

Supporting Collaborative Interaction among Learners Using Collaborative Learning System InCircle

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Abstract—This paper describes the development and the evaluation of a collaborative communication system called InCircle. One notable trend in the pedagogical field is a shift from a teacher-centered learning to a student-centered one. Recent advancement of Information and Communication Technology (ICT) has accelerated the shift. The spread of various mobile applications for educational use has enabled us to share information and knowledge in real time. In order to promote student-centered learning, it is necessary to facilitate interaction among learners. For these purposes, InCircle was introduced in a university level language and culture class in Japan. The objectives of our research study were to examine whether InCircle contributes to the facilitation of interaction among learners and the enhancement of mutual cross-cultural understanding. The evaluation was conducted in an international exchange subject where international students and Japanese students learn about the language and culture at university in Japan. The result of the questionnaire showed the learners' preference to InCircle as opposed to the blog comment function. It also endorsed its usability and effectiveness as a communication tool.

Keywords- collaborative learning; InCircle; international students; international exchange subject; student-centered learning.

I. INTRODUCTION

In recent years, one notable trend in the pedagogical field is that more teachers have moved towards a student-centered learning environment. In the course of this shift, student-centered collaborative learning has drawn much attention from researchers in the pedagogical field [1]. Collaborative learning has a "social constructivist" philosophical base, where learning is regarded as construction of knowledge within a social context [2]. It is reported that student-centered and small-scale course programs resulted in more academic success than lecture-based course program [3]. It is also reported that a student-centered collaborative learning is one of the most effective ways of learning in language classes [4]. In fact, most studies investigating the link between the extent to which course programmes are student-centered on the one hand and promote academic success on the other hand, find positive relationships between the two [2].

Recent prevalence of high-performance mobile devices has enhanced the potential of learners' active interaction via

mobile-based communication tools. We have seen a good deal of researches on communications applications, such as educational application of social network service (SNS) [5]-[8]. Our communications application project, InCircle, is among them. In this study, InCircle was introduced for the purpose of facilitating interaction among learners and enhancing learning opportunities.

The rest of the paper consists of the following sections: Section 2 explains our developed system, Section 3 explains the experiment setup and Section 4 explains the conclusions and future works.

II. INCIRCLE

InCircle [9] is a product developed by AOS Mobile Inc., Tokyo, Japan [10] with the second author joining this project as a chief software architect. It is a client-server application. The server side runs on Linux OS and Windows Server. The client side is working on iOS, Android, and PC Web browser. Chat messages are transmitted and received through the network (Figure 1).

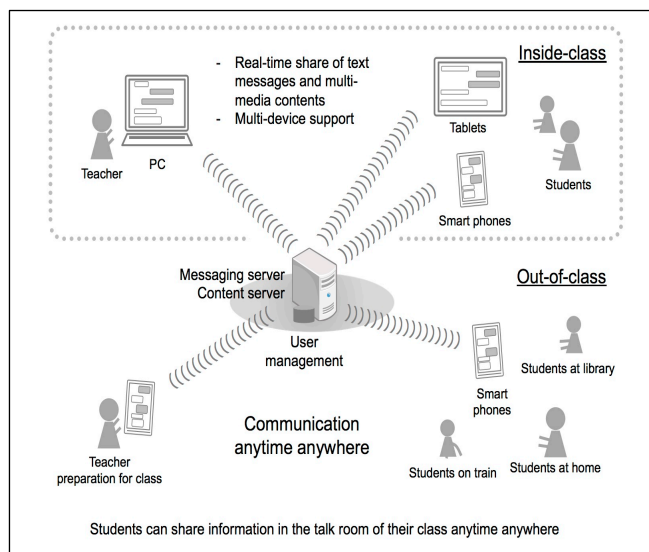


Figure 1. InCircle system configuration.

