

Title	A Dual-Role Collaborative Learning Support System for Simultaneous Speaking Acquisition in English and Japanese
Author(s)	Nishimoto, Kazushi; Anh, Bui
Citation	International Journal of Knowledge and Systems Science, 13(1): 1-19
Issue Date	2022-03-18
Type	Journal Article
Text version	publisher
URL	<a href="http://hdl.handle.net/10119/18087">http://hdl.handle.net/10119/18087</a>
Rights	Anh Bui,Kazushi Nishimoto,International Journal of Knowledge and Systems Science(IJKSS),3-1,2022,1-19,DOI:10.4018/IJKSS.298709(C)2022 publishing Service by IGI Global,This article published as an Open Access article distributed under the terms of the Creative Commons Attribution License ( <a href="http://creativecommons.org/licenses/by/4.0/">http://creativecommons.org/licenses/by/4.0/</a> ) which permits unrestricted use, distribution, and production in any medium,provided the author of the original work and original publication source are properly credited.
Description	

# A Dual-Role Collaborative Learning Support System for Simultaneous Speaking Acquisition in English and Japanese

Anh Bui, Japan Advanced Institute of Science and Technology, Japan\*

Kazushi Nishimoto, Japan Advanced Institute of Science and Technology, Japan

## ABSTRACT

Learning a foreign language is becoming more vital in Japan as a result of globalization. It gives foreigners various reasons to study Japanese including working or living in Japan. They should exchange language and skills and generate opportunities for engagement. Assisting them in exchanging linguistic skills and knowledge is critical. This study first proposes a theoretical model of dual-role collaborative learning to improve second language learners' speaking skills. Learners will participate as facilitators in their native language and receivers in their second language. Some supporting features must be given, followed by a computer-supported collaborative learning (CSCL) named BiTak, which is a video chat system that allows strict turn-taking dual-lingual conversation. The learner's progress is positively evaluated by language teachers using a rubric scoring framework. Based on the experiment results, it was concluded that BiTak has turned users' perspectives of video chat programs into collaborative learning platforms, allowing them to act as facilitators and receivers.

## KEYWORDS

Dual-Lingual Communication, Dual-Role Collaborative Learning, Simultaneous Second Language Acquisition, Speaking Skill, Strict Turn-Taking

## 1. INTRODUCTION

Globalization enables strong collaborations between corporations and entrepreneurs from all over the world. As a result, for example also in Japan, more and more potential professions in a foreign language-speaking environment are being provided with fierce competition, contributing to Japan's growing need for foreign language learning. On the other hand, Japan has recently accepted a growing number of foreigners who wish to learn Japanese for a variety of reasons, including their employment, linguistic preference, or to live in Japan. Hence, there potentially exists mutual benefits for Japanese people and visiting foreigners: Japanese people can learn foreign languages from the visiting foreigners, and foreigners can learn Japanese from Japanese people. They should exchange language information and abilities, and we should provide opportunities for them to engage.

Such bidirectional exchanges, on the other hand, are rare; language learning (teaching) is often done in a one-way manner. Taking the example of a foreigner who works as a lecturer at a language

DOI: 10.4018/IJKSS.298709

\*Corresponding Author

This article published as an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>) which permits unrestricted use, distribution, and production in any medium, provided the author of the original work and original publication source are properly credited.

school, the foreigner teaches Japanese students in his or her own language. He/she, on the other hand, is enrolled in a Japanese language school in order to learn the language. These tasks are accomplished one at a time and in a single direction, as described previously. To the best of our knowledge, no attempts have been made to meet both needs at the same time.

Therefore, we have been researching a method of “simultaneous second language acquisition” in order to improve the mutual benefits of locals and visitors by boosting the efficiency with which their second languages are learned simultaneously. It is the term “simultaneous second language acquisition” that refers to the learner’s acquisition of another language in a sociolinguistic environment while also learning their first language, also known as their mother tongue, at the same time (Mushi, S., 2002). This phrase, on the other hand, is employed in this work in the context of people speaking distinct first languages who are simultaneously learning their second languages through their conversation with one another.

To acquire a second language, we have to master four skills, i.e., speaking, listening, reading and writing. Within them, this study focuses on simultaneous acquirement of the speaking skill during the conversation between Japanese and foreign students.

The remainder of this work is arranged in the following manner. Related works on second language acquisition, collaborative learning, and assessment of second language speaking proficiency are described in Section 2. Section 3 provides a dual-role collaborative learning model with dual-lingual communication, as well as our approach to attain simultaneous second language acquisition using the model. Section 4 depicts the BiTak CSCL system, which promotes the simultaneous development of second language speaking skills. Section 5 presents BiTak system experiments and examines the utility of our suggested technique. Section 6 concludes this paper.

## **2. RELATED WORKS**

### **2.1 Difficulties of the Second Language Acquisition**

According to Landis, Dan, and Richard W. Brislin (2013), although there have been a huge economic and human resources dedicated to studying English in Japan, Japanese still consider themselves as poor speakers of English. Most of them seldom or never confidently use written or spoken English in real-time communication. They claimed that the primary reason for this is the widespread use of traditional grammar-translation method of English language teaching in Japanese schools. The proportion of students who acquire certain confidence and necessary skills are surprisingly low despite the fact that English classes are compulsory in Japanese schools. Japanese people admit that the existing teaching style often limits students’ ability. They just can gain passively from what little English they hear from the teachers and what words are put in front of them. A typical Japanese university lesson, for example, “consists rather heavily of the teacher lecturing while the students take notes which they then repeat in order to pass exams” (Potter 1996, p. 31). Effective teaching method should incorporate as many senses as possible to deepen students into English. Japanese students experience great obstacles in studying English, due to fundamental differences in grammar and syntax, as well as important differences in pronunciation. According to Galloway (2013), there are several factors influence Japanese students’ attitudes in learning English such as pedagogical beliefs, stereotypes, future goals and motivation. On the other hand, Seward (1969) asserts that foreigners also have to deal with language frustration when studying Japanese. They are afraid of borrowed words, male and female speech forms, polite and non-polite speech, and anatomical terms, proverbs, dialects, and other aspects of Japanese culture. These language barriers prevent people from communicating directly (Holman et al., 2011). Some conventional ways of learning languages have been applied such as attending classes, group discussion and learning, self-study. Apparently, there is not the most appropriate method, people learn in different ways at different paces, and the most effective way may involve not one but a mixture of different techniques. Language learning, much like language itself, might be an inherently social pursuit. (Hulstijn, J. H., et al., 2014)

## **2.2 Collaborative Learning (CL) and Computer Supported Collaborative Learning (CSCL)**

Collaborative Learning is defined as a situation in which two or more people learn or attempt to learn something together (Dillenbourg, P., 1999). More specifically, Mitnik, R. et al. (2009) claimed that CL is based on the model that knowledge can be created in a population where members actively interact by sharing experiences and take on asymmetry roles. Knowledge management is a dynamic and continuous social process that entails the acquisition, organization, storage and retrieval of knowledge resources, as well as its transmission to user groups with relevant feedback in order to fulfill corporate goals (Ho, T. V. et al., 2015), (Islam, S. et al., 2012). CL involves the mutual engagement of all participants in a coordinated effort to solve the problem together (Roschelle, J., & Teasley, S., 1995), which can be inferred everyone may get the same output experience. This learning approach has brought about many positive results. When students are working in a group, they will be received benefit from each other in both academic and social support (Tinto, V., & Pusser, B., 2006). They will not feel alone or isolated from the rest, which is an important factor to promote an active and responsible role of each student.

