Exploring the experience of Year 10 South Korean students' English language learning in immersive virtual reality.

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Abstract: *A prescribed English language textbook often directs classroom teaching practices in secondary school classes in EFL contexts, such as in South Korea. The textbook is often accompanied by multimedia resources which are delivered to students as input at a regulated pace with limited opportunities for communicative interaction or spoken output. Such opportunities are further limited in the community outside of the English classroom. Immersive virtual reality (i-VR) has the potential to situate learners in a real-world context for authentic application of textbook language learning. English teachers in the formal classroom focus on linguistic competence development within time constraints by teaching new vocabulary and grammatical items in decontextualised forms. By comparison, i-VR environments focus on learning to construct meaning in communicative events in contextualised, real-world settings based on students' existing linguistic knowledge and ability. In a small-scale pilot study, two teachers of Year 10 English classes in Seoul implemented four i-VR language learning modules in their classes: one as a self-directed learning experience that extended beyond formal classroom learning, and the other as a teacher-facilitated learning experience within the formal classroom. On completion of the four modules over a two-week period, the participating students completed an online questionnaire and a voice recording of a spoken task. In addition, both teachers were interviewed after the two-week implementation to seek their views on their perceptions*

of the value of such i-VR learning for their students. Overall, students reported a positive correlation between their enjoyment of the experience and their perceived competence and confidence improvement. Beyond the motivational and entertainment value, the teachers viewed the i-VR experience as capable of incorporating pedagogical structures using the embedded multimodal resources that is less possible in other immersive forms of language learning. Moreover, the teachers believed that incorporation of authentic conversations and interactional opportunities could further enhance the learning potential.

Introduction

The privileged position of English as a means of intercultural communication across the globe, often without the presence of a monolingual English speaker, presents the development of communicative competence as a desirable goal of English language learning. Despite learning English from a young age at school as a subject, many countries where English is not spoken as the main language of communication lack regular exposure to English language use to practice spoken communication. Most often, learners of English as a Foreign Language (EFL) practice communication in brief interactions with peers and the teacher in a classroom setting. Role-play activities are commonly used to imitate imagined settings and scenarios for the development of spoken communication. Recent developments in digital technologies offer greater opportunities to situate learning in intercultural contexts for contextualised communicative development, thus providing a shift from EFL as a classroom subject to English as a Lingua Franca (ELF) for intercultural communication.

South Korea is regarded as an innovative global leader in technological development with globally recognised high-tech industries (Dayton, 2020). Thus, learning English as a foreign language in South Korea is important for its contribution to global economic development. Although learners use prescribed textbooks in the classroom with accompanying multimodal resources for learning, teachers follow the textbook with a focus on grammar and vocabulary development through reading,

listening and writing. Such a focus develops a good level of linguistic knowledge and competence, but few opportunities for spoken communication and interaction occur within school classrooms or are available to learners outside of the classroom in the broader community. Students who want and can afford conversational practice in English outside of school hours often enrol in private language centres.

Implementing mandated communicative language teaching approaches to English as a Foreign language classroom settings can be challenging as reported by many research studies in various countries, including South Korea, China, Vietnam, Japan, Libya and Saudi Arabia (see, for example, Alharbi, 2015; Lan & Grant, 2021; Lee, 2014; and those listed by Littlewood, 2012; Rao, 2013). Reported challenges include the expense of quality teacher training, cultural beliefs influencing education, the manageability of large classes sizes, time constraints on learning, focus on exams for assessment, goals of learning English, and textbook selection informing classroom practice. Littlewood (2012, p. 352) notes that "the reported problems relate especially to the domain of communicative activities (or 'tasks'), in which students exchange messages with the teacher or with each other". Jeon (2009) discovered similar issues by Korean teachers who proposed smaller classes, more training and more supplementary materials as being the most important.

Recent innovations in digital technologies have provided new opportunities for EFL learning and communicative competence development within and beyond the classroom setting (Asratie et al., 2023). One such technological innovation is immersive virtual reality that locates the learner within a high-fidelity multi-sensory real-world environment that can be explored using a head mounted display (HDM). An instructional design can be embedded that makes use of multimodal resources for the scaffolded development of aural/oral skills, informed by classroom learning. The multimodal resources can be situated and sequenced in an authentic meaning-focussed setting to develop competence and confidence in spoken communication.

This paper reports on the findings of the implementation of a small-scale project, funded by the Australia-Korea Foundation. The purpose of the project was to provide Year 10 students of English in Seoul, South Korea, with a low-cost, accessible solution to develop their speaking confidence and competence in English informed from their classroom learning. The i-VR environment

was designed to provide a better understanding of Australia and its lifestyles through immersion in locations and experiences using a virtual reality environment with embedded multimodal resources to scaffold students' learning.

Specifically, the paper reports and discusses participating students' perceptions of their experiences of learning within the environment and analyses their spoken task-based outputs in the form of voice recordings to better understand their spoken communicative abilities informed by their experience of the i-VR learning modules. Additionally, the paper reports and discusses the English language teacher perceptions of the language learning challenges facing English language learners in South Korea and of the value, or otherwise, of the immersive virtual reality modules as one possible support for the contextualised development of students' English oral skills beyond formal classroom learning.

