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Foreign Language Education$_2^{++}$

Final Report

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Project Page https://foreignlanguagepp.wordpress.com

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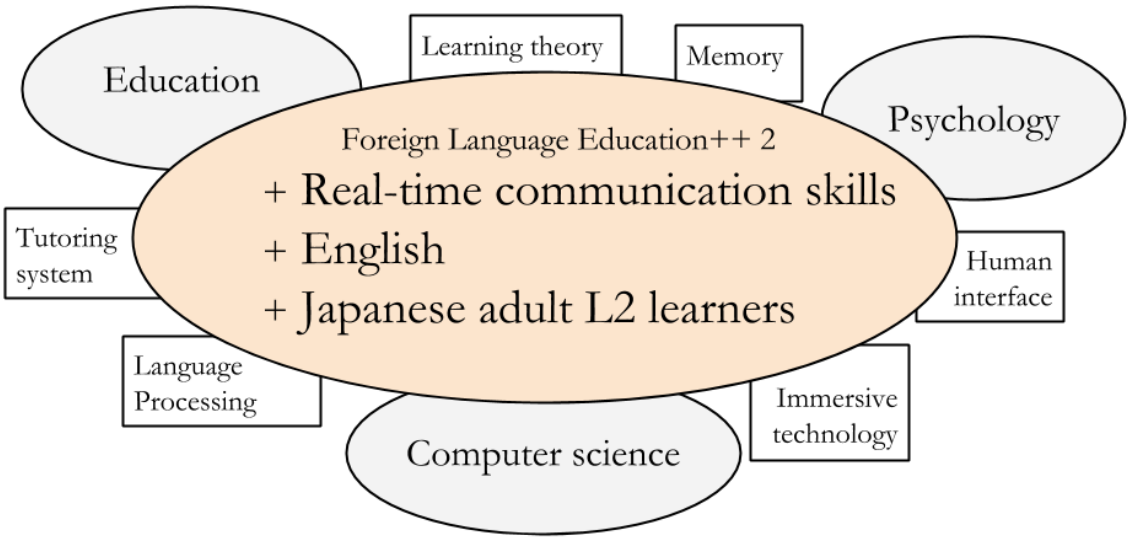
1. INTRODUCTION

Victoria Abou Khalil



The Japanese Ministry of Education (MEXT) has been improving English education in school.[1] The MEXT started mandatory English classes for the fifth and sixth grade students in elementary school since 2008. This reflects that Japanese people have long had difficulty in using English. In 2005, the TOEFL score statistics reported that Japanese people were the second poorest English learners in Asia.[2]The aim of this FBL/PBL project is to find a solution to help Japanese improve their English skills.

1-1. Target

We targeted at adult learners that want to improve their English skills. Although the MEXT recently has been focusing on English education in high school, adult learners are still facing difficulty of learning English despite of their efforts. Moreover, we believed that it is easy to approach them because we are also adult learners.

1 http://www.japantimes.co.jp
2 http://www.ets.org

1-2. Focus

The biggest defects of English education in Japan are speaking and listening. While Japanese students tend to have good reading and writing skills, it is often extremely difficult for most of them to have a fluent English conversation. Why? This is because English education in Japan focuses mainly on reading and grammar and ignores speaking and listening. Therefore, we decided to focus on improving the real-time communication skills including speaking and listening skills.

In fact, speaking has many aspects such as academic presentations and casual talk. Because school education, especially in university, offers training for academic English and leaves students with little or no experience in casual conversations, we targeted at English in casual talk.

1-3. Methodology

In this paper, we propose a teaching method that reduces the anxiety of students and motivate them. We found that students learning English in Japan seem very interested in grammatical correctness, and this make them suffer from increased anxiety and shyness when they are trying to speak English.

1-4. Skills

We specified two issues that Japanese students face when they speak English. First, they tend to think in Japanese and translate their ideas from Japanese into English before answering, resulting in relatively long response time. The other issue is cultural; Japanese people tend to avoid stating their opinion directly during a conversation. These issues make real-time communication in English difficult. Therefore, we focused on skills to decrease the response-time and to state their opinion in this project.

2. PROBLEM CLARIFICATION

Sho Ishiguro

2-1. Methodology

In order to clarify the problem, we *shared personal experience and observations* in seminar presentations and *discussed them from different perspectives* (points of view of psychology and informatics). First of all, we introduced ourselves at 6th of June. Self-Introduction was a good opportunity for knowing each one's background and majors in addition to merely "making friends". Understanding of each one's specialty was a key factor for our collaboration so that we took advantage of each one's expertise. Self-Introduction also showed our motivation such as interest about Multimodal-learning, competitive motivation, cultural interfaces and L2 learning with eye tracking technology. We continued the discussions throughout the seminar and narrowed down the problem, which means we specified the problem and we had decided not to address some topics (i.e., eye tracking technology).

Figure 1: Mr. Rossiter's Talk

We also had *two talks* by Mr. Rossiter and Prof. Kanamaru.

Mr. Rossiter is a teacher at Berlitz with rich professional experience of teaching English to Japanese People. He arrived in Japan in 1975 for the first time and began teaching English. In his talk, he mentioned a psychological factor that seemed to hamper learning English, *fear* or *shyness*. Japanese people tended to be so shy that they would not reply in English when they were asked for directions by foreigners. They, instead, made big "X" gesture to show that they did not speak English. Fortunately, that situation has changed little by little. He said that nowadays many Japanese, even school students, are willing to tell directions in English. We were especially interested in the psychological factor for several reasons. First, we assumed that we could offer an environment, which should attenuate fear of speaking English by using Avatar and making comfortable environment. Second, Ayano already discussed a psychological factor that might affect learning English and we shared a psychological point of view.

