to support lecturers' delivery of learning materials to students (Fuyuki, Tsuji, Ueki, Arakawa, & Kitamura, 2004) and is highly compatible with the framework of the CML. The system configuration of *CEAS* was developed by *PHP* and operates on *Apache* and *MySQL*.[2] In this study, a Web server for operating a *CEAS* was originally set up by *Linux* and the *CEAS* was installed on the server (http://ceas3.gp.kansai-u.ac.jp/). Figure 5 shows a student's opening page on the *CEAS*. From this page, the

student can access learning materials placed on the LMS. Further, the student can exchange his/her opinions with friends via a bulletin board or chat-system on the LMS.

Figure 5. The student's opening page on *CEAS*.

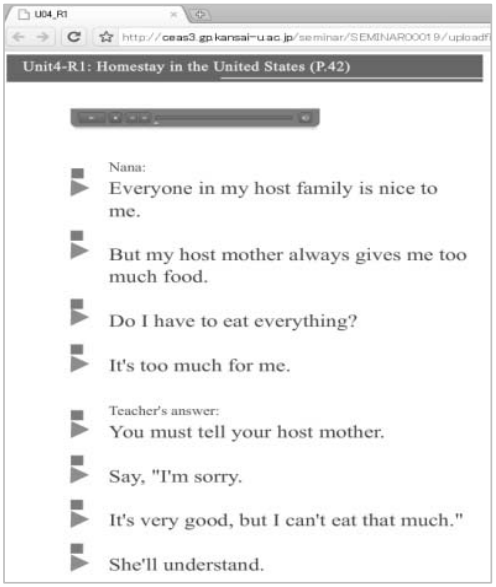


Figure 6. Supplemental material for the Chunk-Sheet. With this material, students can practice reading aloud while listening to the sound file of each sentence.

The materials on the LMS were originally prepared by the authors in careful collaboration with the teacher in charge. Figure 6 is an example of the materials. In addition, movie clips of students' presentations recorded by the teacher were digitized, and 273 clips were uploaded onto the LMS. Table 1 shows the list of the materials, that include sample readings of textbooks, songs, chants, past test items, and external links to the websites.

Table 1
The List of the Materials Uploaded onto LMS

Type of materials	File type	File format	Number of materials
supplemental materials for Chunk-Sheets	sound and text	*Flash*	41
sample reading for each chapter of the text book	sound	.mp3	60
external links to websites	text and pictures	.html	27
students' presentations	movie	.mp4	273
songs	sound	.mp3	19
chants	sound	.mp3	9
previous test items	text	.doc	8

Supplemental materials for the Chunk-Sheet (Figure 6) were made to be used in preparing and reviewing the lessons. The students were expected to download the sample reading files on computers or MP3 players. To increase the opportunity for students to be exposed to authentic resources, external links to websites were placed on the LMS. It was intended to utilize these core learning materials on the LMS to strengthen the teaching cycle in the lesson and elicit students' outside-of-the-class self-learning, thereby increasing their learning hours. Furthermore, additional learning materials were placed on the LMS. For example, songs and chants were uploaded for fun activities and previous test items were placed for preparation for upcoming midterm and end-of-term examinations.

3.3.3 Data collection

The data were collected over a nine-month period from April to December 2008. Each lesson lasted for 50 minutes during the research period, and there were a total of 87.5 hours of lessons. The triangulation procedure was applied to the data collection

process. Triangulation is one of the research methodologies that make it possible to examine the complex structure of practices from multiple sources (Dörnyei, 2007).

To explore the effect of the teaching practice based on the CML, a set of data was collected. Midterm and end-of-term test scores were collected as indicators of students' learning achievements and the outcome of their cumulative efforts. Midterm and end-of-term tests were administrated in the first and second trimesters respectively, so that the students took the tests four times during the research period. The intraclass correlation coefficient among the four tests was .98 ($p < .01$, $r^2 = .96$), indicating that the scores of the tests were highly reliable. Quiz scores were also collected as an indicator of both students' understanding of the lessons and the cumulative learning process. The quiz was administrated each time the Chunk-Sheet section was completed, that is, ten times in the first trimester and nine times in the second trimester. The intraclass correlation coefficient among the quizzes was .96 ($p < .01$, $r^2 = .92$), indicating that the scores of the quizzes were also highly reliable. The tests and quizzes were originally developed by the teacher in charge of the class.

