

Practice Report: On the development of medical English ESP learning model via VR space in collaboration with Finland

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ABSTRACT

Keywords:

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The paper outlines the construction process of a medical English Collaborative Online International Learning (COIL) model developed in collaboration with universities in Finland and the USA in a 3D virtual learning space (metaverse) mediated by Cross Reality (XR) technology. This technology mobilizes all aspects of Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality (MR). This paper will describe the development and construction of a medical English COIL model developed in a 3D virtual learning space (metaverse) mediated by Cross Reality (XR) technology in detail. It will then present a report on the actual lessons conducted using the model. Furthermore, using the model, it will examine the development of metacognitive ability and the L2 ideal self of the students in the classes. It will also investigate whether it is possible to learn medical English in a communicative way.

Introduction

Under the spread of Covid-19, online classes utilizing web conferencing systems such as Zoom, Webex, and Google Meet have become common. In response to these global trends, the principal investigator of this research began developing and experimenting with synchronous and asynchronous learning environments for COIL-type classes with the Nursing Department at Jyväskylä University of Applied Sciences in Finland (hereafter referred to as Jamk) as early as 2017. This pilot study focused on an ESP program for medical English. COIL represents an educational methodology that employs ICT tools to facilitate collaborative learning between two or more countries. It was first established and employed by the State University of New York (SUNY) COIL Centre in 2006. It enables students to experience diverse cultures while remaining in their own country, facilitating mutual learning across countries (and even within countries) at no cost. One of its key advantages both for teachers and learners is the potential

for facilitating collaborative research and learning, which may result in the internal internationalization of the university and the local community.

As a result, real-time interactions in English with overseas instructors and students became possible even through screens. Many participating students experienced a freshness in international communication that was not present in traditional classes and demonstrated an increased motivation for English learning. This suggests the potential for fostering intercultural communication, multicultural coexistence knowledge, and language skills while staying in Japan.

However, after some time, feedback from participating students indicated several issues, such as “unable to have conversations with the same sense as in a physical classroom” and “a lack of shared space leading to passive behavior and becoming merely listeners.” These comments revealed the limitations of this teaching method. Additionally, feedback from the Finnish side noted that “even though faces can be recognized on the screen, the spatial separation between participants remains unchanged.” Indeed, with the current mainstream 2D screens like those used in Zoom, participants’ faces are simply lined up on the screen, often leading to a one-way communication style, and interactive exchanges between students can be challenging. Consequently, even in situations suited for intrinsic motivation, creating a sense of presence and immersion in the class has been difficult.

Literature review

Ikeda (2020) [1] identifies a significant challenge within COIL, noting that it often manifests as a superficial, one-time intercultural exchange. However, due to its foundation in collaborative learning practices, COIL has the potential to foster the simultaneous development of various skills and competencies among participants. While the initiative has facilitated real-time online communication with international partners, technical limitations inherent in web conferencing tools have hindered deeper engagement and reduced the volume of meaningful contributions from students.

As Ikeda and Fujii (2021) [2] observe, expectations regarding the implementation of COIL in VR spaces and meta-verses, and the enhancement of learner mobility, are key considerations. However, it should be noted that the use of VR spaces for learning purposes remains a relatively recent innovation in Japan, having only emerged in recent years. Consequently, even at Kansai University, where the development of COIL environments is most advanced, there is an absence of concrete reports on practical examples in Japan.

In response to these challenges, the present study highlights the potential of spatial mobility within 3D virtual environments to enhance coexistence in learning spaces and promote active participation (Jeong, Lim, & Ryu, 2021) [3]. The research investigates whether the advantages of spatial mobility and social interaction within the metaverse contribute positively to the dynamics of online education, concluding that such mobility significantly enhances the sense of community in learning environments. According to Sá and Serpa (2023) [4], learners can have immersive experiences of spaces that cannot be experienced in reality and consequently

improve strategic and comprehensive thinking skills, problem-solving skills, and learn skills necessary for the real world.