Literature Review
Confidence in Spoken Communication
Spoken communication between interlocutors involves the speaker's intent and the listener's interpretation to provide an appropriate response (DeCapua & Wintergerst, 2004). This dynamic process requires the co-construction and negotiation of meanings within cultural and situational contexts, primarily dependent on the speakers' status, relationship, and communicative purposes (Derewianka & Jones, 2016). The meanings conveyed are experiential and ideational, interpersonal, and textual, and they manifest the field, tenor, and mode of the situational context, as well as the social purpose of communication in the cultural context (Derewianka & Jones, 2016; Nguyen et al., 2017).

Making appropriate language choices for co-constructing meaning relies on shared norms and expectations of communication in a given circumstance. When norms are not shared or expectations differ due to cross-cultural differences in communication, breakdowns in communication are likely to occur (DeCapua & Wintergerst, 2004). Communication breakdowns can result in reduced confidence and increased anxiety among English language learners, making them more reluctant to engage in future communicative interactions (Kim et al., 2022; Su, 2021).

A recent study by Kim et al. (2022) which examined two groups of South Korean short-term sojourners in Australia regarding their willingness to communicate (WTC) found that the participants speaking with native speakers in community created

anxiety for them. The study revealed that the participants' "inclination for L2 communication was motivated by L2 communication confidence, perceived L2 competence, integrative motivation, and was also mediated by the new sociocultural environment, their sense of identity, and emotions" (Kim et al., 2022, p. 18). WTC in the study, "particularly the willingness to engage in potentially extended and open-ended L2 conversations, was found to predict the amount of L2 exposure during sojourn" (Kim et al., 2022, pp. 18-19). Thus, our project explored whether exposing foreign language learners to modelled samples of target language use in Australian situational and cultural contexts with reduced risk could lead to greater confidence in achieving beneficial speaking outcomes, particularly in preparation for cross-cultural interactions.

Communicative Competence Development

Communicative competence, first introduced by Dell Hymes in the early 1970s, has evolved as a conceptual model comprising several sub-components, each with underlying conceptual models. Key components include linguistic competence, discourse competence, pragmatic or sociolinguistic competence, strategic competence, and intercultural communicative competence (Usó-Juan & Martínez-Flor, 2008). Discourse competence, central to communicative competence, incorporates the enactment of the other sub-components through the macro-skills of speaking, listening, reading, and writing (Celce-Murcia, 2008; Usó-Juan & Martínez-Flor, 2008). It extends communication beyond the sentence level, allowing the generation of conversations within situational contexts. Discourse competence necessitates linguistic competence to facilitate the co-construction of meaningful conversations informed by pragmatic competence and intercultural communicative competence. In cases of communication breakdown, strategic competence plays a role in repairing the conversation to meet the goals of the communicative event. Successful communication requires familiarity with the norms and expectations of interaction in a given circumstance within a specific discourse community (DeCapua & Wintergerst, 2004).

The Dynamic Interplay of Language and Culture

The key to effective communication lies in possessing both linguistic and cultural knowledge and awareness. Language serves as a cultural practice, embodying and expressing culture (Moran,

2000). Cultural learning encompasses not only knowledge about a culture but active engagement in its practices and understanding the underlying perspectives (Moran, 2000 & Byram, 2020). This learning process fosters self-awareness and enables individuals to identify themselves as both language speakers and practitioners of diverse cultures. Norton (1997) emphasizes that through speech, language learners not only exchange information but also shape and redefine their identity and relationship to the social world, engaging in identity construction and negotiation. Kramsch (2004) views culture, through the dynamic concept of language relativity, as membership within discourse communities where individuals identify with specific social roles reflecting distinct discourses in a particular society.

Immersion in Foreign Language Learning
Language and culture immersion in the target language use context has long been a proven method for learning a foreign language, particularly for developing spoken communicative competence, as it provides context, exposure and experience necessary for foreign language learning (Peixoto et al., 2021; Wang et al., 2022). Communicative competence recognises language learning as an endeavour to make meaning in situational and cultural context (Alptekin, 2002; Celce-Murcia, 2008; Uso-Juan & Martinez-Flor, 2008). However, it is challenging to create such authentic communicative contexts in the foreign language classroom.

Many teachers have limited success in implementing communicative approaches in the formal classroom setting where language is somewhat decontextualised and the focus is on form at the sentential level. Moreover, nationally adopted language textbooks play a central role in classroom practices in EFL settings, but their focus tends to be on the development of linguistic knowledge and competence which is essential for the development of other subsets of communicative competence, including discourse competence and intercultural communicative competence. Liang (2012, p. 16, citing Boxer, 2002, and Kasper & Rose, 2001) argued that "despite various communicative goals, second language (L2) learners are less likely to produce natural conversation or learn pragmatic language in traditional classrooms without adequate pedagogical strategies".