Given the success of Collaborative Learning theory in traditional, classroom-based groups, it raises expectations for how effectively the benefits of CL will translate to the internet world (Brandon, D. P., et al., 1999). With the advance of current technology, Computer-supported Collaborative Learning (CSCL) has become one of the popular applications of the CL approach to shift from the traditional face-to-face group work (Roberts, 2004). The connection of CL and CMC (computer-mediated communication) technology has been proved to be mutually beneficial by several researchers. CL helps to structure the online environment, whereas CMC technology helps to eliminate many of CL's barriers (Alavi, M., 1994). Hence, CSCL is about how technology can be used to support CL (Koschmann, T. D., 1994). Literally, it is a pedagogical approach that learning takes place via social interaction using a computer or through the Internet. This kind of learning is characterized by the sharing and construction of knowledge among participants using technology as their primary means of communication or as a common source.

## **2.3 Collaborative Learning (CL) and Computer Supported Collaborative Learning (CSCL) in Second Language Acquisition**

Collaborative learning has already been successfully implemented in a large number of language learning environments. It is via group interaction that the learning process is accelerated, as they negotiate and share meaning in a social setting (A Stahl, et al., 2006). Increasing the amount of interaction between students who speak different languages is also strongly suggested. Kimber (2014) recommends that additional opportunities be provided for interactions between Japanese and internationals so that they can assist each other with speaking. Using this strategy, they may be able to meet both of their requirements at once.

Recent research claims that small-group interactions in the classroom for language acquisition proves that collaborative work will reduce dependence on teachers and stimulate the learners' ability to participate actively in conversations (Ibrahim, N., et al., 2015). Enhancing students' communicative ability is always necessary to help them effectively engage in any language situation. Collaborative Learning offers natural, interactive contexts where students listen to each other, ask questions and clarify issues. Several studies on pair and group work have been undertaken, including one by Long and Porter (1985), which found that learners produce longer sentences and do not speak any less grammatically in group work than they do in teacher-led courses.

CSCL has been considered as potential source for students to enhance their language proficiency. In language learning, current studies in the computer-assisted language learning (CALL) field suggest that the computer provides material and feedback for learners to practice the target language in and outside the classroom and has been seen as a positive tool for language learners in their individual study. CSCL in Language Learning offer the potential for interaction between the computer and the

language learner which refers to the learner's responding questions and receiving correct answers. Hence, the computer is also seen as a potential language tutor by providing assessment for students' responses (Levy, M., 1997). In addition, students' autonomous language learning and self-assessment can be widely available through the web rather than being tied to a particular class (Chapelle, C. A., 2001). Besides, because of the spread of COVID-19, face-to-face schooling was actively interrupted. This resulted in a significant shift to the online learning model, as students and teachers remained at home for their own protection (Rugube et al., 2020; Brief, P., 2020). Using digital tools to enhance group communication and collaboration has been shown to increase student involvement in group activities. For example, synchronous online collaborative writing may boost student involvement in text-editing activities, leading to superior academic performance than face-to-face learning (Han & Li, 2019). Using a text-messaging tool like Slack may help students support each other. (Tuhkala & Kärkkäinen, 2018; Zhang et al, 2019).

However, there are still certain drawbacks to using CMC technology for collaborative language learning. First, a technology glitch may impede learning. According to Olaniran (2006), a lack of knowledge about a communication technology might generate anxiety in students before they become comfortable with it. In this vein, Olaniran (2004) believes that CMC instructors must be adaptive to deal with unexpected events that may arise throughout a CMC course. In addition, learner access, institutional security, and timetabling constraints might all be problematic (I Solé, C. R., & Hopkins, 2007). The materials utilized may also make it difficult to meet the needs of particular students. Choosing and adapting materials in a CMC situation might be tough. It requires more time and effort than a face-to-face session since teachers must create more detailed criteria for their students. The quantity and quality of materials may also be affected by computer technology.

In addition, Thornton (1999) asserts that not all students may take equal part in collaborative activities. Some passive students may feel hard to raise their voice or ones who more active will dominate the conversation. Furthermore, few studies have aimed to utilize CSCL for supporting simultaneous learning of multiple languages. Being inspired by those findings of the preceding studies, we propose a theoretical model of dual-role collaborative learning to enhance simultaneous second language acquisition.

## 2.4 Assessment of Second Language Speaking Proficiency

According to Purpura (2016), the term *Language Assessment* refers not only to formal tests like TOEFL, IELTS or an end-of-chapter evaluation, but also to other methods of obtaining information about knowledge, skills, and ability of students such as observing second language performance during pair work or by asking learners to report their understandings and uncertainties. In this paper, we would like to use Rubric: a scoring guide used to evaluate the

quality of students' constructed responses to assess their second language speaking proficiency.

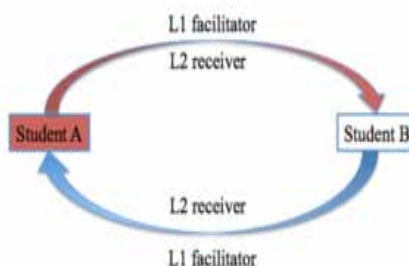
The usefulness of Rubric has been recognized in the field of assessment for many decades (Andrade, Heidi Goodrich, 2000). In order to give valid, reliable, and consistent assessment findings that demonstrate the learners' speaking achievement/level, speaking assessment is frequently reported as an overall mark on bands scales or score points (Council of Europe, 2014). In general, there are two types of assessment measures for speaking skills: holistic and analytic. When utilizing a Rubric, evaluators use an analytic rating system whereby each component is scored individually, or performance is rated holistically based on an overall impression (Pomplun, M., et al., 1998).

## 3. DUAL-ROLE COLLABORATIVE LEARNING MODEL AND DUAL-LINGUAL COMMUNICATION

In order to achieve simultaneous "give and take" of the linguistic knowledge and skills, it is required that people whose first languages are different can play equal roles in simultaneous practicing second languages. Therefore, we propose a novel model of collaborative learning that is called "dual-role collaborative learning" (Fig. 1). In this model, students are required to take two roles when

practicing second language: facilitator in their first language and receiver in their second language. The key point of this model is that each student must play these two roles *simultaneously*. Namely, for instance, Student A plays a role of facilitator in Japanese as well as a role of receiver in English, while Student B plays a role of facilitator in English as well as a role of receiver in Japanese, in an identical collaborative learning activity.

Figure 1. Dual-role Collaborative Learning



To put this model in practice, two languages have to be concurrently used in an identical conversation and understood by respective participating parties instead of choosing one partner's language over the other. We call this way of communication "dual-lingual communication." This is different from bi-/multilingual communication that is defined as the ability to use two or more languages to sufficiently carry on a limited casual conversation (Myers-Scotton, C., 2006).