The system allows users to create groups. Group members are able to send and receive messages and multimedia files in their chat room with an easy operation. Chat messages are synchronized in real-time to realize smooth communication. Figure 2 shows a chat room interface when the instructor posted an interrogative sentence: "Do you have textbook authorization system in your country?" since interrogative sentences trigger active interaction among learners which leads to mutual cross-cultural understanding.

In our system, we have mainly four major advantages:

a) Teachers can be administrators of the system.

Teachers can be administrators of the system so that they can watch the users/their students' behaviors. Therefore, they can avoid their students' malicious behaviors via InCircle. In case of inappropriate behavior from the part of a student, teachers can delete or close the student's account.

b) Teachers can pre-register user accounts.

Unlike other SNS or chat tools, such as Facebook and LINE, user accounts are pre-registered. Teachers create accounts for their students and make a group for the class in advance. There are always some students who do not want to use the existing SNS systems. In fact, in one of the authors' classes, some students rejected to create a Facebook account and some students did not want to use LINE. Unless all the students agree to use it, it is not appropriate to use it as a communication tool in class. Besides, the existing SNS users usually post their private information on their profiles. However, some students may not wish to share private information with some of their classmates. In our system, on the contrary, there is no page in the first place to fill in their private information, such as school career, birth place/date.

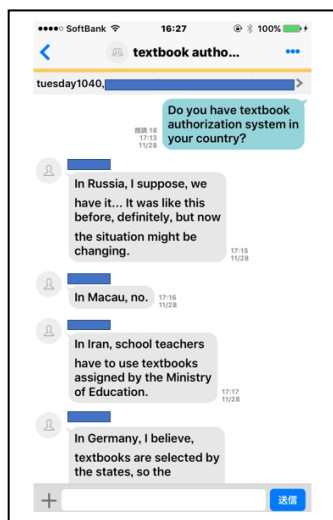


Figure 2. InCircle chat room interface.

c) Security is ensured

Every effort was made in order to ensure the security, such as encryption of the cache data in the client terminal, channel coding, encryption of database, the use of different cryptography keys for each company or school in the server side. Therefore, it is highly protected against divulging of information or account hacking.

d) Users can delete the sent messages.

In our system, we can delete messages after they are sent not only on the sender's side but on the recipient's side. It is likely to happen that we send messages by mistake. Our system can handle such human errors.

Our research questions are:

(1) Can InCircle contribute to the enhancement of the students' mutual cross-cultural understanding?

(2) Can InCircle contribute to the enhancement of interaction among the students?

III. EVALUATION

A. Target class

The target class was one of "international exchange subjects" which was targeted mainly for international exchange students. Japanese students who are interested in class held in English can also join it. The class was held 12 times on a once-a-week-basis in a CALL (computer assisted language learning) room during the fall/winter semester, 2017. The class language was mainly in English. The objectives of the target class were (1) to enhance cross-cultural understanding and (2) to improve the skills of their target languages, which were Japanese or English. The class consisted of 21 students (6 Japanese, 4 Germans, 2 Chinese, 2 Finnish, 1 British, 1 French, 1 Korean, 1 Macao, 1 Russian, 1 Taiwanese, 1 Vietnamese). All the participants were owners of mobile phones. At the beginning of the semester, they were asked to answer the learning style questionnaire created by Academic Skills Advice service [11] to identify their preferred learning styles.

B. Procedures

InCircle was introduced in class from November 14, 2017 to January 23, 2018. It was introduced mainly because not all the students had the identical SNS accounts, such as Facebook, WhatsApp, LINE, Twitter and so on.

A class blog was created by the teacher as a communication tool. Google Blogger service was used for creating the class blog. It was used throughout the semester from October 3, 2017 to January 23, 2018. The teacher posted contents which were useful for classroom learning as well as each class schedule. The mailing list was also created by the teacher for the facilitation of class communication. However, even though the teacher instructed the students to use a class mailing list as a communication tool among classmates, it turned out that it did not play any role as a communication tool.

Therefore, the mailing list was used only by the teacher when she needed to share necessary information with the students.