Moreover, the literature on foreign language acquisition utilizing Extended Reality (XR) technology has proliferated in recent years (Hein et al., 2021; Xinyi Huang et al., 2021) [5]. Li and Lan (2022) [6] introduced the term Digital Language Learning (DLL) to characterize the emerging digital technologies that facilitate language learning, including XR, natural language processing (NLP), machine learning, and automatic speech recognition. As for DLL, Li and Lan further say in the same article that “Because of its highly interdisciplinary nature, DLL can serve as an approach to integrate cognitive, social, affective, and neural dimensions of L2 learning with new and emerging technologies including VR, AI, and big data analytics.” By integrating these technologies, users can engage in interactions that closely resemble real-world experiences in authentic learning environments (Nicolaidou et al., 2023) [7].

As for ESP, in Japan, English language education in nursing faculties was not a popular choice in the past. However, at the beginning of the 21st century, there was a rapid progression in society's globalisation, which resulted in an expansion of the number of foreign visitors to hospitals. Consequently, nurses in clinical practice were required to communicate with patients in English. Furthermore, the results of a nationwide survey of nursing students' classes conducted at the time demonstrated a growing need for practical English language learning instruction. Although not referred to as ESP, the number of nursing faculties that adopted English language materials with medical topics increased rapidly, with about 80% of nursing faculties now offering ESP specifically for medical and nursing courses. According to Nagasaka and Uchida (2004) [8], the concept of collaboration between English and nursing teachers has been traced back to Dudley Evans & St John (1998) [9] and Hutcheson and Waters (1989) [10].

With regard to language teaching using VR spaces, research has shown that language training activities in Second Life were shown to make a positive contribution to the improvement of students' language skills (Nguyen et al., 2021) [11]. Moreover, Tran (2021) [12] shows the importance of learners' attitudes and social interactions especially towards virtual EFL classes, with the finding that classroom discourse should be more focused during online courses.

In light of the aforementioned considerations, it is imperative to identify strategies for enhancing the efficacy of COIL-type learning practices that have been implemented thus far. Additionally, it is crucial to determine how these practices can be effectively integrated with conventional learning activities

Research Questions

In order to respond to the aforementioned questions, this research project is designed:

1. To create a three-dimensional virtual English learning environment, also known as the ‘metaverse’, utilising XR technology.
2. To develop a new model of COIL for medical English learning, in which the students' output-focused tasks are assigned and their ability to communicate is improved step by step.

Implementation

After the afore-mentioned learning environment has been established, classes will be conducted based on the developed model.

Methods

The development of VR space

The initial plan of this study was to apply CG processing to a 360° panoramic image of a Juntendo University classroom, which was captured with an all-sky camera (yielding a 360° panoramic image in all directions, up, down, left, and right). The objective was to install this image (Fig. 1) in a virtual learning environment. As a 3D virtual learning space on the web, it was discovered that Norway's FYND had already developed a 3D learning space with an extremely high degree of precision (Fig 1). It was determined that utilizing this space would be more cost-effective to utilize this space than developing a VR space from scratch.

Fig 1. (Fynd Core)



It was thus resolved to employ this space.

Subsequently, a step-up learning model comprising three graded outgoing tasks, arranged in order of difficulty, was developed to form the core of the learning activities to be conducted in the space. The pilot study before this research identified the shortage of caregivers due to the super-aging population and care by robots as a common social problem in Japan and Finland. Accordingly, subjects pertaining to anti-ageing measures, including “health promotion,” “gerontotechnology,” and “comprehensive community care,” which were frequently requested by students from both countries who participated in previous studies, were designated as topics

for each phase of the investigation.