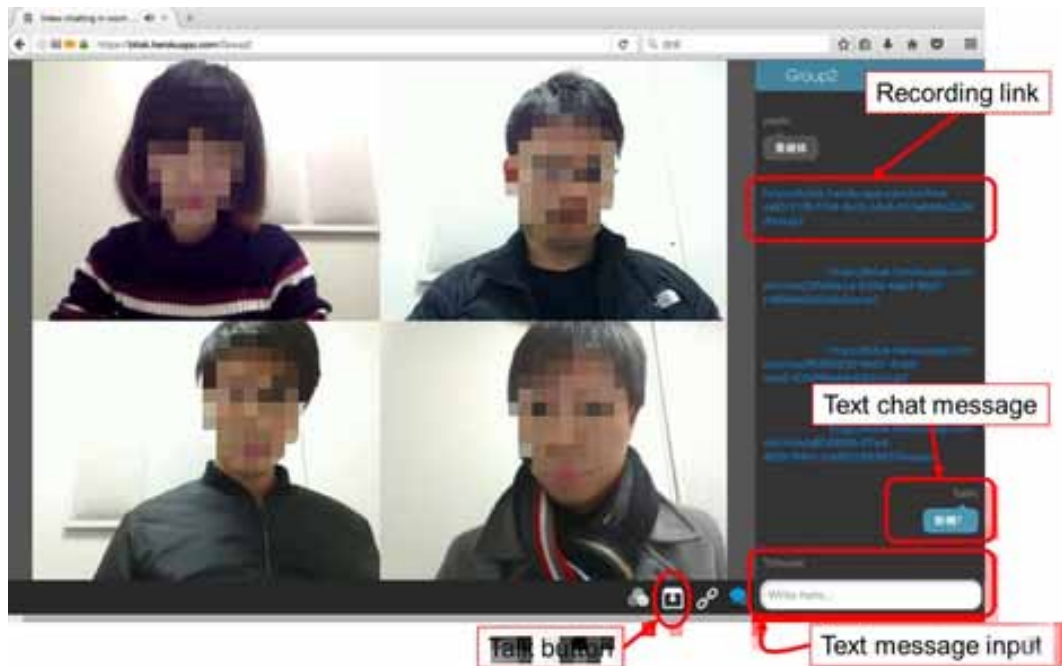
Depending on whatever ability (speaking or listening) the students desire to learn, the dual-lingual communication pattern changes. Each student must speak his or her second language and listen to his or her first language in order to improve their speaking skills, which is the goal of this paper. Japanese students, for example, will speak English, whereas overseas students will speak Japanese. They will correct each other's speaking errors by using their native language during this type of communication. It will be an excellent opportunity for both sides to learn from one another in order to establish effective communication.

#### 4. BITAK SYSTEM

Even in face-to-face conversation, it is possible to simply carry out dual-lingual dialogue. Our goal, however, is to learn to speak a second language in a collaborative manner through dual-lingual dialogue. Some supporting functions for efficient acquisition of speaking competence are required to achieve this goal. Hence, we developed a web CSCL application called "BiTak" to facilitate the dual-lingual communication for language speaking practice. BiTak was developed using the open source from WebRTC, which is a free, open project that provides browsers and mobile applications with real-time communications with simple APIs (Application Programming Interface). Fig.2 shows the user interface of BiTak.

BiTak is equipped with following three functions for collaborative learning through the dual-lingual communication: 1) a strict turn-taking function 2) a recording function of each utterance and 3) a text chat function related to each recorded utterance.

Figure 2. User Interface of BiTak



#### 4.1 Strict Turn-taking Function

Talking naturally without caring overlapping usually brings about the comfort of expressing ideas in an informal conversation. Smooth turn-taking is an essential aspect to coordinate one's communicative actions and interact successfully with others. However, it is not always good for learning a language. You may hardly recognize your speaking mistakes by yourself although the listeners can understand clearly. In many research attempts of second language learning, the fact that turn-taking in communication may affect the quality of group discussion between non-native and native speakers has been taken into consideration. As reported by Mynard (2002), foreign students appeared to be overwhelmed and even disoriented in simultaneous and rapid debate, particularly students who had sluggish keyboarding abilities, slow reading/writing skills, or students from different cultural backgrounds, among other factors. Hence, we attempted to strictly apply the turn-taking approach. In order to achieve the strict turn-taking, BiTak employed half-duplex communication mode similar to a transceiver. When a person wants to talk, he/she just needs to click on the talk button (depicted by this icon in Fig.2) then the others' microphones will be off; they can do nothing but listen to the speaker. After the speaker finishes talking, he/she clicks the talk button again then the talk button will be available for all users. The next person will take turn to talk by repeatedly clicking the talk button. Thus, BiTak system requires users to entirely obey the turn-taking rule and they are not allowed to overlap or to interrupt another speaker: each speaker must completely speak his/her utterance until the end.

#### 4.2 Recording Function of Each Utterance

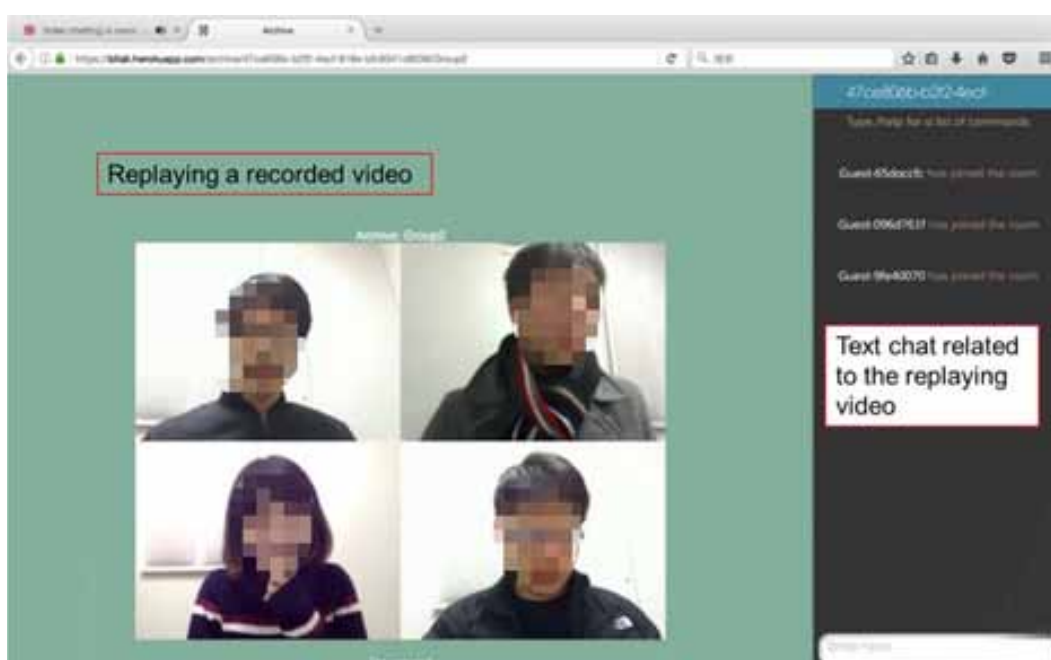
By being clicked the talk button, BiTak system also automatically starts to record the utterance until the talk button is clicked again. Each recorded utterance is immediately uploaded to the server and the recording link will appear in the right pane of the main video chat window (See Fig.2). The recording

function provides the users a chance to watch the video again to fully understand the dual-lingual situation. Furthermore, the users can also download all the recording videos for further reference.