Due to the limitations of the EFL classroom setting for the development of spoken communicative competence, particularly

in East Asian contexts (Chang, 2010), study abroad programs have endeavoured to enhance and apply textbook learning from formal classroom settings to real-world applications. Despite their benefits, not many students have the finances or opportunity to participate in such immersive language learning programs. Language learning beyond the classroom offers new spaces and opportunities to improve the overall language learning process without travel or much additional expense (Reinders et al., 2022). Moreover, an increasing body of research has proposed technological solutions to support the development of spoken competence and interactional competence to address the shortcomings in formal classroom learning (e.g. Liang, 2012).

However, according to Lai et al. (2015), it is important to note that not all language learning experiences outside the classroom have the same level of effectiveness. In many cases, students are unable to make informed decisions about these experiences on their own. Hence, teachers play a crucial role in influencing the quality of students' out-of-class learning (Lai et al., 2015). Therefore, it is advised that they play a more active role by recommending learning resources or monitoring learning efficacy, and effective language learning activities that maximize the affordances of mobile devices so that 'informal' learning can better support 'formal' learning (Lai et al., 2015; Yuan, 2022). In particular, more immersive, high-fidelity, real-world, authentic experiences are becoming increasingly available through immersive virtual reality technologies that provide a deeper and richer immersive sensory experience than simply being present in a virtual space.

Immersive Virtual Reality
Immersive Virtual Reality (i-VR) in its physical form comes in three main types as defined by Hamilton et al. (2020): a head mounted display (HMD) as a device worn over the head, which provides a stereoscopic computer-generated or 360° video image to the user, either (a) tethered (connected to a computer), (b) stand-alone (no computer needed), or (c) mobile VR headsets (mobile/cell phone connected to a HMD). The three types consist of different levels of experience and access different systems and applications for the creation of an immersive real-world experience.

i-VR and Foreign Language Education
Much of the research on i-VR in foreign language education

shows a positive impact with improved students' learning (Chateau et al., 2019; Chen, 2016; Ebert et al., 2016; Garcia et al., 2019; Pack et al., 2020; Zhang, 2020). This represents a broad field of study that includes a range of i-VR technologies from semi-immersion to full immersion and includes languages other than English, but the majority of studies tend to be on English as an additional, second or foreign language, followed by Mandarin Chinese and Spanish.

The findings of the studies report that the i-VR enhanced learning was perceived as more enjoyable and effective than conventional classroom methods (Ebert et al., 2016). Studies also show that i-VR technologies not only have a positive effect on students' linguistic abilities but also on their cognitive abilities (Chen, 2016). Moreover, i-VR could be beneficial in enhancing learners' motivation by bringing language learners closer to the target language culture and create realistic simulations that would not even exist in the physical world (Alizadeh, 2019).

Motivation is well-acknowledged as an essential factor that contributes to success in learning an additional language (Lamb, 2017). When regular exposure to the target language is limited, increased motivation and investment are required over many years to achieve target language user levels of communicative competence (Norton, 2014). The i-VR system increases students' motivation or willingness to learn, which contributes to their enjoyment of language learning from feelings of presence and immersion in a novel learning environment or contextual setting that extends the physical boundaries of the formal classroom setting into a virtual space (Liang-Yi, 2011; Pack et al., 2020). This results in greater focus and fewer distractions to learning (Pack et al., 2020).

The integration of avatars in the learning materials and the freedom to revise and upskill at a self-regulated pace offers learners, particularly lower-level learners, the chance to improve their learning efficacy (Adnan et al., 2020; Divekar et al., 2018; Liang-Yi, 2011). Overall, the majority of studies revealed that i-VR environments for language learning result in high levels of active student participation, high levels of interactivity, navigation and interaction with avatars and even recreation of circumstances and places of cultural importance (Adnan et al., 2020; Cheng et al., 2017; Ebert et al., 2016; Garcia et al., 2019; Liang-Yi, 2011). However, these results must be considered according to the form of i-VR experience offered to learners.

i-VR and multimodality for language learning
i-VR has the capacity to embed objects and multi-sensory resources within the spherical space of the virtual world to enhance the learning experience (Blyth, 2018). The multi-sensory resources are a combination of the virtual environment itself and the multimedia resources embedded within. The contextual connection between objects in the environment, explanatory text and audio panels of the objects, and video panels with audio and text, create a web of contextual semiotic resources as input for learning. When these inputs are encountered individually, they are considered multimedia resources. However, once combined and placed within a specific environment, they transform into multimodal semiotic resources, serving as valuable learning inputs. Virtual guides can provide direction, explanation, and instruction within the virtual world while text on panels can be coloured for points of focus, audio inputs can offer text-to-speech functionality, and visual and video resources can provide dynamic input. All internal resources combine to design a rich semiotic social space for purposeful meaning-focussed learning. The direction, sequence and nature of the multimodal resources scaffold learning and create a prescribed instructional design. Such an experiential instructional design largely addresses the issue raised by Blyth (2018) of not only experiencing the context but also learning within it by "entextualising" the context or transforming it into "analysable text" through the use of embedded video and multimedia, thus making "experiential learning a reality". Blyth adds that:

> "As language technologies grow more immersive, educators increasingly view language learning in terms of a complex social activity – heavily contextualized, thoroughly embodied, and largely experiential" (Blyth, 2018, p. 226).