The development of COIL model

In order to optimise the sequencing of tasks in learning activities with the objective of enhancing communication skills, the SSARC (Simplify, Stabilise, Automate, Restructure, Complexify) model, which Robinson (2010) [13] graded in accordance with its cognitive complexity, was employed as a reference. The Robinson model, which was graded based on cognitive complexity, was used as a reference to restructure and complexify the learning tasks, arranging them in a progressive manner that gradually introduces more complex tasks. Moreover, English-Medium Instruction (EMI) was implemented as the pedagogical approach of the model with the objective of reinforcing the students' positive attitude towards learning in English, in alignment with the highly realistic learning in the virtual space. Additionally, it aimed to cultivate the “situational awareness,” “situational analysis,” “situational judgment,” and “situational prediction” skills essential for nurses. The five levels of competency required for nurses, namely ‘understanding the situation’, ‘analysing the situation’, ‘predicting the situation’ and ‘overcoming the situation’, were divided into three steps, with an attempt to arrange the tasks in such a way that students are clearly aware of them and to facilitate the elicitation of student comments.

Three Step Model

The content of each step is described in detail below.

Step I (Simplify, Stabilise and Automate): the promotion of health through the enhancement of situational awareness.

A presentation is given on a screen set up in the space, introducing health activities targeting older people in different countries and the role of health workers. The presentation employs an intimacy-oriented diffusion task (divergent task) to engage the audience. Through question-and-answer sessions and interviews, the participants develop mutual understanding with Jamk students on a formal knowledge level, and engage in cooperative learning that fosters solidarity while building close interpersonal relationships.

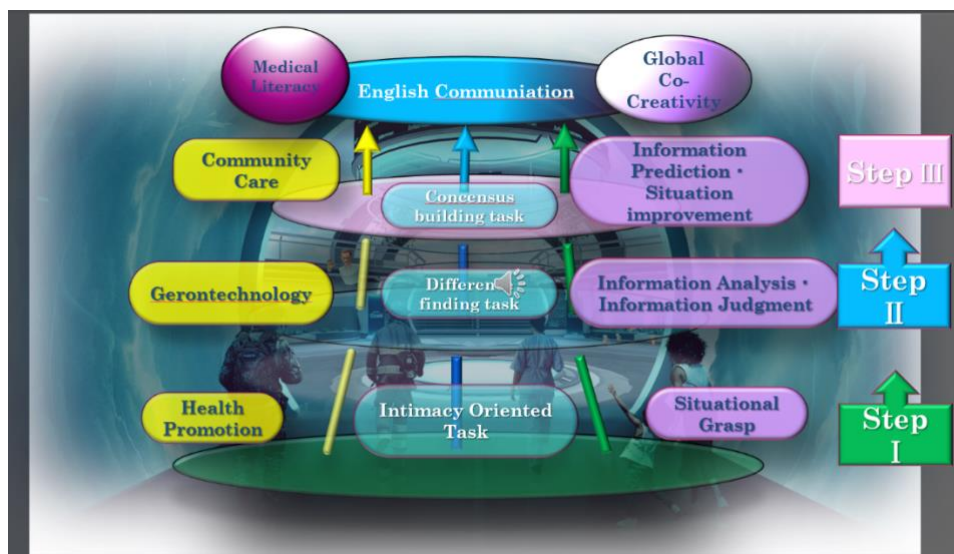
Step II (Restructure): The objective of this step is to develop the participants' situational judgment and situational analysis skills in relation to gerontechnology.

A difference-finding diffusion task is employed to facilitate the provision of information on care robots and AI from each other's countries, with a subsequent presentation comparing and analysing this information. By introducing the actual situation in Japan to Jamk students and comparing and analysing it, mutual understanding at the level of tacit knowledge, such as awareness of the heterogeneity and homogeneity between different cultures, will be promoted.

Step III (Complexify): Comprehensive community care [Developing the ability to predict and overcome situations].

Fig 2.

Three Step Up Model



Through the convergent task, mixed multinational groups (5-6 members) are formed with Jamk students to exchange opinions and hold discussions on the theme of home nursing, which is expected to become increasingly important in many countries in the future. The aim is to reach a consensus in the group through an international co-creation type collaborative presentation on the process leading to this consensus. A conceptual diagram of this model is shown in Fig 2.

Implementation in Class

A total of 20 students and teachers from two universities will participate in 12 virtual lessons. Ten students from Juntendo University, who are enrolled in English Communication II. They have achieved a TOEFL iBT score of 460 or above, or an Eiken (one of the most popular English Proficiency Tests in Japan) Level 2 certification.