Prof. Kanamaru is an expert of informatics and natural language processing and currently works for English education at Kyoto University. The most relevant topic in his talk to our project was *distinction between English for Academic Purposes vs. English for General Purposes*. Looking at English education from a practical point of view, this distinction seems useful for defining the purpose of education. Kyoto University's Curriculum was designed to improve students' academic English skills and therefore the university offers academic writing courses and academic presentation courses. Although we thought about *small talks in English*, they could be considered to be English for General Purposes, which university education has not tackled. Thus, our project contributes to another aspect of English education that has not been addressed. He also introduced a new e-learning environment in the experimental state, where learners can use a touch panel to answer questions and get an interactive feedback. Our solution is also regarded as being in line with the current trend of using technology in education.

2-2. Important subproblems

Based on the big picture described above, we specified the four subproblems in the current English learning in Japan to clarify the problem.

1) School English education: School English education focuses mainly on grammar and translation training.

2) Lack of practice: L2 learners' lack of practice and experience for English communication, subproblems relating to being afraid of speaking English.

3) Learning environment: Learners learn in poor learning environment such as insecure environment and/or uncomfortable situation. For example, students may not do in a classroom as well as they can because of fear.

4) Thinking in Japanese: Learners tend to think in Japanese and translate the Japanese sentences into English. Because this translation process takes long time, they hardly keep up with English conversation.

3. SOLUTION DESIGN

Ayano Tsuda

Based on our previous discussions and introductory talks by *Mr. Rossiter and Prof. Kanamaru,* our project goal came to be improving English-speaking skills for Japanese learners, targeted mainly on adult learners. We extracted four requirements, which were as follows:

1) Secure environment: to create a secure environment to reduce fear and anxiety when learning a second language,

2) Multimodal communication: to use multimodal communication channel to facilitate learning,

3) Immediate feedback: to provide immediate feedbacks by implementing systems using immersive technologies,

4) Adaptive feedback: to create a system that is adaptive to each learner's learning and their goals.

Our requirements were founded upon the notion of situation-based learning (SBL), which focuses on acquiring a language through extracting meaning in a context, similar to infant's first language acquisition (Tomasello & Akhtar, 1995). This method of learning is said to benefit real situational communication (Tomasello & Akhtar, 1995), which aligns with our project goal.

To implement our solution design, we decided to use immersive technologies, such as computer role play and avatars. Our motivation for using these technologies were firstly, by using avatars that masks one's identity, we postulated that it would help one to overcome their fear and anxiety by creating a secure environment, which could boost their confidence.

Secondly, we thought these technologies would provide immediate feedback, which could help the learner to evaluate oneself and make improvements when necessary in a facilitated manner. Lastly, with motion capture technologies, we assumed it would create a multimodal communication channel that would encourage language learning of the adult learners.

4. DEVELOPMENT

Naoki Otani

Based the design requirements we explained in the last section, we designed a computer role-play system, where learners communicate with computer agents and other learners in English. Our role-play system enhances a situation-based learning, learners can practice English through using English. In the role-play, the computer system gives a practical situation (e.g. asking direction in streets and ordering food in restaurants) and each learner and computer agent has his/her own role.

Using immersive environments and avatars, learners really can act the role without fear and anxiety (requirement 1). For example, suppose two learners, A and B, are in different environments. The learner A takes an order from the learner B as a waiter. The learner A is projected as a computer-graphic avatar wearing a waiter costume on the learner B's screen. The learners cannot see the other's face and body. Learner's body motions are captured for controlling avatars by using physical sensors such as Kinect (requirement 2). Thus the learner can communicate only with gestures for some extent. Such multi-channel information gathered from sensors can also be used for the system to produce immediate feedbacks (requirement 3). For instance, when a learner moves his/her hands without saying anything, the system detects it and says something supporting the learner. The system stores various kind of situations (or learning materials) and can provide the best situation that matches learners' goals, motivations and levels (requirement 4).

The role-play system itself has already long been practiced in real education. For example, most of textbooks used in Japanese school include many dialogue passages, which help teachers let their students communicate with each other in English. However, many researchers still have been working on developing computer-assisted role-playing system. Some studies have shown that the role playing system has positive effects on interview training (Baur et al., 2013) and communication (social) training (Hoque et al., 2013, Pan et al., 2012).

However, it is still very hard to realize such a high-quality automatic communication system. First, automatic speech recognition, a process to convert phonetic information into languages that computers can understand, is an open research field and there are many emerging novel works to improve the recognition performance every year. Moreover, it is another difficult task to for computers to understand the human's intentions, while such understanding is an important point of human communication.

Therefore, in this project, we decided to develop baseline systems to realize a role playing system and an immersive secure environment and evaluate the effects on learners feelings (fear, anxiety and motivation) comparing our technology-enhanced methods with traditional teaching methods.

We conducted two experiments on two different baseline systems. First, we developed a web-based role-playing system, where learners read aloud given scripts and the system responses to them. We conducted experiments with crowdsourcing and studied learners' attitudes to English with a questionnaire. Second, we prepared a communication platform with an immersive environment. We gave a lecture in English school with traditional methods and conducted experiments with the immersive environment in university. We then analyzed participants' feelings.