Towards the end of the semester, when students used to both communication tools, i.e., InCircle and Blogger, close examination was made on how the students used them as communication tools during the class held on January 9th, 2018. For the enhancement of the mutual cultural understanding, the teacher posted theme topics on both sites. Since it was a class held right after the new year holidays and for most of the students, it was their first new year holidays in Japan, the topic was new year holidays: "Did you find something special for お正月(New Year)?" on Blogger site and "How do you celebrate new year holidays in your country?" on InCircle. The students were instructed to post comments on both media. They were informed that their posting would affect their grades.

C. The Results

Table 1 shows the number of posts in InCircle talk room and the blog comment columns. The number of posts on InCircle was 26, while that of Blogger was 14. The number of the participants on January 9th' class was 20. The number of the students who posted comments on InCircle was 18, while those on Blogger was 8. As the number of the post shows, the students were more active in posting messages on InCircle.

TABLE I. COMPARISON BETWEEN INCIRCLE AND BLOGGER COMMENTS ON JAN. 9, 2018 (PARTICIPANTS: 20)

InCircle	Blogger
<i>How do you celebrate new year holidays in your country?</i>	<i>Did you find something special for お正月(New Year)</i>
The number of posts	The number of comments
26 (18 students)	14 (8 students)

Tables II and III show the participants' comments reacting to the teacher's questions via both media. Figure 3 shows the interfaces of both media. As for Blogger comment function, its users cannot post multimedia files so that the information they could get was only text-based.

One notable phenomenon for InCircle was an interaction among students, which did not happen in Blogger's comment column. One comment (No.15) posted by Student #13 triggered Student #4's question (No.18), which was answered by Student #13 (No.21), which triggered Student #17's photo post (No.22). This interaction ended with Student #4's post showing her gratitude (No.24) as shown in Table III. Apparently, InCircle promoted the interaction among students. On the contrary, when the teacher posted a question in Blogger site, Did you find something special for お正月 (oshogatsu: New Year), 8 students posted comments in the comment column. This topic was expected to stimulate the students' interactions since for the most students, the new year 2018 was their first new experience in Japan, and in fact, new year holidays are the most special holidays in Japan. There must have been many things new to them. But unlike the teacher's expectation, one student's post did not lead to

another students' reaction. They just answered to the teacher's question (Table II).

TABLE II. BLOGGER USE ON JAN. 9, 2018

No.	Time 1/19/2018		Comments
	11:12	Teacher	(Q) Did you find something special for お正月(New Year)
No.1	16:37	Student #1	(A) おもち(omochi: rice cake)
No.2	16:37	Student #2	(A) しめ飾り(shimekazari: new year decoration made from straw ropes)
No.3	16:38	Student #3	(A) I played with kites on Oshogatsu when I was a kid
No.4	16:40	Student #2	(A) お雑煮(ozouni: New Year soup with rice cake)
No.5	16:40	Student #4	(A) 年賀状(nengajou* New Year Card)
No.6	16:40	Student #5	(A) It's very interesting that there is a particular importance of doing something for the first time in the beginning of the new year (like watching the first sunrise or first visiting temple).
No.7	16:41	Student #6	(A) お年玉(Otoshidama: New Year money to give children)
No.8	16:41	Student #7	(A) おせち料理. (osechiryouri: New year food)
No.9	16:42	Student #2	(A) 初詣(hatsumoude: New Year's visit to a Shinto shrine)
No.10	16:43	Student #2	(A) 初日の出(hatsuhinode: First sunrise)、書初め(kakizome:New Year's writing)
No.11	16:43	Student #7	(A) kakizome
No.12	16:45	Student #8	(A) 初売り(hatsuur:The first sale)
No.13	16:55	Teacher	(Related to No.12) 福袋 (ふくぶくろ :fukubukuro:Lucky bags) https://en.wikipedia.org/wiki/Fukubukuro
No.14	16:55	Student #2	(A) かるた(karuta:cards)