The total number of access log entries was also collected. The frequency of the access log entries can be an indicator of how often a student logged into the LMS and used the materials there for self-learning. Access log entries were automatically counted by the LMS when a student logged into the system and used the materials. Access log entries counted during the summer vacation were eliminated from the total number in order to investigate how often a student visited the LMS and used the materials after school at home during the trimesters.

In addition, qualitative data, such as interviews with the students and the teacher, classroom observations, and e-mail exchanges, were collected to explore the influence of the practice in more detail. As for interviews, a semi-structured interview technique was adopted for this study because it allowed the interviewees (i.e., the teacher and the students) to elaborate on particular issues while introducing new ones (Thornton & Sharples, 2005). The interviews took 30–60 minutes and were recorded with the permission of the teacher and students, and they were later transcribed.

3.3.4 Data analysis

To investigate the influence of the teaching practice on the improvement of students' English ability, the correlation coefficients between access log entries and other variables were investigated. Furthermore, the data on 16 students were extracted and the correlation between their z-score gains and the access log entries was

examined. These 16 students were selected because they had attained above-average scores on the midterm test in the first trimester and the end-of-term test in the second trimester, so that their English ability seemed to have greatly improved. The correlation coefficient between the two tests was at .95 ($r^2 = 90$, $p < .01$). Z-score gains could be seen as an indicator for determining the level of students' achievement in English improvement. Z-score gains were calculated in two steps: (a) the midterm test scores in the first trimester and end-of-term test scores in the second trimester were transformed into z-scores, and (b) the midterm z-scores in the first trimester were subtracted from the end-of-term z-scores in the second trimester.

To investigate the influence of the teaching practice on the students' learning process in more detail, bearing in mind the results obtained through statistics, semi-structured interviews with two students were conducted. The two students were selected because they showed frequent access to the LMS and notable improvement on the end-of-term test score. The first line of questioning involved general questions about the use of a computer at home. The second line of questioning involved more specific questions about the use of the materials on the LMS. The interview sessions were recorded with the teacher's and interviewees' permission and later transcribed by the first author.

Lastly, semi-structured interviews with the teacher in charge and classroom observations were conducted to investigate the influence of the teaching practice on the manner in which the teacher conducted lessons. The interview session consisted of two parts. The first line of questioning involved questions about the teacher's teaching style. The second line of questioning involved questions about how the practice influenced the lessons. Additional interview sessions were conducted after classroom observations. The data obtained were all transcribed by the authors with the permission of the teacher.

3.4. Results

3.4.1 Students' English ability

To investigate the influence of the teaching practice on the improvement of students' English ability, the correlation coefficients between access log entries and other variables were examined. The following variables were entered in the analysis: (a) the midterm test scores in the first trimester (test 1); (b) the end-of-term test scores in the first trimester (test 2); (c) the midterm test scores in the second trimester (test 3); (d) the end-of-term test scores in the second trimester (test 4); (e) the quiz scores just

before test 1 was conducted (quiz 1); (f) the quiz scores just before test 2 was conducted (quiz 2); (g) the quiz scores just before test 3 was conducted (quiz 3); (h) the quiz scores just before test 4 was conducted (quiz 4); and (i) access log entries (log). The variables were analyzed by using non-parametric statistical analysis (Siegel, 1956) since the normality of the data was not guaranteed in the quiz scores. Table 2 gives the results of Spearman's rank-order correlation of all the variables.