5. STUDY 1

5-1. System *Naoki Otani*

We develop the web-based role-play system. Why did we make it web-based? It was to obtain as many experimental results as possible from web. By making our system available in the Internet, we conducted experiments in crowdsourcing, which is an upcoming process to obtain needed results from many workers in the Internet by paying low cost to them. We developed the web-based role-play system using two components of *Web Speech API*[3]: Speech Recognition and Speech Synthesis, which are currently only available on a Google Chrome web browser. In our web-based role-play system, a user communicates with computer agents as follows: the user first read aloud a given script (e.g. "Hello, thank you for seeing me"). The system recognizes it automatically. If the recognized text matches the script, the system read the next script ("Hello, sir."). The system's voice is generated by the Speech Synthesis API. The user read the next script again. In this study, our web-based role-play system takes about 3 minutes to complete whole the role-play.

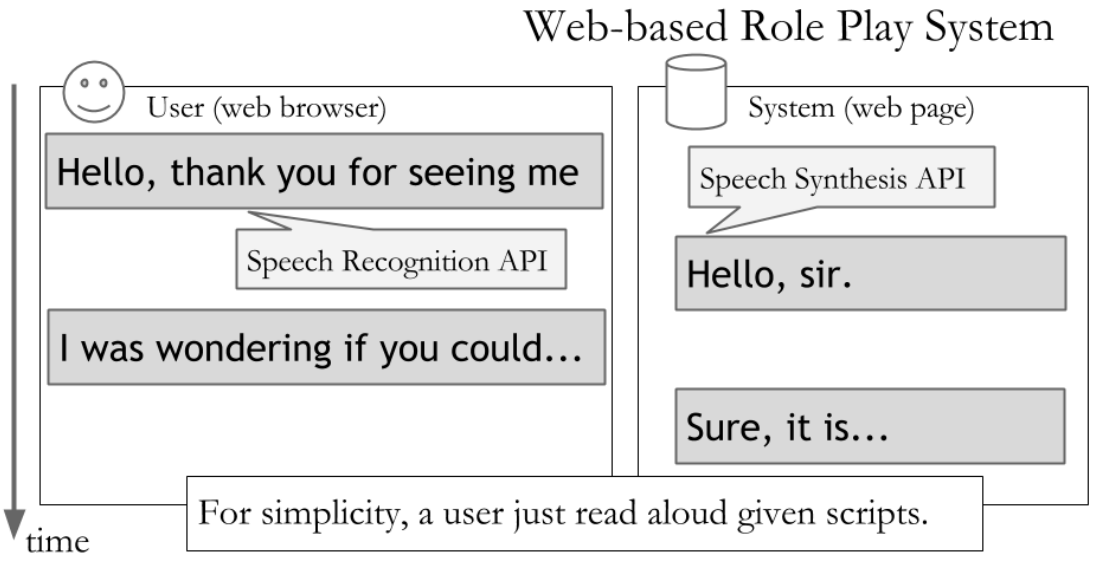


Figure 2: Web-based Role play System

3 Web Speech API Specification, https://dvcs.w3.org/hg/speech-api/raw-file/tip/speechapi.html

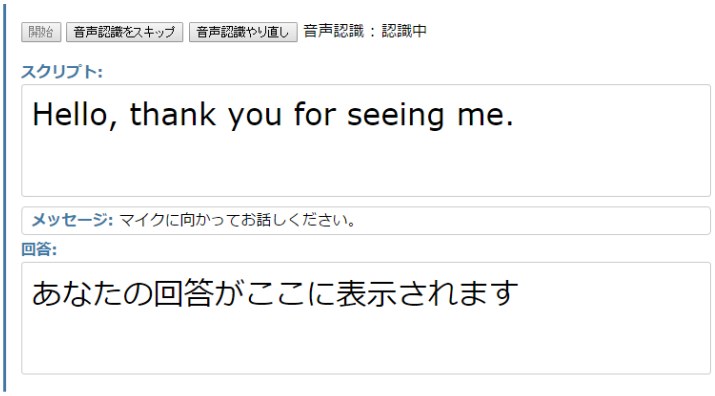


Figure 3: Role-play System Interface

5-2. Participants *Sho Ishiguro*

46 adult participants were recruited via *lancers*[4], a Japanese commercial crowdsourcing platform. In this study, 16 of 46 participants were assigned to the role play condition and 30 of 46 participants to the no-role play condition (We will explain the two conditions later in section 5-4.).

5-3. Materials *Sho Ishiguro*

English Video and Script. Free English video offer by British Council[5] was used. The transcript of this video is also available and it was used as the *script* in this study.

Role-play. As we explained earlier, the role-play system is implemented in the form of a website where participants can do a English role play with interactive responses.

Questionnaire. Three questionnaires, *Scale of Attitudes and Motivation in Learning English* (Koizumi & Matsuo, 1993), *Multidimensional Perfectionism Cognition Inventory* (Kobori & Tanno, 2004) and *English Language Classroom Anxiety Scale* (Kondo & Ying-Ling, 2003) were selected and modified for the present study. Because participants included non-university students, items from English Language Classroom Anxiety Scale were modified to measure English Language Anxiety in general.