### 4.3 Text Chat Function Related to Each Recorded Utterance

The recording link will lead users to another tab where they can re-watch the video (See Fig.3). Meanwhile, the main video chat (where people are talking) will be still facilitated without any interruption. If, for example, an utterance in English from a Japanese participant includes some errors or unsuitable expressions, it should be corrected immediately. In order to readily achieve it, we provide a text chat function to each recording link, not to entire recording links. The users can chat, ask or point out any unclear points by typing text in the chat bar right beside the recording video. The dual-role of learners in dual-role collaborative learning will be clearly emphasized in this feature of BiTak.

Figure 3. An example of re-watching a recorded video



## 5. EXPERIMENT AND DISCUSSION

### 5.1 Research Objectives

This study aims to propose a theoretical model of dual-role collaborative learning to enhance simultaneous acquisition of speaking ability of second language learners. It is hypothesized that learners will play two roles in the conversation: facilitators in their first language and receivers in their second language. This model cannot be easily achieved with normal face-to-face communication so that some supporting features need to be provided. As a result, based on the dual-role collaborative learning paradigm, we designed Bitak, a video chat system with multiple functions to assist simultaneous development of speaking skills in a second language.



Through designing experiments and evaluations, this research intends to seek answers for the following research questions:

- Is it possible to achieve simultaneous second language acquisition by applying Dual-role Collaborative Learning model?
- Is Bitak useful for carrying out Dual-role Collaborative Learning model to attain simultaneous acquisition of speaking ability of second language?

## 5.2 Experiment Procedure

To investigate the effectiveness of the proposed method for simultaneous acquisition of speaking skill of the second language as well as to verify the validity of BiTak system, we conducted user studies. There are 32 students participating in the experiment process (16 Japanese with multi-level English abilities and 16 foreign students mastering English) and were randomly divided in 8 groups of four. Each group consists of 2 non-Japanese students who speak English fluently as native speakers and 2 Japanese students as. All the chosen students were voluntarily participated in the project and the equal level of second language proficiency between a pair of speakers in the experiment is not necessarily required. It is better to test the effectiveness of Collaborative Learning at different levels to see if they can help each other enhance their second language speaking skills. We compared the experiences of the four 4-member groups using all the functions of BiTak with the other four 4-member groups who only used the interface of BiTak (i.e., a simple video conferencing system without the strict turn-taking function and the recording function). Meanwhile, regardless of whether or not the BiTak capabilities were used, both groups were forced to converse in a dual-lingual manner. Each group was obliged to take part in a series of six experiments in which they were able to discuss the themes raised in the evaluation interview in depth. Each experiment took roughly 90 minutes to complete. All subjects were asked not to utilize any other language learning tools during the experiment period in order to ensure unbiased improvement.

To test the progress in speaking skill before and after the above-mentioned experiment series, all subjects were required to attend pre-experiment and post-experiment evaluations. A professional English instructor questioned the Japanese students about their English-speaking skills, whereas a certified Japanese teacher interviewed the non-Japanese students about their Japanese speaking skills. The interview questions are the same in both evaluations, and improvement is measured using a rubric for Testing Speaking Skill that was created specifically for the assignment (See Appendix 1&2). The criteria for this study's analytic rubric were taken from the standards and practices outlined in the Common European Framework of References (CEFR) for Languages (Council of Europe, 2014) with the most common criteria for oral performance assessment. The analytical technique is used to evaluate students' performance by examining different portions separately first, then combining the outcomes of individual scores to obtain a final total score. Criteria and scales are the two pieces of an analytical assessment rubric. This technique of assessment offers students and teachers with vital information regarding areas of strength and weakness. (Ulker, V., 2017)

In addition, after the experiment series, each subject was also asked to attend a 30-minutes individual semi-structured interview with the first author. The individual interview questions were guided by the general themes which aim to gain thinking about dual-lingual communication and BiTak's features (strict turn-taking with the recording function). Besides, the questions were also open-ended enough for us to be able to pursue new topics raised by the participants (See Appendix 3). Each interview was recorded and transcribed to text then the transcripts were informally analyzed.

## 5.3 Result Analysis

### 5.3.1 Results of Rubric

Figure 4. Result of Rubric

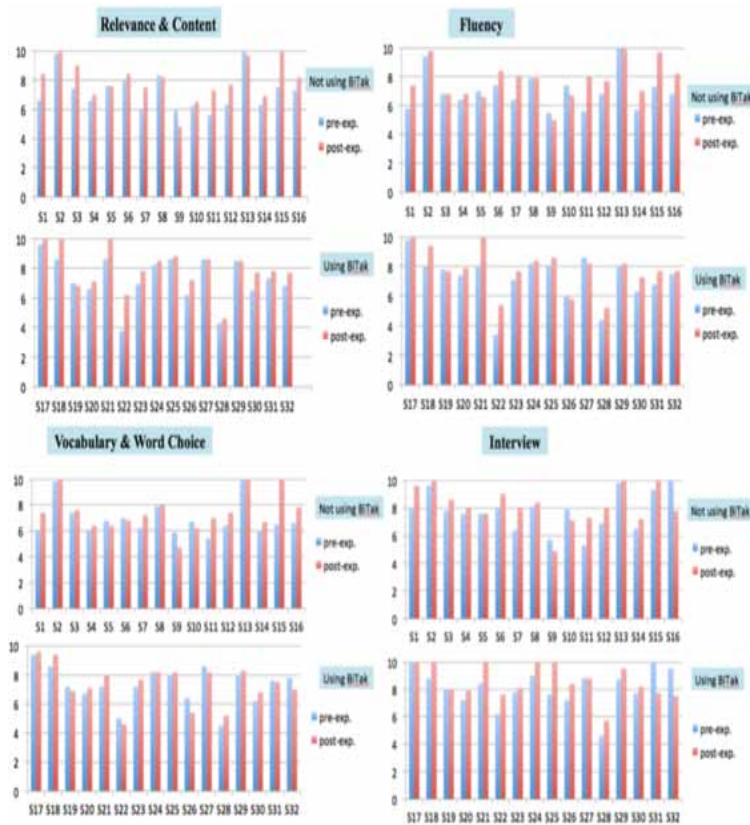


Figure 5. ANOVA results for pre-experiment post-experiment scores in Relevance & Content

### Relevance & Content

	Japanese	English
Using BiTak	1.4	0.5
	0.9	-0.2
	2.4	0
	1.4	0.9
	0.5	0.6
	0.2	1.2
	1	1.5
	0.4	0
Not using BiTak	2.5	-0.3
	0.9	0.3
	1.8	0.3
	0.2	-0.1
	1.6	-1.1
	0.4	0.3
	0	1.7
	0.4	1.4

SUMMARY	J	E	Total
With BiTak			
Average	1.025	0.5625	0.79375
Without BiTak			
Average	0.975	0.3125	0.64375
Total			
Average	1	0.4375	
Source of Variation	df	F	P-value
Sample	1	0.289364145	0.594878641
Columns	1	4.069183293	0.05335113
Interaction	1	0.128606287	0.722571396
Within	28		
Total	31		