(Q):question (A):answer

TABLE III. INCIRCLE POSTS ON JAN. 9, 2018

No.	Time 1/19/2018		Comments
	10:27	Teacher	(Q) How do you celebrate new year holidays in your country?
No.1	16:26	Student #1	(A) In Germany we celebrate with fireworks on New Year Eve and the first day of the new year. We usually congratulate everyone on midnight, when the new year starts.
No.2	16:26	Student #2	(A) We eat Berliner (German sweet bread filled with jam or alcohol) and do fireworks at midnight
No.3	16:35	Student #3	(A) A lot of my friends and family in Germany do a fondue at New Year Eve because it takes quite long to eat and that night you have the time for a long dinner.
No.4	16:44	Student #4	(A) We celebrate the Spring Equinox (March 21st, 春分の日) as the first day of the New Year.
No.5	16:46	Student #5	(A) In the night of 31st of December, we eat 年越しそば (toshi-koshi Soba)
No.6	16:46	Student #4	photo related to No.4

No.7	16:47	Student #6	(A) In the UK people spend New Year eve drinking with friends and family. We count down at midnight, sing "auld lang syne" (traditional Scottish song) together and then watch the national fireworks display.
No.8	16:48	Student #7	(A) in Finland we have fireworks around midnight and we usually spen New Year with friends. Sparkling wine is common and https://www.asejaera.fi/image_view.php?name=U/listaus_Tahtisadetikku-19-cm-sadetikku-1.jpg
No.9	16:48	Student #6	(A) In Italy we eat lentils on New Year eve as it is supposed to make you rich over the next year, we also drink and celebrate with family
No.10	16:48	Student #8	(A) In China, we rarely celebrate for New year and we only have 3 day off. However, we will celebrate for Chinese New year, celebrating with family.
No.11	16:48	Student #9	(A) In Japan we watch 紅白歌合戦 on TV at 31st of December.
No.12	16:48	Student #10	(A) In France we usually party with friends and/or family, drink champagne, do the count down and there is also fireworks.
No.13	16:48	Student #11	(A) I'm Japanese but since my family has lived in many places, we've just settled for not doing much in New Year.
No.14	16:50	Student #12	(A) For us (in Russia) fireworks are so important during the New year night, that they are usually associated with this fest particularly. While preparing the food for the dinner we watch some "traditional" Russian movies about the New year. After the midnight we exchange presents (by searching them underneath the Christmas tree) and go out to walk around. It's very easy to meet all friends on the streets at night.
No.15	16:50	Student #13	(A) In Macau, we will go count down, but it is not a main festival for us. The main one, Chinese New Year, sits in February, and we will have reunion lunch or dinner and receiving red pockets.
No.16	16:50	Teacher	(Related to No.11)紅白歌合戦 (こうはくたがっせん) https://en.wikipedia.org/wiki/K%C5%8Dhaku_Uta_Gassen
No.17	16:52	Student #14	(A) In Taiwan we eat dinner with family and play fireworks in 12/31. And we go to temple in 1/1. But we celebrate the lunar calendar.
No.18	16:52	Student #4	(Q to No.15) @Studner#13: what are those red pockets?
No.19	16:52	Teacher	(Related to No.5) 年越しそば (としこしそば) https://en.wikipedia.org/wiki/Toshikoshi_soba
No.20	16:52	Student #15	(A) During Chinese New Year, family gather together and have dinner, watch TV, after 12 o'clock of new year's eve, older generation will give out red pockets. 1/9/2018 16:52
No.21	16:52	Student #16	(A to No.20) Red pockets are like お年玉 in Japan.
No.22	16:52	Student #17	(Related to No.21) Red pocket's photo
No.23	16:53	Student #18	(A) Buy fireworks and use them in 31.12 after klo 18.00. Burn candles, ULKOTULI
No.24	16:54	Student #4	(A to No. 21) I see! Thanks.
No.25	16:54	Student #18	ULKOTULI's photo (related to No.23)
No.26	16:56	Teacher	(Related to No.12)お年玉 (おとしだま)