4 Lancers, http://www.lancers.jp

5 British Council. Word on Street, http://learnenglish.britishcouncil.org/en/word-street/big-meal-scene-1

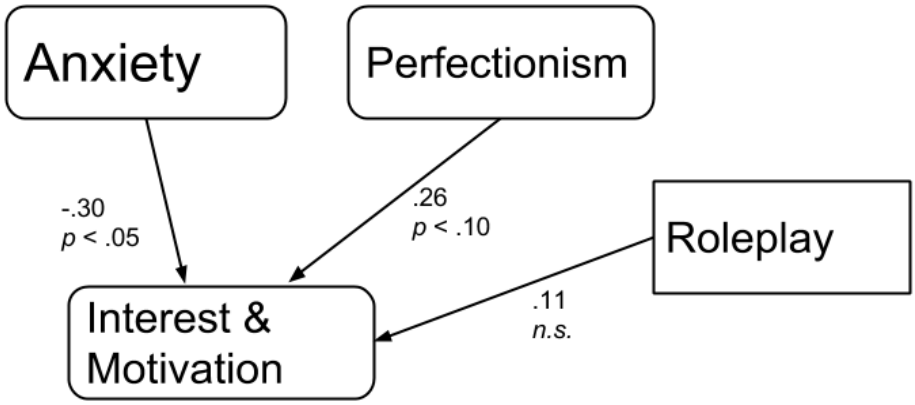


Figure 4: Model 1

5-4. Procedure *Sho Ishiguro*

Participants in the both conditions watched English video, and then participants only in the role-play condition did the web-based role play. In the web-based role-play phase, participants read a sentence from the script loud. When participants read it so accurately and clearly that the Speech Recognition API recognized it correctly, the webpage replied (it read another sentence from the script corresponding to what participant read) and showed another sentence which participant were to read loud. They then answered the questionnaires. Participants in the non-role play condition answered the same questionnaires without the web-based role-play. All participants were recompensed. We paid 200 yen for each task. The total cost was 10,280 yen.

5-5. Results *Sho Ishiguro*

Structural Equation Modeling (SEM) with latent variables was used to analyze the data. *Anxiety*, *Perfectionism* and *Interest & Motivation for Learning English* were supposed latent variables in models to represent 'true' values. Since measurements of each item (question) inevitably have measurement errors, controlling errors by using SEM was considered to be effective. Anxiety, Perfectionism and Interest & Motivation were standardized and follow a normal distribution. Role-play was a dummy variable (0 or 1 indicating doing or not-doing role play respectively). Numbers in figures showed relations of variables as a correlation coefficient does.

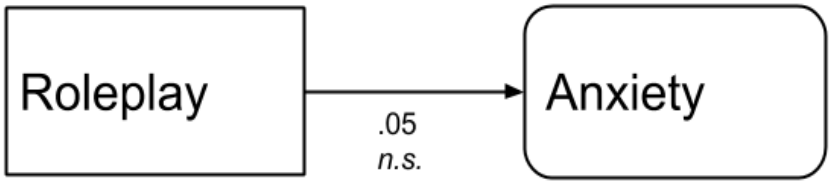


Figure 5: Whether Role play affected Anxiety

The first model was a model, which assumed that Anxiety, Perfectionism and Role-play affected Interest & Motivation (Figure 4). Anxiety negatively affected Interest & Motivation (β = -.30, p< .05). However, neither Role-play (difference between doing or not-doing role play) nor Perfectionism affected Interest & Motivation.

Another possibility that Role play affected Anxiety was then considered (Figure 5), but Role play didn't affect Anxiety (β =.06, *non significant*).

5-6. Discussion *Sho Ishiguro*

We had discussed the influence of psychological factor on learning English before conducting this experiment. The result that Anxiety affected Interest & Motivation confirmed our notion. It may suggest that Anxiety including fear and shyness hampers learning English by lower Interest & Motivation, which boosts learning, English in the long term. Regarding role-play, our role-play seemed to fail to enhance Interest & Motivation and to lessen Anxiety at first glance, but our aim was not only to create an effective system for English education but also to establish *a way of assessing a system*. In this sense, this study had a great success and will contribute to future work. In addition, it's important to note that Anxiety and Interest & Motivation were formed over many years and they may be stable and hard to change. One-shot role-play may not be enough to change Anxiety or Interest & Motivation. If participants did our role-play several times, we might have seen the relation of Role-play and Anxiety.

Future work should address two aspects. First, it should identify the problem of lack of the possible influence of role-play on psychological factors. Our implementation didn't affect psychological factors or failed to detect the possible influence. As we mentioned earlier, this may be because one-shot role-play was not enough to change Interest & Motivation. Future work should focus on the effect of role-play in long run or the effect of doing role-

play multiple times. Alternatively, our system failed to affect Interest & Motivation because the script in this experiment could not be proper for role-play. It's very likely that some scripts are proper for role-play and others are not. Future work should use a variety of scripts. Another possibility is that online experiment was not appropriate way of demonstrating the influence of role-play. We chose online experiment because of easiness and quickness for gathering participants. We can recruit participants across all age groups in relatively short term. In a traditional way of experiment, we advertise in the university and recruit mainly university students. Despite some advantages, online experiments have potential problems. The most crucial problem is that online experiment cannot reduce error factors in its design. For example, participants in an online experiment may do task-unrelated thought or *mind-wandering* during role-play. We also cannot make the environment same to every participant. Some participants may have done our role-play in a noisy environment. For the reasons stated above, our data could be contaminated by these error factors. The traditional way of experiment may be required.

Second, it should make a hypothesis of how role-play can affect Interest & Motivation. Role-play can affect Interest & Motivation directly and it can affect via Anxiety as a *mediator* (Anxiety mediates the relation of Role play and Interest & Motivation). If doing role-play lessens anxiety, lessened anxiety then will increase Interest & Motivation.