Distinctions between the i-VR environment and the classroom setting
Tan et al. (2016) argue that virtual environments offer greater potential for language learning compared to classrooms, but careful consideration must be given to complexity and pedagogical design. Different semiotic resources have varying affordances and constraints in expressing meaning (Jewitt, 2003; Kress, 2009; Machin, 2013; Van Leeuwen & Kress, 2001). Multimodal language inputs in immersive virtual reality enhance meaning-making and language learning. Embedding these inputs supports scaffolding and enriching the learning environment, enabling the design of a pedagogical framework specific to virtual reality.

Although a pedagogical framework and instructional design are possible, informal language learning beyond the classroom requires self-regulation and self-efficacy. Mascolo (2009) highlights the instructor's significant role as an active participant who guides learning in student-centered learning settings, following Vygotsky's idea of the 'more knowledgeable other.' Virtual guides within immersive virtual reality can serve as instructors and facilitators of learning. Moreover, the linear 360-degree i-VR video format with embedded resources offers agency to learners by allowing them to rewind, forward, skip irrelevant sections, and review specific parts, granting autonomy and control over their learning. The i-VR environment also exposes students to diverse models of spoken English and accents, enhancing their range of communicative skills.

Parmaxi (2020) reported in a systematic review of literature on virtual reality and language learning that most research had been conducted on non- or semi-immersive virtual reality environments and not fully immersive virtual reality environments. He also noted that "existing research … pays little attention to low-cost fully immersive VR" and argued that "researchers should increasingly acknowledge the impact of immersive VR systems as a tool that can enrich the learning experience and provide real-life simulations within the classroom walls" (p. 10). Similarly, Southgate et al. (2018) report the benefits of highly immersive virtual reality for learning in the school sector and acknowledge that more research on the pedagogical design and classroom use of such immersive virtual reality environments is needed.

Few studies exist in which foreign language learners are immersed in a foreign culture context for exposure to the foreign language for experiential learning using a linear 360-degree video format. Berti et al. (2020) conducted a study in which 19 learners of Italian in the USA were immersed in three virtual reality experiences captured by the researcher in Italy, but without the embedded multimodal inputs or instructional design of our project. The study found that virtual reality was positively perceived and helped learners discover new cultural layers generally not encountered in traditional pedagogical materials. Despite the lack of interaction within the environment which many participants perceived as a limitation, the authors conclude that "highly immersive VR environments may still support students learning by providing personalized and contextualized learning opportunities that traditional materials do not offer" (p. 57).

Thus, similar to Berti et al.'s (2020) study and based on the findings of Parmaxi's (2020) systemic review, our team designed a low cost fully immersive virtual reality environment using a linear 360-degree video format with an embedded instructional design to investigate the potential of improving confidence and competence in speaking English among secondary school students in an EFL context. The discursive elements of specific language production that were modelled within the i-VR learning modules were procedural texts, personal recount texts and explanatory texts, each with its own grammatical form. The expectation was that students would be able to reproduce their own versions of these texts in spoken format, maintaining the integrity of the discursive form, based on their personal learning within the immersive virtual reality environment.

The design, implementation and investigated effectiveness of the virtual reality environment in this project was primarily informed by Makransky and Petersen's (2021) Cognitive Affective Model of Immersive Learning (CAMIL): a Theoretical Research-Based Model of Learning in Immersive Virtual Reality which is presented in the following section.

Project Design

For the purposes of this current project, the authors adopted mobile VR headsets for a low-cost implementation of an immersive virtual reality experience, since participants in the South Korean context had ready access to smartphones. YouTube offers a high-quality i-VR experiential online platform through free publication of captured and edited 360-degree video. The immersive environment allows a spherical view of the captured environment even when paused. When played, the video proceeds in a linear format towards a pre-determined endpoint. Multimodal resources can be embedded within the video at specific points on the timeline using video-editing software and are viewed as existing within the environment. Users are detached from the physical world and immersed in a multisensory experience within the pre-designed immersive environment. Thus, i-VR adapts traditional multimedia content and significantly raises the user's level of immersion, particularly at the level of visual perception in learning (Psotka, 1995).

Makransky and Petersen (2021) presented a model that illustrates how technological factors in i-VR result in the i-VR affordances of presence and agency. Presence and agency have

many forms which were considered for this project, including self-presence, social presence, instructional presence, and notions of agency such as the ability to pause on particular content or to revise content as needed. The affordances and resulting affective and cognitive factors were considered both in the design of the i-VR modules and in their relation to students' experience of learning in the immersive virtual environment to determine whether they resulted in effective learning outcomes.