Table 2
Intercorrelation among the Variables

	a	b	c	d	e	f	g	h	i
a: test 1	—								
b: test 2	.95**	—							
c: test 3	.90**	.93**	—						
d: test 4	.90**	.93**	.95**	—					
e: quiz 1	.51**	.48**	.51**	.49**	—				
f: quiz 2	.60**	.61**	.63**	.64**	.50**	—			
g: quiz 3	.58**	.58**	.61**	.61**	.52**	.64**	—		
h: quiz 4	.70**	.72**	.72**	.76**	.59**	.64**	.59**	—	
i: log	.32**	.38**	.47**	.39**	.24*	.30**	.29**	.39**	—

Note. $N = 93$; *$p < .05$, **$p < .01$ Data sets of test1 and quiz 1, test 2 and quiz 2, test 3 and quiz 3, and test 4 and quiz 4 are underlined.

Strong levels of correlation were found between test and quiz scores, and the degree of coefficient correlation gradually increased as the number of tests accumulated: test 1 and quiz 1 (item "a" and "e," $r = .51$), test 2 and quiz 2 (item "b" and "f," $r = .61$), test 3 and quiz 3 (item "c" and "g," $r = .61$), and test 4 and quiz 4 (item "d" and "h," $r = .76$). The correlation among the test scores is higher than that for the quiz scores. This might well represent the Japanese EFL context, in which term test scores have a great influence on the evaluation of the final grade in each trimester. The students, thus, usually study harder for the tests than for the quizzes. In addition, moderate levels of correlation were found between the access log entries and other variables.

Figure 7 illustrates the distribution of the students' midterm test scores in the first trimester ($M = 53.57$, $SD = 21.66$) and end-of-term test scores in the second trimester

(M = 48.46, SD = 19.70). Sixteen students were selected because they had attained above-average scores on both the midterm test in the first trimester and the end-of-term test in the second trimester. For the scores of the 16 students on the midterm test in the first trimester, M = 71.13 and SD = 10.10, whereas on the end-of-term test in the second trimester, M = 71.00 and SD = 8.97. Their z-score gains were then calculated (M = 0.33, SD = 0.19). An analysis of the correlation coefficient between the z-score gains and the 16 students' access log entries (M = 9.69, SD = 10.49) showed a moderate level of correlation (r = .46, r^2 = .21).

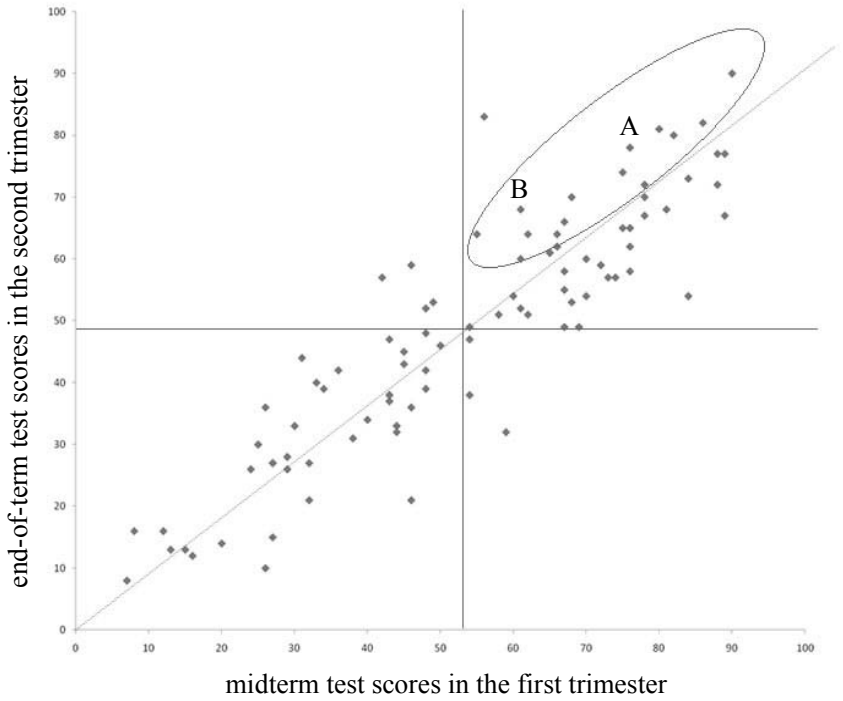


Figure 7. Scatter diagram illustrates the distribution of learners' midterm test scores in the first semester and end-of-term test scores in the second semester. The data set of the 16 students is circled. A and B are the students interviewed.