We would like to add lastly that the members from different specialties, namely informatics and psychology contributed to this study using their working knowledge and sharing perspectives. We realized a synergy in this work, something more than the simple sum. We admit that coding and analysis could be outsourced, but all we did was not just coding and analysis. We discussed problem setting, the way of solving the problem, assessment and interpretation of data. We found the invaluable interaction effect in such discussions.

6. STUDY 2

The objective of the second experiment was to find out the effectiveness of the use of immersive technologies in reducing anxiety when learning a second language. This study was divided into two parts. In the first part, we conducted a preliminary experiment to observe the anxiousness one feels in traditional English teaching method. In the second part, we conducted a separate experiment with different participants and tested the effectiveness of teaching using immersive technologies. Both the traditional teaching method and the teaching with immersive technology were conducted with the same theme. We predicted that use of immersive technology will attenuate anxiety towards learning English and that use of immersive technology will motivate students more compared to traditional teaching methods.

6-1. Part 1 *Ayano Tsuda*

6-1-1. Participants

Participants were recruited from You∞ Me English conversation school located in Osaka. The first participant (P1) was a male in his forties, who was learning English for skill up, and the second participant (P2) was a female participant, currently attending a university and learning English because it is required for school.

6-1-2. Procedure

We conducted a questionnaire to evaluate each participant's anxiety and fear towards learning English. The questionnaire consisted of three sections. The first section asked about their background information, including their reasons for learning English, and their scores in language qualification exams. The second section consisted of questions regarding their anxiety towards learning English adapted from English *Language Classroom Anxiety Scale* (Kondo & Ying-Ling, 2003). It measured the general anxiety one feels towards learning English, such as 'I worry whether I can keep up in class', their anxiety about what others think, 'I worry whether others think my English is bad' and anxiety towards speaking, 'I get anxious when I give presentations in front of class'. They were rated in a six point-Likert scale (1: disagree, 6: agree). The third section measured participant's motivation and interest in learning English adapted from Tanaka and Hiromori (2007). The questions intend to measure four aspects of motivation, which were; 1) *Internal motivation*

which happens when one feel pleasure and enjoys doing the activity, ‘I enjoy finding out new things about the language’. 2) *External regulation*, when one does something for external reward or constraint, e.g. ‘I learn English because of the exams’. 3) *Introjected regulation* which refers to taking regulation put by others but not as own, e.g. ‘I feel ashamed of myself when I can’t speak English’. 4) *Identification*, which is part of internal motivation, in which one values other’s goal and regulation as own, e.g. ‘Learning English will help me grow as a person’. These items were also rated in a six point-Likert scale (1: disagree, 6: agree).

Only for the first questionnaire, we also asked about the participant's impression towards English teaching using technologies such as social networking sites and virtual realities, rated from looking forward to being worried.

The experiment for part 1 was done in a two-phase process; in the first phase (pre-test) we conducted the questionnaire to gather baseline information of the participants. In the second phase, the participants participated in an actual traditional teaching in which they learned about how to interrupt conversations in a polite manner using phrases such as ‘By the way...’ and ‘ Do you mind if I...’. After the teaching, the participants completed the same questionnaire as the one for the pre-test.

6-1-3. Results

For the first questionnaire, questions regarding participant’s impression towards English teaching using technologies such as social networking sites and virtual realities were asked. One of the participants mentioned they were looking forward to it because one “can communicate with others”. The other participant said they were kind of looking forward to because “if using them helps, then it’s good”. As for the use of virtual realities in learning English, one mentioned they were worried because ‘not sure how it works, whereas the other said they were kind of looking forward since “if it really works it would be good”.

Related *t*-tests were conducted between the first phase and the second phase to observe whether there were changes in each participant’s anxiety and motivation. For the anxiety factors (graph 1), there were no significant difference for general anxiety ($t(1)=2$, $p=n.s.$), approval anxiety ($t(1)=1$, $p=n.s.$) nor with speaking anxiety ($t(1)=3$, $p=n.s.$). As for the motivational factors (graph 2), there were no significant difference for internal motivation ($t(1)=3.836$, $p=n.s.$), external regulation ($t(1)=1.333$, $p=n.s.$), introjected regulation ($t(1)=-1.333$, $p=n.s.$) and identification ($t(1)=3.836$, $p=n.s.$).