Figure 6. ANOVA results for pre-experiment post-experiment scores in Fluency

# Fluency

	Japanese	English
Using BiTak	0.2	-0.4
	1.4	0.5
	2	-0.1
	0.2	0.2
	2	0.6
	0.9	1.3
	0.6	1
	-0.2	1.6
Not using BiTak	2.4	0
	1.4	0.2
	1.6	0.8
	0.4	0
	0	-0.5
	0.4	-0.7
	-0.4	2.4
	1	0.9

SUMMARY				
	J	E	Total	
With BiTak				
Average	0.8875	0.5875	0.7375	
Without BiTak				
Average	0.85	0.3875	0.61875	
Total				
Average	0.86875	0.4875		

Source of Variation	df	F	P-value
Sample	1	0.150228881	0.701247546
Columns	1	1.548481065	0.223679907
Interaction	1	0.070328756	0.792801404
Within	28		
Total	31		

Figure 7. ANOVA results for pre-experiment post-experiment scores in Vocabulary & Word Choice

## Vocabulary & Word Choice

	Japanese	English
Using <b>BiTak</b>	0.2	-0.4
	0.8	0.4
	-0.8	-0.3
	-0.4	0.3
	0.8	0.5
	-0.1	0.7
	0.2	0.6
	-1	1
Not using <b>BiTak</b>	3.5	0
	1.2	0
	1.4	0.7
	0.2	0.1
	0.2	-1.2
	0.4	-0.5
	-0.4	1.6
	-0.2	1

SUMMARY				
	J	E	Total	
With <b>BiTak</b>				
Average	-0.0375	0.35	0.15625	
Without <b>BiTak</b>				
Average	0.7875	0.2125	0.5	
Total				
Average	0.375	0.28125		

Source of Variation	df	F	P-value
Sample	1	1.242883137	0.274393965
Columns	1	0.092445853	0.763338632
Interaction	1	2.436050948	0.129807185
Within	28		
Total	31		

Figure 8. ANOVA results for pre-experiment post-experiment scores in Interview

# Interview

	Japanese	English
Using BiTak	0	0
	1.2	0.7
	-2	0
	1.4	0.8
	1.6	0.3
	-2.3	0.7
	2.4	0.5
	1.2	1.6
Not using BiTak	0.7	0.2
	-2.2	1
	1.6	1.1
	0.4	0.3
	0.8	-0.8
	0	-0.8
	0.4	2
	1	1.1

SUMMARY				
	J	E	Total	
With BiTak				
Average	0.4375	0.575	0.50625	
Without BiTak				
Average	0.3375	0.5125	0.425	
Total				
Average	0.3875	0.54375		

Source of Variation	df	F	P-value
Sample	1	0.038447788	0.845962869
Columns	1	0.142188566	0.708957788
Interaction	1	0.002047515	0.964229635
Within	28		
Total	31		

The speaking performance of all subjects in the evaluations were assessed by the professional language instructors by four criteria in the Rubric with the scale from 0 to 10 points:

- “Relevance & Content”,
- “Fluency”,
- “Vocabulary & Word Choice”, and
- “Interviews: Does interviewee understand question?”

Fig.4 shows the specific scores of each participant evaluated before and after the experiments in all four criteria mentioned above. Most of subjects received positive feedbacks from the two teachers for their progress during experiment period. As can be seen from the figure, a majority of participants showed sufficient improvement between the pre-experiment and post-experiment evaluation. The distinctions also varied from small to big proportion in both groups.

The improvement difference of each participant between pre-experiment and post-experiment based on their scores in Rubric was analyzed by ANOVA.

The values shown in the table on the left side of the four figures are differences between the scores of post-experiment and pre-experiment evaluations of each participant. Basically, all the participants' skills were improved by the average (all the average were bigger than 0). Also can be seen from Figs.5,6,7 and 8, in the “Column” patterns (between Japanese and English students), although there was a slight tendency of statistically significant differences (SD) in Relevance & Content  $F(1,28) = 4.07, 0.05 < P < 0.1$ , no significant differences were found in all of the four criteria (P-value (Fluency, Vocabulary & Word Choice, Interview)  $> 0.05$ ). This result proves that there was no significant differences between the improvement of Japanese and Internationals, which means they could simultaneously improve their speaking skill to almost the same degree through dual-lingual communication.

However, the same conclusion could not be given to the usefulness of BiTak. According to the “Sample” patterns in the mentioned figures, all the P-value were bigger than 0.05. Namely, there were no significant differences in improvement of using and not using BiTak. It could not be concluded quantitatively that Bitak is useful for simultaneous second language acquisition. We would like to find it useful through qualitative data (semi-structured interview and transcript analysis results)

### 5.3.2 Results from Individual Semi-structured Interviews

We conducted a 30-minute semi-structured individual interview with each member to gain insight into how they felt while using BiTak. They all indicated their general feelings after using BiTak, the comfort of using Bitak, or their opinions on utilizing Bitak as a supportive tool to learn second languages in open-ended questions pertaining to dual-lingual communication and functions of BiTak.

#### • Not-using-BiTak Groups:

These groups talked solely through BiTak's interface, as if it were a regular video-conferencing system, which meant that the strict turn-taking and recording functions were unavailable. Although all the subjects initially considered dual-lingual communication strange and difficult, they eventually realized how beneficial it is for people at all levels from beginner to intermediate. The more they became familiar with the dual-lingual communication, the more eager they are to communicate in this manner.

However, when asked about assisting others in correcting their mistakes, most of the subjects in the group stated that they were hesitant to do so because they were in the middle of a conversation. They sometimes recognized their friends' mistakes but neglected them to wait for the conversations

to finish then unintentionally forgot the errors. This is an important problem of the dual-lingual communication where no support is provided for keeping the dual-lingual manner strictly.

- **Using-BiTak Groups**

These groups communicated utilizing BiTak and all of its features. As a result, they were forced to follow BiTak's strict turn-taking rule, which was pushed on them in a systematic manner.

It was quite tough for this group to use strict turn-taking for the first time. Interestingly, they deliberately discuss the way to communicate in BiTak without any instructions of the authors to make the communication went smoothly: applying dual-lingual conversation with strict turn-taking for presentation, using recording link for realizing mistakes and normal conversation for correcting mistakes and discussion.

The members steadily stated that this approach is intended to learn language, rather than just for conversing. When they did the presentation using BiTak, only one person had to talk. They felt that it was a nice challenge for them because they could perform a lot of presentation to improve their speaking skill.

They all agreed that dual-lingual communication can help individuals improve their second language speaking skills. Japanese students rarely have the opportunity to speak English, and international students rarely have the opportunity to speak Japanese, thus there are mutual benefits. They could learn some new words and correct some of their previous errors. They believe that while this type of communication is uncomfortable for chatting, it is good for learning languages.

Everyone in the group agreed that the strict turn-taking feature provided them time to consider before speaking up. As a result, they felt more comfortable expressing themselves. Another intriguing feature discovered by the participants was the recording link. They all thought this feature was crucial since it allowed them to listen to their friend's presentation repeatedly to spot and rectify problems for each other.

### 5.3.3 Analysis of the Transcript

In addition to the fundamental analyses indicated above, we conducted an in-depth examination of the transcript to have a better understanding of the learners' improvement process. According to this investigation, dual-role collaborative learning as a novel learning style is naturally and clearly used in dual-lingual conversations using the BiTak.