3.4.2 Interviews with Two Students

To investigate the influence of the practice on the students' learning process in more detail, semi-structured interviews were conducted with Students A and B (see Figure 7). They both registered high access log entries and high z-score gains. The interviews were conducted in Japanese, so that they could express themselves naturally

in their mother tongue. The transcriptions were translated into English by the first author.

Student A is a female student. She stood 45th in the midterm test z-scores in the first trimester but rose to 2nd place in the end-of-term test z-scores in the second trimester. She logged into the LMS 20 times during the research period. Student B is a male student. He ranked 46th in the midterm test z-scores in the first trimester but moved to 22nd place in the end-of-term test z-scores in the second trimester. He logged into the LMS 26 times during the research period.

Through the interview sessions, it became clear that the LMS offered students an additional learning environment and they used the resources on the LMS effectively. However, they differed from one another in the way they used the materials. Student A did not use the computer at home on a regular basis, and she logged into the LMS when she felt she needed to do so.

Interviewer: *How often do you use the materials on the LMS at home?*
Student A: *Sometimes, when I need to check them.*
Interviewer: *Do you often use the computer?*
Student A: *No.*
Interviewer *How do you use the materials on the LMS when you need to do so?*
Student A: *To write my comments or diary on the bulletin board system, and listen to the sound files.*

(Translation ours)

By contrast, Student B used the computer almost every day.

Interviewer: *How often do you use the materials on the LMS at home?*
Student B: *Quite often.*
Interviewer: *Do you often use the computer?*
Student B: *Yeah.*
Interviewer: *How do you use the computer?*
Student B: *I like music, so I use it for editing, listening, and buying music. I often see YouTube and iTunes.*
Interviewer: *Do you send e-mail on the computer?*
Student B: *Yeah. Almost every day.*

Interviewer: *How do you use the materials on the LMS?*

Student B: *I download the sound files and put them onto my iPod. I also use the materials for my self-study.*

Interviewer: *Did you notice any changes since you started downloading the sound files?*

Student B: *Yeah, I think I started practicing pronunciation with them.*

(Translation ours)

Even though the number of access log entries did not differ much between Students A and B, the way they used the materials on the LMS was completely different. Student A's focus was mainly on in-class coursework and she treated studying with the LMS materials as extra work. In contrast, Student B used the computer quite often and utilized the materials in his own way. This finding is in accordance with K. H. Wang, T. H. Wang, Wang, and Huang (2006), in which they revealed that learning style was a significant factor affecting students' achievement in a Web-based learning environment. In addition, both students mentioned that they liked watching friends' presentations, which were recorded during the lessons and put on the LMS by the teacher as a reference for their upcoming presentations.

With these results in mind, it is possible to maintain that the students' use of the materials on the LMS was moderately related to their cumulative efforts toward their quiz scores and the improvement in their English ability. In addition, the resources on the LMS offered students an additional learning environment and students used the resources on the LMS outside the classroom. Although a definite causal relationship between the use of the materials on the LMS and the improvement of students' English ability has yet to be clearly identified, it is thus possible to argue that the practice based on the CML successfully integrated in-class practices with students' outside-of-the-class self-learning by means of technology.

3.4.3 Interviews with the teacher

The second research question was investigated by means of a semi-structured interview with the teacher. The teacher answered the question of how the teaching practice based on the CML had influenced the way he conducted lessons. The interviews were conducted in Japanese and later transcribed with the teacher's permission. The transcriptions were translated into English by the first author.

The following interview shows that the teacher's way of conducting lessons qualitatively changed due to the creation of a seamless linkage between the lesson and students' self-learning at home. With the help of the teaching practice based on the CML, the teacher was able to offer an "extended learning environment" (van Deusen-Scholl et al., p. 657) via the LMS, and to expand the classroom context, time, and space for teaching/learning. As a result, the teacher reduced the time for one-way instruction and spent sufficient time on reading activities and interaction with the students during lessons. In addition, and more importantly, these qualitative changes in the lessons seem to create an environment that leads the students to autonomous learning. The comment by the teacher in the interviews, "*I can let the students study on their own or I can let them teach themselves*," seems to reflect the improvement in the quality of the lessons.