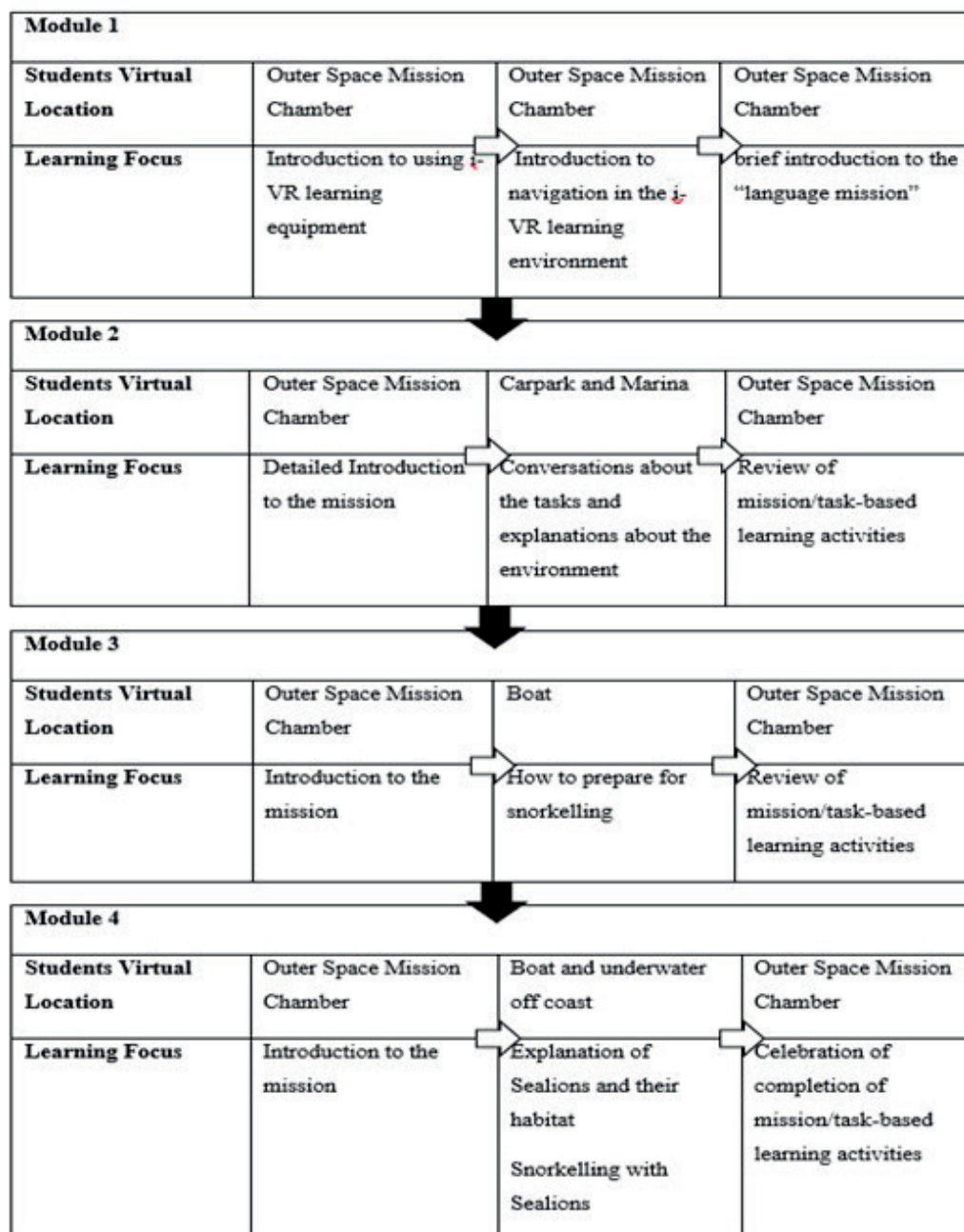*Figure 1: CAMIL model proposed by Makransky and Petersen 2021*
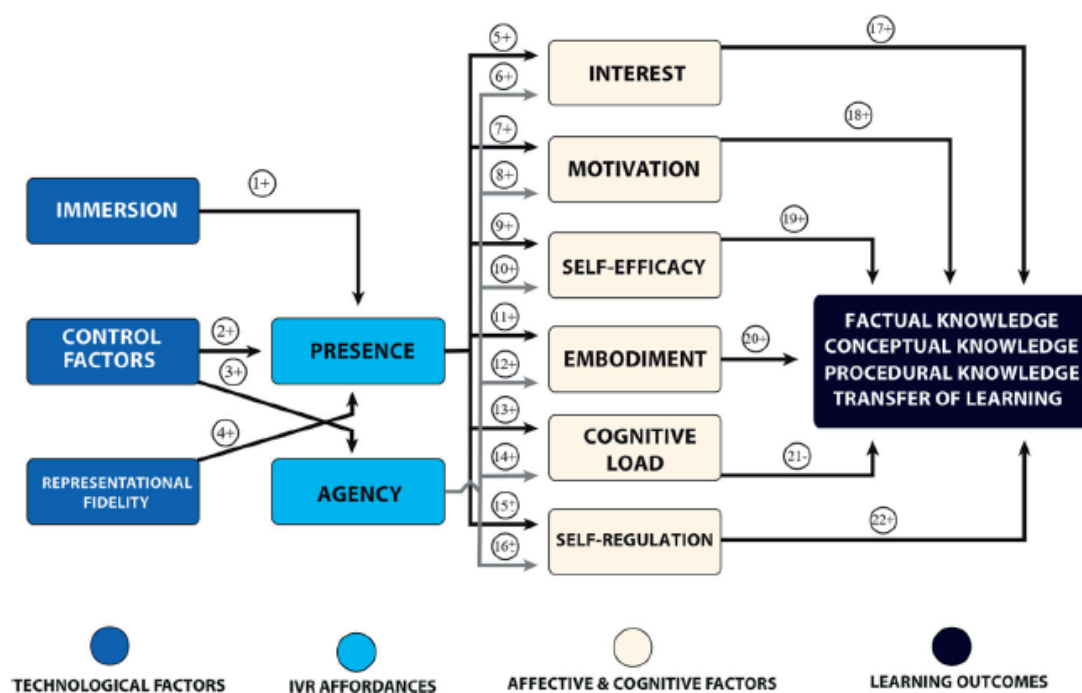
The project consisted of four developmental modules of 10 to 15 minutes of linear 360-degree video content with embedded multimodal inputs as scaffolded learning supports. The content was conceptualised from a current unit of work, from which Year 10 South Korean student participants were learning, entitled "Going Places" in which they were introduced to the language of travelling abroad. An artificial 'bot' was used to interact with participants, to guide their attention within the environment and to provide explanations and instruction as a teacher-facilitator. The setting within the modules occurred in two main locations: an outer space mission chamber and Port Lincoln in South Australia. Participants were teleported between locations through a virtual portal. Explanations of the mission and its associated tasks and language revision were provided in the mission chamber while the language modelling and learning occurred in the setting of Port