(Q):question (A):answer

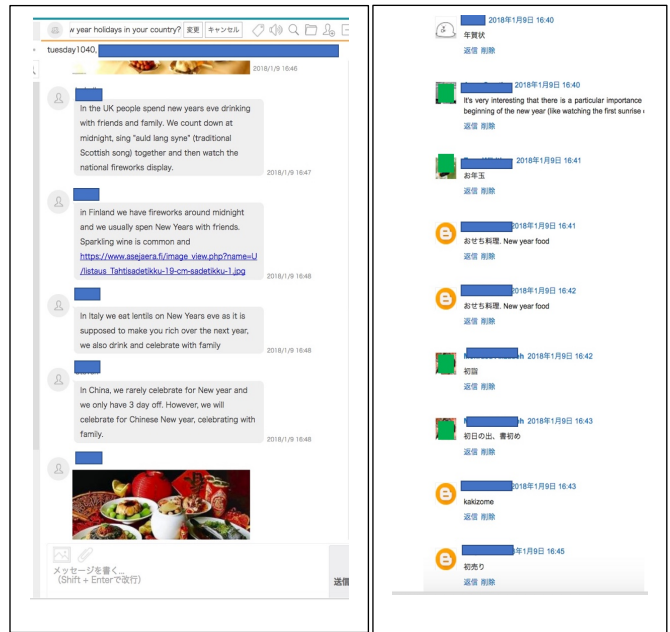


Figure 3. InCircle posts (left) and Blogger comments (right)

At the end of the phase, they were asked to answer the five-point-scale-questionnaire as shown in Table IV. Q1 and Q3 were created based on the technology acceptance model proposed by [12]. Q2 was created to examine the fun factor of our system. Q4 and Q5 were created to examine its contribution to the class objectives. Q6 and Q7 were created for examining the user acceptance of its interface and the whole system.

TABLE IV. THE RESULTS OF THE 5-POINT-SCALE QUESTIONNAIRE

	Questions	Mean	SD
Q.1	Was it easy for you to use InCircle?	4.4	0.86
Q.2	Was it fun for you to use the system?	3.9	0.89
Q.3	Was it helpful as a means of communication with your classmates and teacher?	3.7	1.19
Q.4	Was it helpful for understanding Japanese culture and other cultures?	4.3	0.90
Q.5	Was it helpful for your target language learning?	3.2	0.94
Q.6	Please rate its interface	3.8	0.60
Q.7	Please rate the whole system.	3.7	0.80

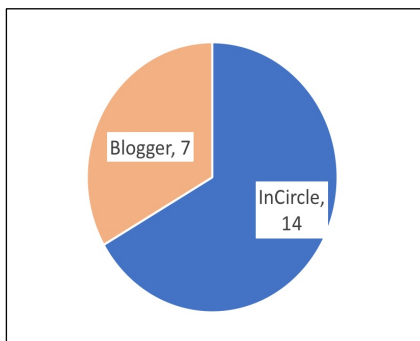


Figure 4. Which was easier to handle?

The highest score, 4.4 was given when they were asked about the usability of the system (Q.1). As some students felt it was like other existing apps (as in comments #2, 9 and 13 in Table 5), most students had already used other similar apps, which lead to the high score of the usability of InCircle. The lowest score, 3.2 was given when they were asked if it was helpful for their target language learning (Q.5). Since it was a basic rule in 'International Exchange Subjects' to run the class in English, the language in InCircle was mostly English. Therefore, it was helpful for English language learners (6 students), but it was not so helpful for Japanese language learners (15 students). Since the improvement of their target language skills is one of the class objectives, it is our next work to consider how our system can be utilized for the language learning including its contents. The average scores of its fun factor (Q2), its interface (Q6) and the whole system (Q7) were 3.9, 3.8 and 3.7. which we consider them passable enough so that no urgent refinement is necessary.