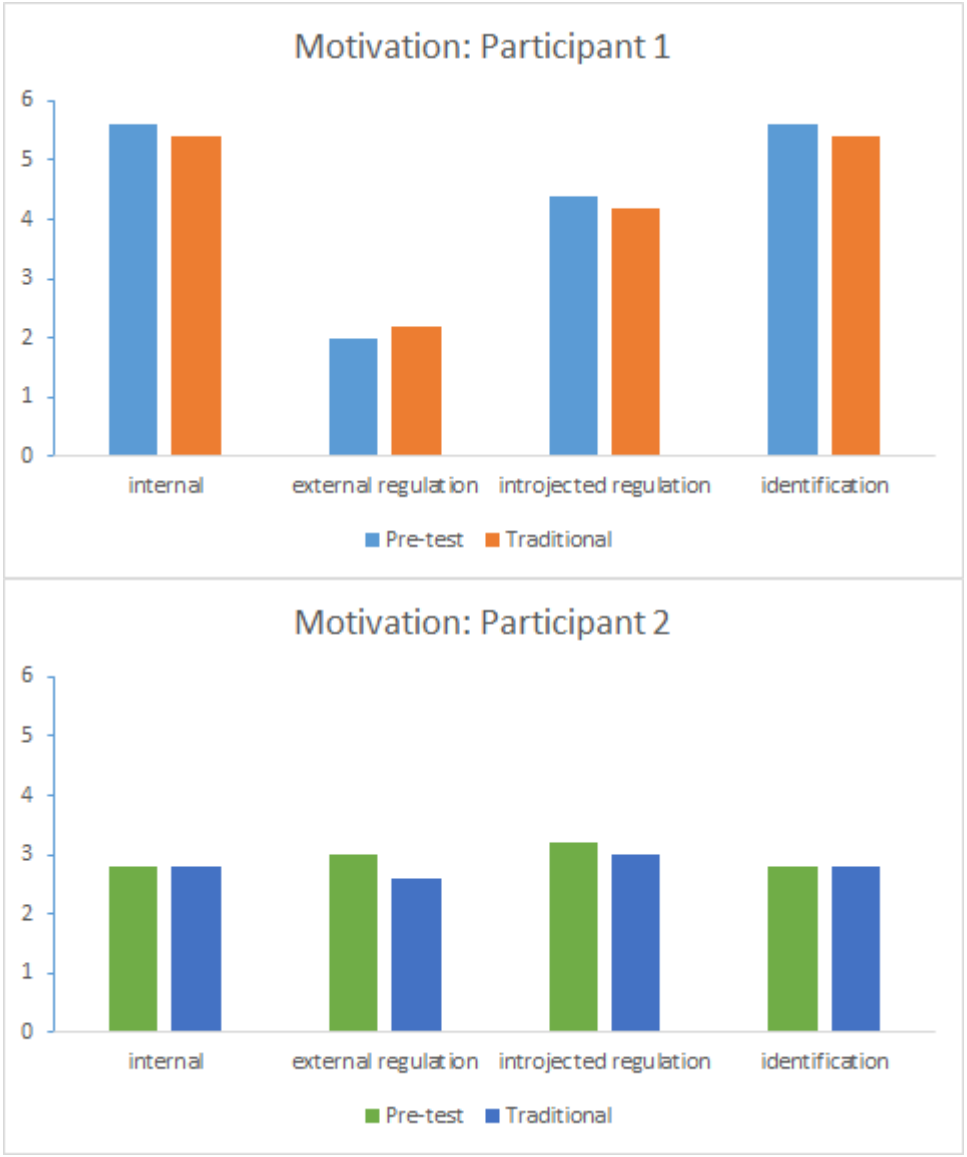


Figure 6: Motivation Results of Participants 1 and 2

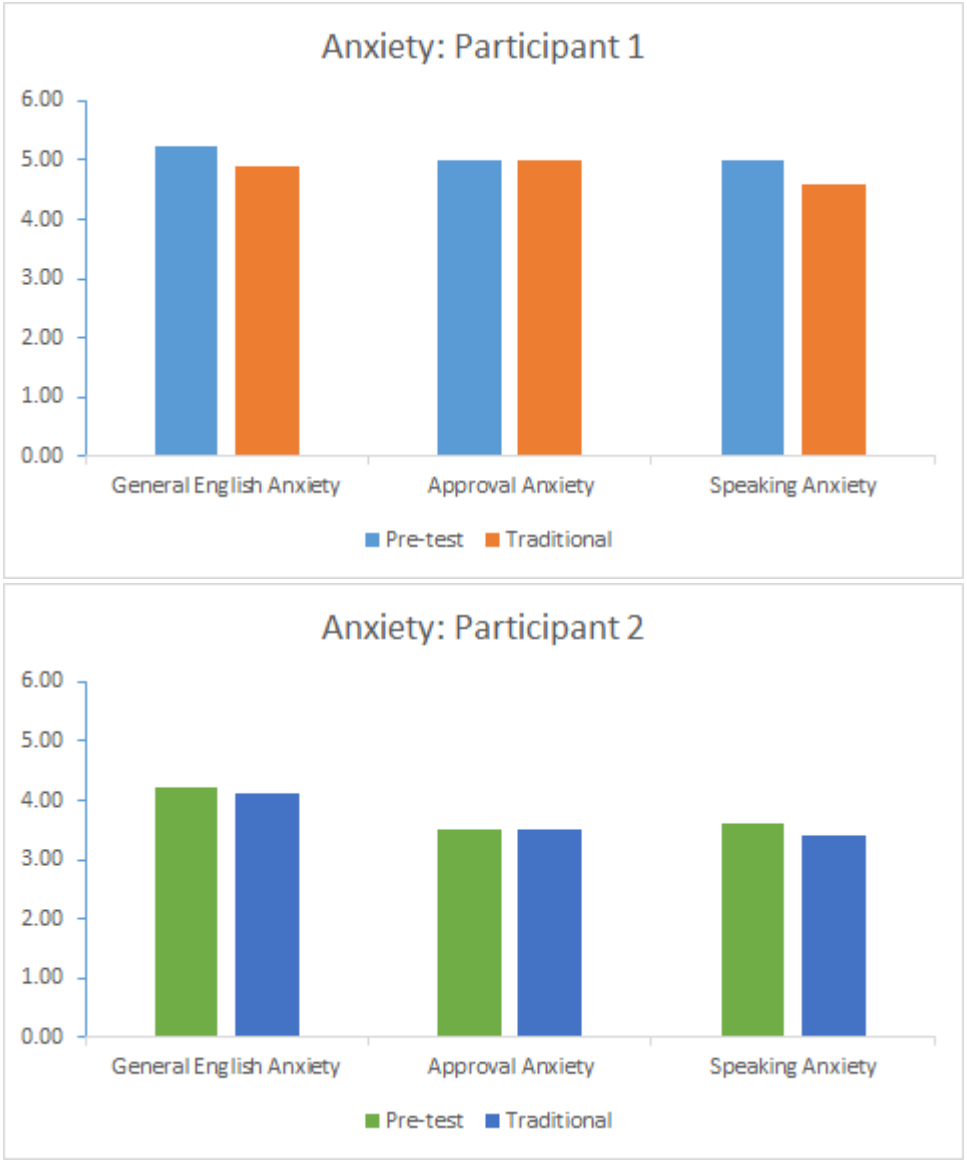


Figure 7: Anxiety Scale Results of Participants 1 and 2

6-1-4. Discussion

As a preliminary study, we compared the anxiety and motivation individuals face when learning English. The results indicated that there were no significant difference between the first phase and second phase for both motivation and anxiety for each of the participants. However it is worth noting that at individual level, participant 1 had higher anxiety level but also higher internal motivation, indicating that this participant is studying English for enjoyment but the anxiety is still present. It might be necessary to look at performance in future research to specify whether one's motivation would help improve one's performance despite their anxiousness or worsen one's performance because of their anxiety.

Figure 8: Immersive Environment

6-2. Part 2 *Victoria Abou Khalil*

6-2-1. Participants

The two participants were both male university students at Kyoto University specializing in Informatics with low to average English speaking skills.

6-2-2. Procedure

As for the previous part of the experiment, we conducted the same questionnaires to evaluate each participant's anxiety and fear towards learning English. The first section was as for the first part about their background information, including their reasons for learning English, their scores in language qualification exams as well as the participant's impressions towards English teaching using technologies. The second section consisted of questions regarding their anxiety towards learning English. The third section measured participant's motivation and interest in learning English.

This part of the experiment was done completely in an interactive environment. As shown in the figure below, the environment offers gesture recognition and allows people to interact with each other through avatars. The immersive environment is supposed to offer the feeling of a secure environment to the student, as the students will find him/herself