Lincoln where the mission was enacted and the task-based learning was initiated. Students progressed from a carpark to a marina where they boarded a boat and travelled to the coast of Langton Island to swim with sealions. Preparation for the snorkelling with sealions was given while aboard the boat.

Figure 2: Learning progression of the four i-VR learning modules

Indicators to the Direction of the Learning Progression Flow:

Module 1			
Students Virtual Location	Outer Space Mission Chamber	Outer Space Mission Chamber	Outer Space Mission Chamber
Learning Focus	Introduction to using i-VR learning equipment	Introduction to navigation in the i-VR learning environment	brief introduction to the "language mission"

Module 2			
Students Virtual Location	Outer Space Mission Chamber	Carpark and Marina	Outer Space Mission Chamber
Learning Focus	Detailed Introduction to the mission	Conversations about the tasks and explanations about the environment	Review of mission/task-based learning activities

Module 3			
Students Virtual Location	Outer Space Mission Chamber	Boat	Outer Space Mission Chamber
Learning Focus	Introduction to the mission	How to prepare for snorkelling	Review of mission/task-based learning activities

Module 4			
Students Virtual Location	Outer Space Mission Chamber	Boat and underwater off coast	Outer Space Mission Chamber
Learning Focus	Introduction to the mission	Explanation of Sealions and their habitat Snorkelling with Sealions	Celebration of completion of mission/task-based learning activities

The speed of speech within the environment was adjusted to 145 words per minute to suit the learners' listening ability, and a variety of standard English accents was used to ascertain their preferences for intelligibility.

Participants had a choice of four language tasks at the end of the expedition from which to record spoken output. Two involved the production of spoken procedural texts, one the production of a spoken personal recount of the experience within the virtual reality environment, and one the production of a spoken explanatory text about the habitat and lifestyle of sealions in the region based on input provided within the fourth module. The purpose of the spoken output was to determine what students were able to produce as a result of the modelled language learning within the i-VR environment.

Methodology
The project employed a multiple methods case study methodology to capture in-depth understandings of the experience of two classes of Year 10 English students in Seoul, South Korea and their teachers' perceptions of the experience (Cohen et al., 2018c). Participating students were invited to complete an online questionnaire and to record a spoken response to one of four tasks presented at the end of the i-VR learning modules. The two teachers were interviewed about the benefits they perceived of immersive virtual reality for developing spoken discourse competence through a new cultural experience that aimed to apply and extend relevant linguistic knowledge and competence from formal classroom learning.

Research Question:
In what ways and to what extent can the experience of highly immersive virtual reality English language learning modules improve the self-perceived speaking competence and confidence of Year 10 English language learners in an EFL setting?

Methods of data collection
Two English language teachers in secondary schools in Seoul with an interest in the project were recruited to participate along with their Year 10 English classes. The first class (Case Study 1 – learning beyond the classroom (LBC) participants) was given cardboard VR headsets that accommodate a mobile phone to take home to explore the four virtual reality modules that were developed by the project team. The second class (Case Study 2 – in-class participants) was provided with higher-quality plastic goggles that could accommodate a mobile phone to use in a teacher-facilitated formal classroom environment. Both groups

explored the four modules published on YouTube VR over a two-week period. Fifty students participated in Case Study 1 and 30 students participated in Case Study 2. Students were permitted to view and review the content as many times as they wanted, although the LBC cohort had fewer constraints than the in-class cohort who had limited access to and use of the VR goggles owned by the school.