Interviewer: *Do you think that your way of conducting lessons has changed since you started the new teaching practice?*

Teacher: *Yes, I think so. Today's lesson can be a good example (In the lesson, the students sang a song in English). I used to try to finish one thing in one lesson, even if time was so tight. However, it won't happen now. As you (the interviewer) saw today, I did not give them the lyrics of the song first, because I had told them that "you can check them (the lyrics and the song) on the LMS" and "you can watch the movie clip linked to YouTube." In this sense, I can let the students study on their own or I can let them teach themselves.*

Interviewer: *Aren't you worried about handling lessons in that way?*

Teacher: *No. At least I've given students the learning materials, the "Chunk-Sheet," so that they can do the minimum requirements such as checking the Japanese meaning, the vocabulary, and the pronunciation by themselves with the resources on the LMS. As a result, now I have reduced the time spent on simple explanations and spend more time on activities during lessons. That's a big difference.*

(Translation ours)

To confirm the teacher's comments in the interview, video data were collected and analyzed. Table 3 shows the result of video data categorization. Video data were collected during an ordinary lesson in the research period. One lesson was 50 minutes, but the amount of time that was used for checking students' attendance was omitted from the data. A part of the Grounded Theory Approach procedure (Corbin & Strauss, 2008) was used in classification of the video data. As a result, five categories were generated. "One-way Instruction" was used to categorize the period of time in which the teacher elaborated on the reading materials or related issues in the textbook on one-way instruction. "Interactive Instruction" was used to categorize the period of time in which the teacher asked questions and the students answered his questions, or the students asked questions and he answered them. "Students in Individual Activities" was used to categorize the period of time in which the students were engaged in an individual activity such as reading aloud. "Students in Group Activities" was used to categorize the period of time in which the students were engaged in group activities such as sharing notebooks and checking pronunciation. Lastly, "Students' Presentation" was used to categorize the period of time in which the students gave presentations. The inter-rater reliability (of all the data analyzed) between the first author and a postgraduate student who is majoring in foreign language education was at 82.5%. The authors decided that the result was at an acceptable level of agreement (Potter, 1996).

Table 3
Categorization of Video Data Analyzed

	Time [h:mm:ss]	Percent
One-way Instruction	0:14:44	34.6%
Interactive Instruction	0:03:34	8.4%
Students in Individual Activities	0:06:41	15.7%
Students in Group Activities	0:15:48	37.1%
Students' Presentation	0:01:51	4.3%

Note. h = hour. m = minute. s = second.

As the result shows, the way in which the teacher conducted the lesson seemed to be fully interactive and cooperative. The amount of time for "Interactive Instruction,"

"Students in Individual Activities," and "Students in Group Activities" together amounted to 61.1% of the total of the lesson. Reflecting on the previous lessons in which he was teaching without the use of LMS, the teacher answered in the interview as follows:

Interviewer: *Before you start using the new teaching practice, in what way did you conduct lessons?*

Teacher: *I think I was giving lessons in a very orthodox style. It was kind of grammar translation method, copying the target sentences from the textbook, reading them and asking the students the Japanese meanings.*

Interviewer: *You mean it was based on the textbook.*

Teacher: *You can say that. But if you have lessons in that way, as is obvious, you can't give the students time and opportunities to practice and use English in lessons. I believe it is important to learn English through practicing. I want the students to speak and use English in lessons. I have tried many things so far to reduce the amount of time for one-way instruction, but it was really hard to do so in lessons. However, since I started the new teaching practice based on the CML, the amount of time I can spend for practicing has notably increased. I am not sure if the way the students use English is real English or not, but at least, I have an enormous amount of time in lessons, in which I can let them teach themselves.*

(Translation ours)

In the interview, the teacher said his way of conducting lessons has changed from the orthodox grammar translation method to more interactive and student-centered ways. With the help of the teaching practice based on the CML, the teacher could expand the classroom context.