Figure 4 shows the result of the question: which one was the easier to handle, InCircle or Blogger site? two thirds (14 out of 21) of the students felt InCircle was easier to handle. This implies that the majority felt that the Blogger site was more complicated to write comments in than InCircle. It was in line with the high score of Table 4 Q1.

D. Discussion

Our research questions were (1) Can InCircle contribute to the enhancement of the students' mutual cross-cultural understanding? (2) Can InCircle contribute to the enhancement of interaction among the students? As for (1), it can be said safely that our system contributed to enhancement of mutual cross-cultural understanding because of the fact that the average point of Q.4 (Was it helpful for understanding Japanese culture and other cultures?) was as high as 4.3. In traditional teacher-centered lecture style class, it is difficult for the students to learn from other students. For instance, they could learn how to celebrate New Year in other countries by using InCircle. As for (ii), even though the average point of Q.3 (Was it helpful as a means of communication with your classmates and teacher?) was 3.7, not as high as expected, more students used InCircle than Blogger comment column and the number of postings via InCircle outnumbered Blogger comments (Table I). Therefore, it can safely be said that our system contributed to enhancement of interaction among the

students. Since other SNS tools, such as Facebook, LINE, twitter have some weaknesses as a communication tool for classroom use as mentioned earlier, InCircle is expected to be an effective communication tool in student-centered collaborative learning class.

Table 5 shows the participants' free comments on InCircle.

TABLE V. THE STUDENTS' IMPRESSION OF INCIRCLE

No.	Comments
#1	so so
#2	it's good
#3	Quite similar to any chat system I experienced before...
#4	It's a good system and easy to use.
#5	It seems like a neat tool with a clean interface and without much bloat.
#6	Good for communication
#7	I like how easy it is to access.
#8	i would use it as part of class
#9	Pretty good but similar to other platforms
#10	Just normal chatting Website
#11	It could get a little disorganized with so many people in the class.
#12	Good Experience
#13	I think it is like the application, "LINE" or "Skype".
#14	It was refreshing and fun! New style!
#15	I'm not sure how exactly I would benefit from using the site. It is nice and all, but we did not use it that much in class so that I would have gotten a clear understanding in what kind of situations it would be helpful. Connecting with teacher is for me done by email or in person, and classmates you would use whatever social media app is popular atm, email or in person.
#16	There is, in my opinion, no need to use it. It provides you with an easy opportunity to communicate with class members and the teacher but there is no need for communication. This class is about computers in language learning, and in my opinion sharing with others is not the primary way of achieving that. Therefore, I am just not interested in using these kind of programs.
#17	Very useful!

There are two clearly negative comments: #15 and #16 which seem non-negligible. The result of the learning style questionnaire which was conducted at the beginning of the semester, showed their preference of "learning alone" to "learning in a group". There might be a possibility that their negative attitude toward group learning reflected their negative comments on InCircle. This is not directly connected with the effectiveness of the system itself, but how to deal with those students who prefer "learning alone" is an important issue to cope with for an implementation of a successful collaborative learning.

IV. CONLUSIONS AND FUTURE WORKS

In this study, we describe facilitating interaction among students using InCircle. When compared with Blogger comment column, InCircle showed its superiority in many

aspects as described in Discussion section. The questionnaire results showed that the students were satisfied with its usability. Our hypotheses (research questions (1) and (2)) were proved to be correct. However, it was found out that our system was not supportive for their target language learning. Since it is one of the two objectives of the target class, it is necessary to consider how to introduce InCircle from the pedagogical viewpoint in order to support their language learning. It is among our future works to find out some solutions to improve the skills of their target languages via InCircle. In addition, even though it does not concern our system itself, there are some students who are not keen on collaborative learning. How to get those students involved in collaborative learning is another issue to tackle in the future.

ACKNOWLEDGMENT

Part of this research work was supported by the Grant-in-Aid for Scientific Research No.16H03078 from the Ministry of Education, Culture, Sports, Science and Technology (MEXT) in Japan.

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