Fig. 3

Organization of each unit

Organization of each unit(ex. Gerontological Nursing)

1st	Gerontological Nursing	Reading Assignment	Health Care Support by Robots and AI	VR & Contact
2nd		Idea for Presentation	Lecture by Jamk Teacher	VR
3rd		Presentation Practice	Lecture by English Teacher	Contact
4th		Presentation	VR Session With Jamk Students	VR

Schedule of the 4th Class

I . Mini-Lecture by Japanese Teacher “Robotic Device for the Elderly” (15mins)

II . Presentations by Juntendo students (30 mins)

Group A “Robots to support ADL(Activities of Daily Life) of elderly people”

Group B “Communication Robots: how do they mentally heal elderly people”

Group C “Interest-provoking Data on Robots and AI use for elderly people”

III . Breakout Room Discussion (30 mins)

Ten Jamk students led and instructed by Vehmaskoski joined them. The lessons will be conducted based on the models. Each participant is required to create an avatar and upload it to the virtual space. As is shown in the Fig.3, each unit of the teaching model is allocated four sessions (90 minutes per session). The first session comprises an exploratory learning session with mini-lectures delivered by nursing teachers from both countries. The second session consists of a lecture by Vehmaskoski that aims to provide Juntendo students with ideas for their presentation. The third session is for the practice for the presentation. This session is led by Yamashita. The students' pronunciation and choice of words including grammar are checked and corrected if it is wrong. In the fourth session, Juntendo students, divided into three groups and located in their own rooms in VR space, will make presentations on the chosen topics. Jamk students are also allocated into one of those rooms. After their presentations are over in each room, Juntendo students answer questions from Jamk students or they can go directly into the discussion. The sample unit shown in Fig.3 has gerontechnology as its topic and the difference finding task as its main objective. In one of the rooms, a Jamk student asked whether there is any resistance to being cared for by robots in Japan. In response, there was an answer from a Juntendo student who said, 'Robots do not have likes and dislikes, so they can treat people who need care fairly'. These exchanges were both thought and interest provoking.

Results/Findings and discussion

A survey was conducted on the development of metacognitive skills and the development of L2 ideal self and L2 ought-to self in 12 participating students in a COIL environment using the newly introduced Zoom. Surveys were administered before and after the study to examine changes in.

Metacognitive skills

According to Okmawati(2020) [14], the acquisition of metacognitive strategy is very important in that it makes learners aware of the learning style and helps them use the strategy to activate, observe, and evaluate the learning. Metacognition can be categorised into two broad classifications: 'metacognitive knowledge' and 'metacognitive skills'. The former is further subdivided into three categories: 'declarative knowledge', 'procedural knowledge' and 'conditional knowledge'. The latter is divided into the following subsections: 'planning', 'information management strategies', 'monitoring', 'debugging strategies' and 'evaluation'. The by administering 52 questions developed by Scraw.

The format is based on a six-level Likert scale. The development of metacognition is evidenced by children who previously spoke unilaterally about any topic of their choosing realising that 'I don't feel like my story is being understood very well by the other person'. This can be observed in children who previously spoke one-sidedly about topics of interest, but now realise that they are not being understood very well and change how they explain things.

Results of metacognitive ability verification

All 12 students participating in the class were asked to answer 52 questions on the MAI (Meta-Awareness Inventory) developed by Scraw using a six-point method. The results were subjected

to factor analysis and extraction by adding a Promax rotation. According to the results, Monitoring & Planning skills were extracted as the main factor, followed by Debugging Strategy and Self-evaluation were found to be influential as the second and third factors. For these three factors. A comparison of the pre- and post-survey results for these three factors was as follows. Significant differences in the development of these four metacognitive skills were found, indicating that the established learning environment was effective. The results show that the implemented learning environment was effective. Repeated ‘monitoring’ and ‘control’ through metacognition is directly linked to personal growth. Participating students can acquire the ability to look at themselves objectively and find their weaknesses through ‘monitoring’ and develop themselves quickly by ‘controlling’ their thoughts and actions in a positive direction based on their weaknesses, respectively.