3.5 Discussion

The results suggest that the teaching practice based on the CML in this study had a positive influence on students' learning environment and the manner in which the teacher conducted the lesson. Furthermore, the practice contributed to the improvement of students' achievement in English ability.

With these results, the effect of the practice in the Japanese EFL context is confirmed. The authors insist that this teaching practice can contribute to ameliorating the disadvantage of learning English in the Japanese EFL context. It is true that the improvement of student English ability and the teacher's way of conducting lessons cannot be entirely attributed to the use of technology, but we can say that it is largely attributable to an integrative instructional design based on an ecological perspective, which embeds technology within the totality of the classroom context and makes it possible to integrate technology into teaching practices.

In the light of Ecological Psychology, Gibson (1966, 1986) stated that the living animal and environment are interrelated and never to be handled separately. He argues that human action and perception are stimulated and embedded in a situation or a context. From an ecological perspective of second language acquisition, van Lier (2004) proposed ecological linguistics and said that language learning occurs as emerging from the context in which language learners are engaged and draws on affordance. According to him, affordance for language learning means "a relationship between an organism (a learner, in our case) and the environment, that signals an opportunity for or inhibition of action" (p. 4). The common features of these studies are to identify actions and perceptions of human beings as a consequence of mutual interaction of person and the environment. Bronfenbrenner (1989) defined human development as "a joint function of *person* and *environment*" (p. 188), and formulated the theory based on Lewin (1935) as follows:

$$D = f(PE)$$

According to Bronfenbrenner (1989), the "D" term refers to "development," the "P" term refers to "person," and the "E" term refers to "environment." "D" is a function of both personal and environmental factors. In a similar vein, the authors believe that the use of technology in foreign language teaching/learning cannot be discussed without the context, and should be integrated within the classroom context.

To put into effect an ecological perspective, with the foregoing in mind, the authors would like to present an extended version of Bronfenbrenner's formula as follows:

$$U = f(PCT)$$

In this formula, the "U" term refers to "use of technology in foreign language learning," the "P" term refers to "person" including teachers and learners, the "C" term refers to "classroom context," and the "T" term refers to "tools." The process of the use of technology in foreign language learning can be described as a joint function of *person*, *classroom context*, and *tools*. By looking at the use of technology in our field by means of this formula, the authors think that such technology can be integrated into teaching practices.

4. Conclusion

Some limitations of the study should be pointed out. First, the weblog counting system needs to be upgraded. The weblogs on the system in the present study simply record the number of times a student has logged in. We were therefore unable to see how students were learning on the LMS. Access log analysis tools such as *Google Analytics* should be equipped on the LMS for further research. Further, the social network analysis method, which is useful for understanding the complex process of learning and interaction among learners on the Web (Oshima, Nihara, Ota, & Oshima, 2010), should be applied to analytical procedures. By incorporating such advanced access log tools into the LMS and new methodology, the data on individual student learning behavior on the LMS can be collected and analyzed. Second, the practice was tested only on a public lower secondary school environment. Further tests, therefore, should be conducted in the different environments representing the Japanese EFL context.

Despite the limitations, in this study, the practice based on the CML was implemented in a public lower secondary school for an extended period and had a positive influence on the students' learning environment and the manner in which the teacher conducted lessons. Furthermore, the practice contributed to the improvement of achievement in students' English language ability.

Acknowledgements

The authors would like to thank Dr. A. Mizumoto, a lecturer at the University of Marketing and Distribution Sciences, for his advice on the statistical analyses. Also, the authors would like to thank Mr. M. Furukawa, a teacher at Mikanodai Junior High School, for his generous support.

Notes

1. This scale was originally developed by the United States Foreign Service Institute and it represents the average English proficiency level of non-native speakers. It consists of eleven major ranges of proficiency, beginning with Level 0 (no functional ability in the language) to Level 5 (native or bilingual proficiency). Designations "+" are used between levels (Saegusa, 1985).
2. See more detailed information on the community page at http://ceascom.iecs.kansai-u.ac.jp/ .

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