- **Not-using-BiTak Groups**

Here are some examples from the transcript:

- A) E1: "let's start" wa nan desu ka? (How to say "let's start" in Japanese?)  
J1: Hajimemasho. (Let's start.)  
E2: "Accommodation" wa nan desho? (How to say "Accommodation" in Japanese?)  
J2: In Japanese... "Shukuhaku shisetsu" (In Japanese, you can say "Shukuhaku shisetsu")
- B) J1: When did you go to Japan?  
E1: kotoshi, shigatsu...san nichi?? (this year, April ...number 3??)  
J1: Mikka. (You should use Mikka for 3<sup>rd</sup>, san nichi is just number three)  
E1: ah, shigatsu no mikka, arigatou (Ah, April 3<sup>rd</sup>, thank you.)
- C) J1: If I have money, I want to go to Germany.  
E1: "Germany?" Doko? (Germany? Where?)  
J1: Eh? (What do you mean?)  
E1: "Germany" wa doko? (Germany is where?)

- J1: Doitsu no doko? (You should say “Doitsu no doko”, “Germany” wa doko is not correct)  
 E1: Ah...
- D) J1: How about winter in Japan?  
 E2: Samui desu. Arerugi ga arimasu. (It is cold. I am allergic.)  
 J2: What is “arerugi” written in English? (He/She wanted to ask what the word is written in English)  
 E2: It’s allergic.
- E) E1: yasumijikan wa nani o shi masu ka? (What do you do in your free time?)  
 J1: I sleep. Hmm.. I feel sleepy...  
 E1: “I often feel sleepy.”  
 J2: In my case, for relax, for example, walking or swimming...hmm...  
 E2: Ah, you usually go swimming or walking in your freetime?..  
 J2: Oh, yes...  
 J1: I usually driving around ... the town.  
 E1: “Driving license” wa nihongo wa nan desu ka? (How can I say driving license in Japanese?)  
 J1: Unten menkyoshō desu. (It is Unten menkyoshō desu)  
 E1: Ah... arigatou. (Ah thanks)
- F) E1: Tomi no hito wa “not always”..How to say “not always”? (Rich people are “not always”... How to say “not always” in Japanese?)  
 J1: (write in the text chat) ..itsumo..dewanai (It is itsumo dewanai)  
 E1: Ah, tomi no hito wa itsumo shiawase dewa nai. (Ah, rich people are not always happy.)
- G) E1: rirakkusu no tame ni nani o shimasu ka? (What do you do to relax?)  
 E2: “tame ni” wa nan desuka? (What does “tame ni” mean?)  
 J1: it means “about” or “for”. For example in my case, I go walking or swimming for relaxing.  
 E2: Ah.  
 J2: I go to my bed to relax. (slight grammatical mistake but there’s no correction from Es)

These groups were asked to use BiTak as a regular video chat application without employing the strict turn-taking or recording functions, and to speak with each other in a dual-lingual manner, as specified in 5.1. The result from transcript revealed that they had good experience with dual-lingual communication. They did not, however, notice the goal of language learning. They complied with our request to speak in groups on a variety of issues. As can be seen in examples A to F, if one of the members was having trouble finding the appropriate word, they usually raised their voice to seek for assistance; otherwise, the others simply ignored the member’s errors. (example G). From the aforementioned examples, it is obvious that they frequently requested unfamiliar language, did not drill down into word usage, and instead continued the conversation topic by topic. They were able to finish debating the topic questions in the time allotted as if they were simply chatting. They were unconcerned with the mistakes of others. It was alright if they understood, and then they began to forget to correct each other’s errors. It is not beneficial to language acquisition. Because their roles were not clearly defined, determining the facilitator in this collaborative group was difficult.

### ● Using-BiTak Groups

Here are some examples from the transcript:

- H) J1: Modern lifestyle gives us so many time to relax... in the past has to do many thing, for example, do laundry...But now we don’t need to do in many time.  
 E2: shabete no toki wa Subject wa arimasen ne. (There was no subject in your sentence.) You should say “in the past people had many thing to do..”  
 J1: Ah, I see.
- I) E1: (misused between ippai (a lot of) and isogashi (busy))

J1: “Shigoto ga ippai” means I have a lot of work

“Shigoto ga isogashi” means I am very busy.

So it’s different.

E1: naruhodo. Sorekara, Shigoto ga ippai na no de, isogashi desu. (Oh I see. I can say I am busy because I have a lot of work)

J2: Oh yes.

E2: Hai, arigatou...(Ah thanks)

J) E1: Saigo no bun no imi wa chotto wakarimasen. (I cannot understand your last sentence.)

J1: Ah I said “I travel to foreign country about one time a month”

E1: You said “one time”, I think “once” is better.

E1: Ryokou wa suki desu. (I like travelling)

J2: I think instead of saying “wa”, you should say

“(Watashi wa) ryokou ga suki desu.” (E1 misused of “wa” and “ga”)

E1: Hai.

K) E1: Minasan wa shigoto shimashita ka?

J1: Hmm... “shigoto shimashita ka” means “Did you work yesterday?”. If you want to ask about working experience, you have to say “Shigoto shitakoto ga arimasu ka?”.

E1: Ah, naruhodo. Arigatou. (Ah, I see, Thanks.)

With distinct requirements, the Using-BiTak groups were requested to use all Bitak’s features, including strict turn-taking and recording. As a result, they took longer to complete one question than the groups that did not use BiTak. They only managed to complete half of the topic questions in the time given. During the presentation phase, each participant received three or four opportunities to present their ideas. They had more time to think and find flaws for each other because they had to listen to the recording twice. The corrective content was more specific than in Group 1, focusing on both lexical and grammatical errors (see example H and K). Furthermore, examples I and J demonstrated that they purposefully assisted each other as facilitators and recipients. Japanese members became Japanese facilitators, recognizing and providing feedback on foreign members’ Japanese blunders, whereas foreign members became English facilitators, assisting Japanese members in correcting their mistakes. In other words, in this type of collaborative learning, their roles as facilitators and receivers have been successfully portrayed.

As a matter of fact, by employing dual-lingual communication, dual-role collaborative learning naturally happens in most cases. The use of strict turn-taking and recording links, however, was a significant distinction between both groups that made this dual-role collaboration more efficient and clearly exploited. All the recording links were seriously considered by members of the Using-BiTak groups. They wanted to make sure their partners were aware of their errors and willing to make amends. All of them progressively developed an interest in learning rather than merely chattering on the account of the proposed features of BiTak.

## 5.4 Discussion

From the result analysis, it was demonstrated that simultaneous acquisition of speaking skill of two different languages can be achieved by employing dual-lingual communication. Furthermore, although it was not supported by the quantitative results based on the rubric scores, the qualitative results based on the interview and the transcriptions supported that CSCL BiTak is useful to carry out dual-role communication as a method of the second language learning. All the participants eventually developed a sense of learning as a result of utilizing BiTak, not just conversing about the proposed characteristics of BiTak, but also comprehending their position as facilitators and receivers; such things were not noticed in the groups that did not use BiTak. As a result of these findings, it can be concluded that the dual-role collaborative learning method is effective in the acquisition of two languages at the same time.