Participating students were asked to complete a 27-question online survey. Questions included self-assessment of their spoken competence and confidence using English, their perceptions of the experience of using i-VR and their overall satisfaction with the experience of learning in the environment. On completion of the two-week immersive learning period, participating students were asked to anonymously submit to a secure online server, a voice recording of their spoken output from one of the four tasks presented at the end of the fourth i-VR module. After the two-week period, semi-structured interviews of up to 30 minutes with guiding questions were used for both teachers on Zoom about their perceptions of the challenges that South Korean students face in general with English language learning and, in particular, spoken communication in English, and their perceptions of what value or benefit immersive virtual reality offered, particularly with regard to the current project. Cohen et al. (2018) make clear that "the interview is a social, interpersonal encounter, not merely a data-collection exercise". The sequence of the interview was controlled whilst allowing space for spontaneity using the semi-guided structure. This allowed for greater complexity and depth (Cohen et al., 2018).

Methods of data analysis
Most of the responses in the online student survey were on a sliding scale from 0-100 and were analysed in SPSS using a range of non-parametric tests based on the relatively low participation rate. These numeric responses were further supported with text responses offering reasons for choices. The voice recordings of participating students in response to the tasks were compared to the learning models provided in the i-VR modules to understand what students were capable of producing as an outcome of the learning experience.

The two recorded teacher interviews were each transcribed by the interviewer after listening back to the recorded interview for a sense of the whole. Each transcript was then emailed to the

respective teacher to check for accuracy. Redundancies were removed and the transcripts were written as a narrative summary. The transcripts were then coded into themes for comparison and further analysis before a composite summary was produced based on identified themes. The synthesised transcripts reported the similarities and individual differences in relation to the emergent themes (Cohen et al., 2018b).

The evidence from all data sources for each case were corroborated to better understand each case and the outcomes of the project as a whole (Cohen et al., 2018a).

Findings

The key findings from the student questionnaires, the student voice recordings and the teacher interviews for both cohorts are reported in this section. The responses were mostly combined for both groups due to low statistical variation between the two groups. Thus, little to no variation existed in the findings between Case Study 1 and Case Study 2. For this reason, the data was combined for analysis and differences presented only as required.

Student Participant Background Information

Within the student questionnaires, questions from Q1 to Q3 were designed to investigate students' "English Learning Duration", "Exposure to English Listening" and "English Speaking Environment" to gain a better understanding of any differences in their English language learning circumstance prior to Year 10. The summary of findings is presented as follows:

Most students have been learning English from 3 to 10 years and commenced their learning of English either (a) from Reception to Year 5 or (b) from Year 5 to Year 8. Exposure to listening to English is spread evenly across different settings from the English classroom only to the school and beyond, with slight variations in preferences for the two cases. Both groups primarily speak English in the classroom, but the LBC group revealed a relatively stronger tendency to speak English after school compared to the in-class group.

Both groups self-assessed as having relatively low speaking abilities (Q4 – see figure 3 below) and relatively low confidence in speaking English when compared to their classmates (Q5 – see figure 4 below).

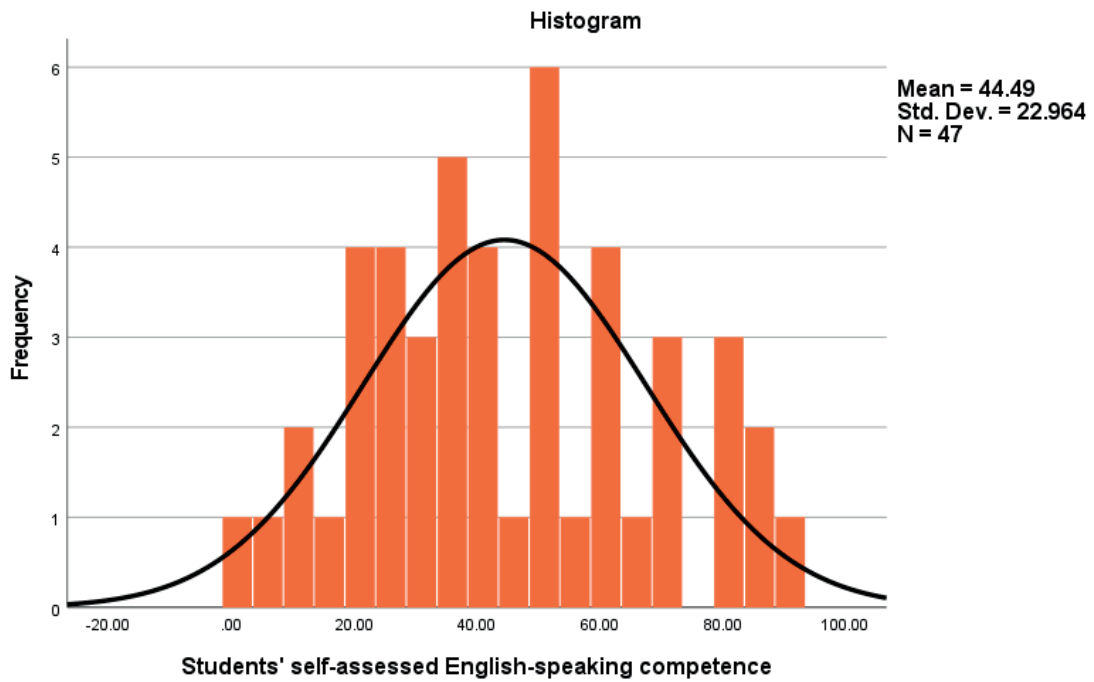*Figure 3: Students' Self-Assessed English Speaking Competence*