Table 1.

Results of Metacognitive competence validation

	Pre-Research		Post-Research	
	Mean	SD	Mean	SD
Monitoring & Planning (20 items)	3.11	1.43	3.56	1.13
Debugging Strategies (9 Items)	3.36	1.32	3.74	1.32
Self-Evaluation (7 Items)	3.3	1.38	3.41	1.11

Development of the L2 ideal self (ideal-L2 self) and the L2 obligatory self (ought-to-L2 self)

The L2 ideal self is defined as an idealised representation of the child’s future self when using a second language (L2: second language). The L2 ideal self is a concept that refers to the idealised self-image of what the child would like to become in the future using their second language (L2). In the context of aspiring to write a book in English in the future, it is essential to recognise that the motivation for learning is to bridge the gap between the ideal self and the current self. In contrast, the L2 obligatory self is the self that others expect of you, i.e. the self you ‘must become’. This is the self that is expected of you by your family. This is exemplified by a person who engages in learning for the purpose of gaining the approval of family, superiors or colleagues. This is also exemplified by a student who engages in learning for the purpose of gaining recognition from family, superiors or colleagues. In order to avoid negative influences such as ‘I don’t want to be seen as a bad student’ or ‘I don’t want to be seen as an incompetent subordinate’. In order to avoid negative repercussions, they are more likely to engage in second language learning. These motivations for foreign language learning. These indicators of motivation to learn a foreign language were proposed by Zoltán Dörnyei in 2005 and have been the main theoretical framework for subsequent motivation research.

This theoretical framework is regarded as the main one for subsequent motivational research. The results of this research will be examined with a focus on the development of these two abilities.

Verification of the development of the L2 self

A survey on the L2 self was conducted using a 10-item questionnaire developed by Dörnyei and Taguchi. The data are presented as the percentage of students who responded in the affirmative to each question. The English Communication II course is a fully elective course, frequently undertaken by students with an affinity for the English language at the Faculty. The mean TOEFL iBT score is approximately 450, with the majority of students having attained the second level of the English Proficiency Test. Moreover, the course is predominantly attended by students who aspire to gain international experience through overseas travel during their undergraduate studies. As evidenced in Table 2, engaging in discourse with international students on topics such as the aging of society and the shortage of caregivers in English, even if only indirectly, has been identified as a significant factor contributing to an increase in the ideal self. However, as Table 2 illustrates, only a small proportion of students expressed a desire to work as nurses abroad in the future. Nevertheless, they do appear to aspire to work and communicate in English. Additionally, they appear to view English as a crucial subject, one that is linked to their future career development. However, it is unclear whether this perception is directly linked to their self-concept. In essence, they appear to view English language learning in a more accessible manner.

With regard to comparisons with previous experimental data, the study could not be conducted because it was not possible to conduct the classes with the same group of students. Therefore, the results of a survey of changes in cognitive ability and L2 self before and after the classes are presented.

Table 2.

L2 Self Development Survey Results

No.	Questions	Pre	Post
1	I can imagine myself living in a foreign country having discussions in English	7.8	10.2
2	I can imagine myself doing my job un English	15.6	17.7
3	I can imagine myself communicating with foreign people in English	21.7	58.3
4	I can imagine myself learning to speak in English	44.3	67.8
5	When I think about my job in the future, I imagine myself speaking in English	8.2	58.3
6	I want to get good grades in English so I study English	53.2	67.8
7	I study English because it is a required subject	64.3	17.7
8	I study English because my friends say it's an important subject	53.2	35.4
9	I study English because I am expected to do so by my parents	15.6	0
10	English is an important subject because it is necessary for upgrading my career	21.7	67.8

Conclusion

It is hypothesised that COIL-type classes utilising VR spaces have achieved a certain level of success. However, as research into the relationship between motivation and EEG is ongoing, it will be necessary to measure not only the development of the ideal self but also learners' EEG and eye tracking biological responses, and to estimate motivation during learning in a more objective manner.

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Biodata

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