Dual-lingual communication is a novel and effective approach of simultaneously learning two languages. Japanese spoke English during the experiments, while internationals spoke Japanese. This kind of communication is basically unnatural to everyone, however, it seemed that no one faced any inextricable difficulties with this dual-lingual pattern. More intriguingly, when participants were compelled to practice dual-lingual conversation, they progressively grasped the importance of acquiring a second language rather than simply communicating with it. Everyone in the group has unknowingly decided to study in order to improve their language skills.

The smooth turn taking system usually ensures that the flows of conversations can naturally carry on unambiguously and coherently. However, in dual-lingual communications, especially in using BiTak, users are required to obey strict turn-taking to communicate. This communication manner is apparently unnatural in making informal conversations and easy to make people feel annoyed or uncomfortable if they have to wait until their turn to speak. On the contrary, the results from all experiments have shown that strict turn-taking successfully facilitating the simultaneous second language acquisition.

The purpose of creating Recording button is to help users watch the video again to ask the others about what they are still not clear or confused. The images of body language and sound in the videos can be hints for users to improve their speaking skills. The recording function gained its confirmation of efficiency through a long-term experiment. At first, people also felt annoyed to be asked to watch again the recording video in the middle of conversation. Nevertheless, their attitudes changed after realizing the atmosphere of language learning when using BiTak. The importance of recognizing and correcting mistakes by watching videos again was gradually stabilized throughout the series of experiments.

## 6. CONCLUSION

In this paper, we proposed a theoretical model named dual-role collaborative learning in simultaneous second language acquisition and implemented a web CSCL system BiTak, which is equipped with three functions, i.e. the strict turn-taking function, the recording function and text chat function related to each recorded utterance, for facilitating dual-role collaborative learning of speaking skill through dual-lingual communication. The learner's progress is positively evaluated by language teachers using a Rubric scoring framework. Based on the experiments, it was suggested that BiTak has changed the notion of users from an ordinary video chat application to a collaborative learning system thanks to its three prominent features and the learners became able to play their roles as facilitators and receivers to support each other's speaking skill.

The focus of this study was limited in improving the speaking skill. Based on the dual-role collaborative learning approach, we've been researching a new method for listening skill. In the near future, we will report on the results of this innovative method.

## FUNDING AGENCY

The Open Access Processing charge for this article was covered by Anh Bui of Japan Advanced Institute of Science and Technology, Japan, who is the corresponding author of this article.

## ACKNOWLEDGMENT

The authors greatly thank all subjects who cooperated to our experiments. Especially, we would like to express our gratitude to Prof. Shungo Kawanishi and Ms. Masako Tsutsui who dedicatedly took part in student evaluation process. This work was supported by JSPS KAKENHI JP26280126.



## REFERENCES

- Alavi, M. (1994). Computer-mediated collaborative learning: An empirical evaluation. *Management Information Systems Quarterly*, 18(2), 159–174. doi:10.2307/249763
- Andrade, H. G. (2000). Using rubrics to promote thinking and learning. *Educational Leadership*, 57(5), 13–19.
- Brandon, D. P., & Hollingshead, A. B. (1999). Collaborative learning and computer-supported groups. *Communication Education*, 48(2), 109–126. doi:10.1080/03634529909379159
- Brief, P. (2020). *Education during COVID-19 and beyond*. United Nations. <https://www.un.org/development/desa/dspd/2020/04/social-impact-of-covid-19>
- Chapelle, C. A. (2001). *Computer applications in second language acquisition*. Cambridge University Press. doi:10.1017/CBO9781139524681
- Council of Europe. (2014) *Education and Languages, Language Policy*. Available at: [https://www.coe.int/t/dg4/linguistic/CADRE1\\_EN.asp](https://www.coe.int/t/dg4/linguistic/CADRE1_EN.asp)
- Dillenbourg, P. (1999). Collaborative learning: Cognitive and computational approaches. advances in learning and instruction series. Elsevier Science, Inc.
- Galloway, N. (2013). Global English and English Language Teaching (ELT)—Bridging the gap between theory and practice in a Japanese context. *System*, 41(3), 786–803. doi:10.1016/j.system.2013.07.019
- Han, M., & Li, Y. (2019). The effect of face-to-face and non-face-to-face synchronously collaborative writing environment on student engagement and academic performance. *Journal of Education, Innovation, and Communication*, 1(2), 65–74.
- Ho, T. V., Nakamori, Y., Ho, T. B., & Nguyen, S. D. (2015). The Effects of a Knowledge Management-Based Model for Teacher Professional Development in Hands-On Approach. *International Journal of Knowledge and Systems Science*, 6(1), 60–78. doi:10.4018/ijkss.2015010105
- Holman, C., Leibrock, J., Jimenez, J., Greitzer, D., & Haynes, T. (2011, May). Lingua: cultural exchange through language partnerships. In CHI'11 Extended Abstracts on Human Factors in Computing Systems (pp. 1001-1006). ACM. doi:10.1145/1979742.1979510
- Hulstijn, J. H., Young, R. F., Ortega, L., Bigelow, M., DeKeyser, R., Ellis, N. C., Lantolf, J. P., Mackey, A., & Talmy, S. (2014). Bridging the gap: Cognitive and social approaches to research in second language learning and teaching. *Studies in Second Language Acquisition*, 36(3), 361–421. doi:10.1017/S0272263114000035
- Ibrahim, N., Shak, M. S. Y., Mohd, T., Zaidi, A., & Yasin, S. M. A. (2015). The Importance of Implementing Collaborative Learning in the English as a Second Language (ESL) Classroom in Malaysia. *Procedia Economics and Finance*, 31, 346–353. doi:10.1016/S2212-5671(15)01208-3
- Islam, S., Kunifuji, S., Hayama, T., & Miura, M. (2012). An Adoption Model for E-Learning and Knowledge Management Systems. *International Journal of Knowledge and Systems Science*, 3(2), 51–66. doi:10.4018/ijkss.2012040104
- Kimber, L. (2014). Attitudes and beliefs of students toward bi-/multilingualism at an international university in Japan. *Ritsumeikan Journal of Asia Pacific Studies*, 33, 139–152.
- Koschmann, T. D. (1994). Toward a theory of computer support for collaborative learning. *The Journal of the Learning Sciences*, 3(3), 219–225. doi:10.1207/s15327809jls0303\_1
- Landis, D., & Brislin, R. W. (Eds.). (2013). *Handbook of intercultural training: Issues in training methodology* (Vol. 116). Elsevier.
- Levy, M. (1997). *Computer-assisted language learning: Context and conceptualization*. Oxford University Press.
- Long, M. H., & Porter, P. A. (1985). Group work, interlanguage talk, and second language acquisition. *TESOL Quarterly*, 19(2), 207–228. doi:10.2307/3586827
- Mitnik, R., Recabarren, M., Nussbaum, M., & Soto, A. (2009). Collaborative Robotic Instruction: A Graph Teaching Experience. *Computers & Education*, 53(2), 330–342. doi:10.1016/j.compedu.2009.02.010