alone in the environment interacting with another student anonymously.

Participants were given the following subject:

"You are walking in the countryside with your friend and you are discussing an outdoor activity to do in the afternoon. Your friend is proposing an activity. Interrupt him/her with one of the sentences below, and give your opinion about the matter. Which activity you will like to do (Basketball, Drinking, fishing, etc.)? And why?"

Interruption sentences:

- By the way....
- Do you mind if I …
- Excuse me ...

Participants interacted with each other without being physically in the same space and without getting to know each other personally, but only through the avatars.

6-2-3. Results

For the first questionnaire, questions regarding participant's impression towards English teaching using technologies such as social networking sites and virtual realities were asked. Both participants were kind of looking forward to it because the first participant "can't come up with an example of English teaching using SNS' and the other participant thinks that "Using apps close to our lifestyle may lead people to be in touch with English more and increase the English level" As for the use of virtual realities in learning English, one participant was kind of looking forward because it will allow to "have conversations with people one normally won't". The other participant was looking forward stating that the 'reason why one does not speak English is because we live in Japanese based daily lifestyle where English usage is not necessary. If the virtual really works, one can connect to foreign countries and force oneself to speak English.' mentioned they were worried because 'not sure how it works, whereas the other said they were kind of looking forward since 'if it really works it would be good'.