- Mushi, S. (2002). Simultaneous and successive second language learning: Integral ingredients of the human development process. *Early Child Development and Care*, 172(4), 349–358. doi:10.1080/03004430212717
- Myers-Scotton, C. (2006). *Multiple voices: An introduction to bilingualism*. Blackwell Publishing.
- Mynard, J. (2002). Introducing EFL students to chat rooms. *The Internet TESL Journal*, 8(2).
- Olaniran, B. A. (2004). Computer-mediated communication as an instructional learning tool: Course evaluation with communication students. In P. Comeaux (Ed.), *Assessing on-line teaching & learning* (pp. 144–158). Anker Publisher Inc.
- Olaniran, B. A. (2006). Applying synchronous computer-mediated communication into course design: Some considerations and practical guides. *Campus-Wide Information Systems*, 23(3), 210–220. doi:10.1108/10650740610674210
- Pomplun, M., Capps, L., & Sundbye, N. (1998). Criteria teachers use to score performance items. *Educational Assessment*, 5(2), 95–110. doi:10.1207/s15326977ea0502\_2
- Potter, J. (1996). Education in a Japanese University. *Skole: The Journal of Alternative Education*, 13(3), 29–52.
- Purpura, J. E. (2016). Second and Foreign Language Assessment. *Modern Language Journal*, 100(S1), 190–208. doi:10.1111/modl.12308
- Roberts, T. S. (Ed.). (2004). *Online collaborative learning: Theory and practice*. IGI Global. doi:10.4018/978-1-59140-174-2
- Roschelle, J., & Teasley, S. D. (1995). The construction of shared knowledge in collaborative problem solving. In *Computer supported collaborative learning* (pp. 69–97). Springer. doi:10.1007/978-3-642-85098-1\_5
- Rugube, T., Mthethwa-Kunene, K. E., & Maphosa, C. (2020). Promoting interactivity in online learning—towards the achievement of high-quality online learning outcomes. *European Journal of Open Education and E-learning Studies*, 5(2). Advance online publication. doi:10.46827/ejoe.v5i2.3381
- Seward, J. (1969). *Japanese in Action: An Unorthodox Approach to the Spoken Language and the People Who Speak It*. Academic Press.
- Solé, I. (2007). Contrasting two approaches to distance language learning. *Distance Education*, 28(3), 351–370. doi:10.1080/01587910701611369
- Stahl, A. G., Koschmann, T., & Suthers, D. (2006). Computer-supported collaborative learning: An historical perspective. *Cambridge Handbook of the Learning Sciences*, 2006, 409–426.
- Thornton, P. (1999). Reading together. In D. Kluge & S. McGuire (Eds.), *JALT Applied Materials: Cooperative Learning* (pp. 23–36). Japan Association for Language Teaching.
- Tinto, V., & Pusser, B. (2006). Moving from theory to action: Building a model of institutional action for student success. *National Postsecondary Education Cooperative*, 1–51.
- Tuhkala, A., & Kärkkäinen, T. (2018). Using Slack for computer-mediated communication to support higher education students' peer interactions during Master's thesis seminar. *Education and Information Technologies*, 23(6), 2379–2397.
- Ulker, V. (2017). The Design and Use of Speaking Assessment Rubrics. *Journal of Education and Practice*, 8(32), 135–141.
- WebRTC. (1990). <http://www.webrtc.org/No.9>
- Zhang, X., Meng, Y., de Pablos, P. O., & Sun, Y. (2019). Learning analytics in collaborative learning supported by Slack: From the perspective of engagement. *Computers in Human Behavior*, 92, 625–633. doi:10.1016/j.chb.2017.08.012

## APPENDIX A – ADDITIONAL RUBRICS

### Rubric for Testing Speaking Skill

#### Task Description:

Table 1. Relevance and content

10 / 9	Communicates significantly more information than required to fulfill the task; includes elaboration and detail.
8	Fully satisfies the requirements of the task; includes all relevant information.
7	Communicates adequate information to fulfill the task.
6	Attempts to address the topic but few relevant information, the amount is less than adequate.
5 - 0	Provides almost no information, or there is not enough speech to evaluate.

Table 2. Fluency

10/9	The answers are smooth and flowing. No hesitancy or rephrasing.
8	The answers are smooth for the most part. Occasional hesitancy. Some rephrasing.
7	The answers are generally hesitant and often choppy.
6	The answers are extremely hesitant and choppy. Frequent pauses and/or unfinished phrases.
5 - 0	The answers are limited to isolated words or short phrases. No fluency.

Table 3. Vocabulary and word choices

10 / 9	Uses a sophisticated range of vocabulary appropriately.
8	Uses a fairly wide range of vocabulary. Most of vocabulary is used appropriately.
7	Uses an adequate range of vocabulary, but sometimes inappropriately.
6	Uses a limited range of vocabulary. Vocabulary is often used inappropriately.
5 - 0	Shows no command of vocabulary.

Table 4. Interviews: Does interviewee understand questions?

10/9	Understands all questions. No repetition necessary.
8	Understands most questions. Occasional repetition necessary.
7	Understands approximately half of the questions. Repetition is often necessary.
6	Understands only a few of the questions. Repetition frequently necessary.
5 - 0	Understands no questions. Repetition and/or rephrasing of questions is always necessary.

## APPENDIX B – EVALUATION QUESTIONS

The questions used in the evaluation:

1. Self-introduction: (2mins)
  - ✓ Talk something about yourself: hometown, major, hobbies...
2. Entertainment: (2mins)
  - ✓ What is your favorite form of entertainment?
  - ✓ In your opinion, which kinds of TV programs are waste of time? (love stories, adventure stories, mysteries, comedies, documentaries, game shows, horror) Explain your answer.
3. Travelling: (2mins)
  - ✓ Do you like travelling? If yes, how often do you travel?
  - ✓ How do you feel when you come back home after a long journey?
4. Happiness: (2mins)
  - ✓ What do you think of happiness?
  - ✓ What do you like to do when you are happy?
5. Social network: (2mins)
  - ✓ What kinds of social network websites would you like to use?
  - ✓ Is it good to find friends on social network?

## APPENDIX C – SEMI-STRUCTURED INTERVIEW QUESTIONS

The questions used in the semi-structured interviews:

1. Describe your overall impressions of the application.
2. The system's usability: is it simple to use?
3. What do you think about dual-lingual communication in terms of comfort? Is it possible to learn a language through this method of communication?
4. Is it true that your speaking has improved?
5. Have you ever had to fix someone else's mistake?
6. Do you think the recording button and strict turn-taking can help you enhance your speaking skills?

*Kazushi Nishimoto is a Professor of Japan Advanced Institute of Science and Technology, Japan. He received his B. Eng. and M. Eng. from Kyoto University, Japan, in 1985 and 1987, respectively, and received Dr. Eng. from Osaka University, Japan, in 1998. He worked for Matsushita Electric Industrial Co. Ltd., (Panasonic) from 1987 till 1995. He was a researcher of ATR Communication Systems Research Laboratories and ATR Media Integration & Communications Research Laboratories from 1992 till 2006. Also, he was a researcher of Precursory Research of Embryonic Science and Technology, Japan Science and Technology Agency from 2000 till 2003. His research interests include creativity support technologies, informal communication support technologies, and human computer interaction. He is a member of IEEE Computer Society, ACM, IPSJ, JSAI, HIS, and JSKE.*