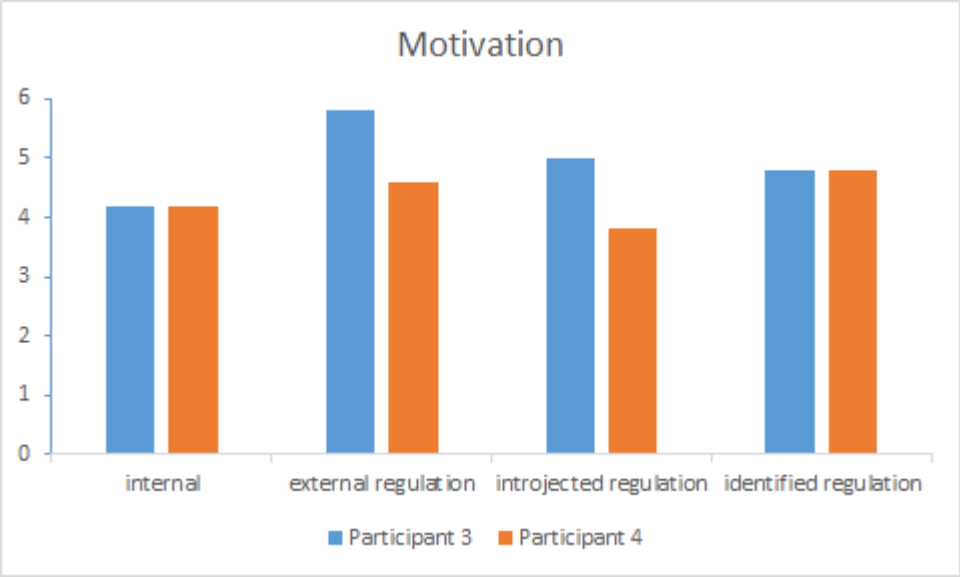


Figure 10: Motivation Results of Participants 1 and 2

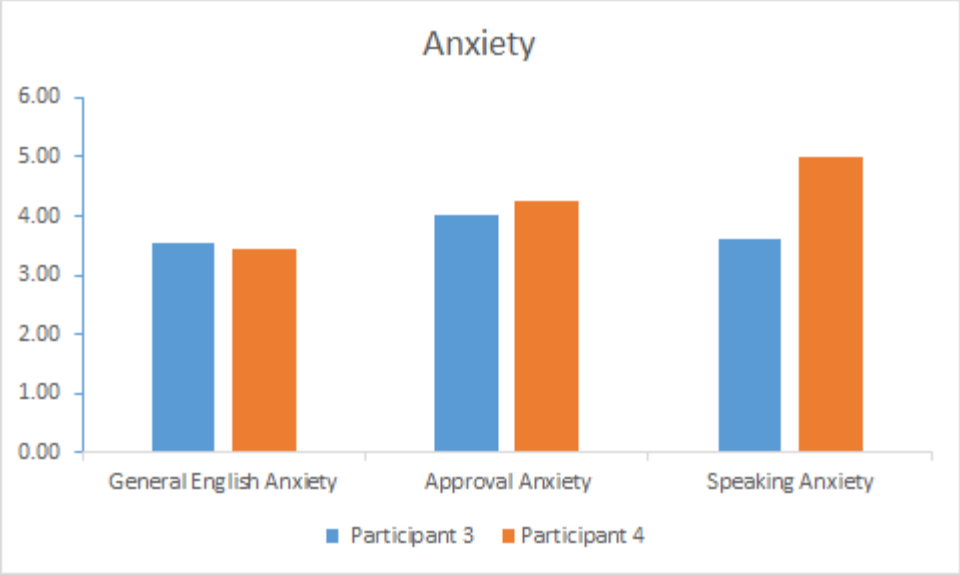


Figure 11: Anxiety Results of Participants 1 and 2

6-2-4. Discussion

As a preliminary study, we compared the anxiety and motivation individuals face when learning English. After conducting the experiment we weren't able to conduct another questionnaire. However a relaxed atmosphere was observed. In fact, each participant was left in his space (interactive environment) alone. Ten minutes later, when we came back to put an end to the experiment, we observed a relaxed atmosphere from both sides, as they were still talking and joking with each others in English through the interactive environment.

One limit of this research was that we were unable to conduct a third phase in which the same participants would attend a teaching session using immersive technology that would have helped to directly compare the effect of the use of immersive technology. Therefore, this research should be continued in clarifying its effect in attenuating anxiety and increasing one's motivation.

7. CONCLUSION

Naoki Otani

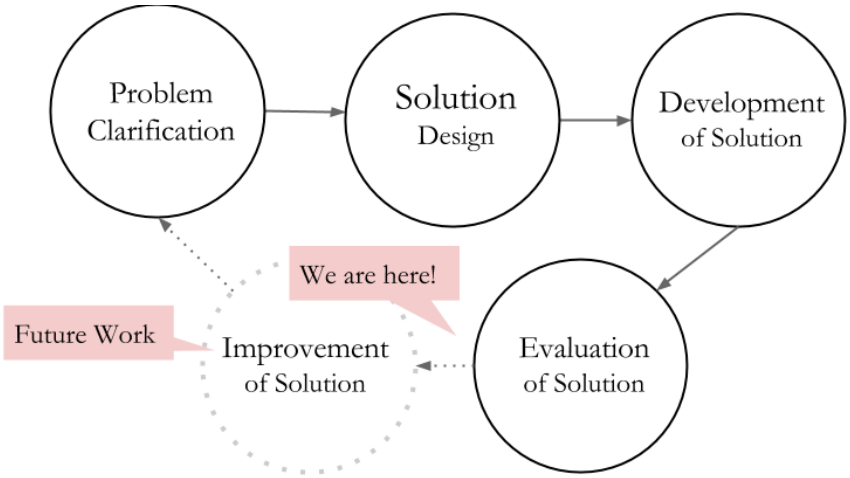


Figure 9: Project Overview

In this project, we tackled the problem of English education in Japan. We focused on adult learners in school. Our aim was to find a solution to help the learners improve their English skills, especially real-time communication skills including speaking and listening. Based on the general design process, we started from clarification of the problem, designed and developed our solution and finally evaluated our approach.

First, we defined the problem through discussions in class and talks given by two lecturers. We specified the following four obstacles in English education in Japan: 1) school education focuses mainly on grammar and translation, not on real-time communication. 2) Learners lack of practice and experience for English communication and tend to be afraid of speaking English. 3) Learners are in insecure learning environments, which make them feel fear to make mistakes 4) Japanese learners first think in Japanese, taking a long time to speak English.

Second, we designed a solution to solve these problems. Our solution is situation-based learning (SBL), which focuses on acquiring a language through extracting meaning in a context. This method of learning is said to benefit real situational communication. Moreover we extracted four requirements for effective SBL: 1) secure environment to reduce fear and anxiety, 2) use of multimodal communication channel, 3) immediate

feedbacks by systems using immersive technologies, 4) adaptive learning to match each learner's learning and their goals.

Third, we developed our solution as computer-assisted role play system to support SBL. The system satisfies the four design requirements. It uses immersive technologies and keeps learning environments secure, where learners communicate with others through avatars. By using physical sensors, learners and computer agents can communicate in multimodal channel signals. The computer agent can provide immediate feedbacks by exploiting such information. The situation is adjusted to meet learners' goals, motivation and skills. However, it is still very hard to realize these features. Therefore we focused only on the role-play system and communication with immersive technologies (avatars) and developed two baseline systems.

Finally, we evaluated the effect of our approach on learners' attitude to English. We conducted two experiments: 1) the effects of web-based role-play system on learners' feelings (anxiety, fear, motivation). The participants were recruited in a commercial crowdsourcing platform. 2) The preliminary comparison between communication through immersive technologies and traditional English class. The results implied our further direction and future work.

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