Histogram

Mean = 44.49
Std. Dev. = 22.964
N = 47

Students' self-assessed English-speaking competence

Figure 4: Students' Self-Perceived Confidence in Speaking English Compared with Classmates

Histogram

Mean = 39.93
Std. Dev. = 24.946
N = 44

Students' self-perceived confidence in speaking English compared with classmates
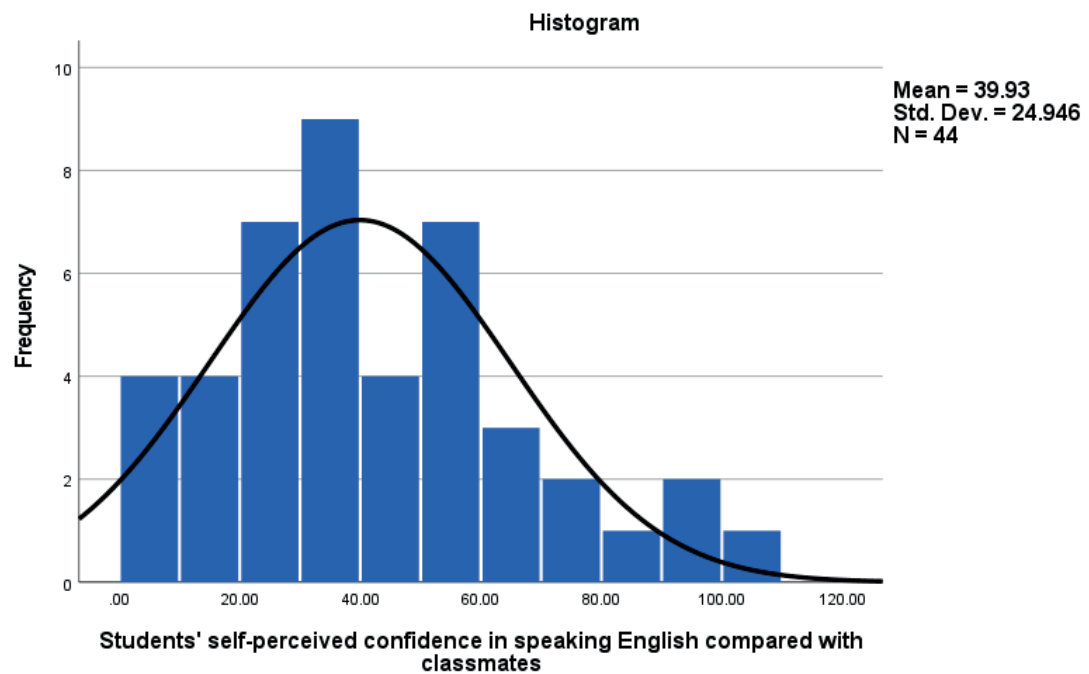
The examination of the results of the questionnaires primarily focussed on four key dependent variables to answer the research questions:

Q8. The immersive virtual reality learning module in this project has **improved my confidence** in speaking English.

Q9. The immersive virtual reality learning module in this project has **improved my competence** in speaking English.

Q12. How much did you **enjoy the experience** of learning in the virtual reality learning module for this project?

Q23. To what extent did the virtual reality learning experience **improve your listening comprehension** ability?

Non-parametric tests of correlation were used to determine the association between these outcome variables and 7 independent variables pertaining to specific aspects of the i-VR program:

- **Immersion:** Q14. How immersed did you feel in the environment? (immersion)

- **Physical presence:** Q15. To what extent did you feel the virtual environment was real to you?

- **Self-presence:** Q16. To what extent did you feel like you were snorkelling underwater with the sealions?

- **Social presence:** Q17. To what extent could you relate to Jarvis, the AI personal assistant?

- **Instructional presence:** Q18. To what extent did Jarvis support your learning in the environment?

- **Agency:** Q19. To what extent did you feel you had control over your learning in the environment by pausing and replaying sections of the video?

- **Cognitive load:** Q20. To what extent did you feel there was too much new learning in the environment?

All of these independent variables were strongly correlated which indicates they are measuring coherent aspects of the i-VR program:

Table 1: Correlations between Independent Variables

	Q14	Q15	Q16	Q17	Q18	Q19	Q20
Q14		0.462**	0.691**	0.497**	0.667**	0.731**	0.682**
Q15			0.647**	0.542**	0.547**	0.430**	0.383*
Q16				0.452**	0.667**	0.620**	0.617**
Q17					0.924**	0.628**	0.383*
Q18						0.738**	0.486**
Q19							0.547**
Q20							

In the analysis below, Somers' delta was used to determine the strength of association between each independent variable (IV) and dependent variable (DV) and whether the IV could be used to predict the DV score. Most are significant but some aspects of the program seem to be more important than others, depending on the outcome.

Q8. The immersive virtual reality learning module in this project has improved my confidence in speaking English

Figure 5: The immersive virtual learning module improved students' confidence in speaking English
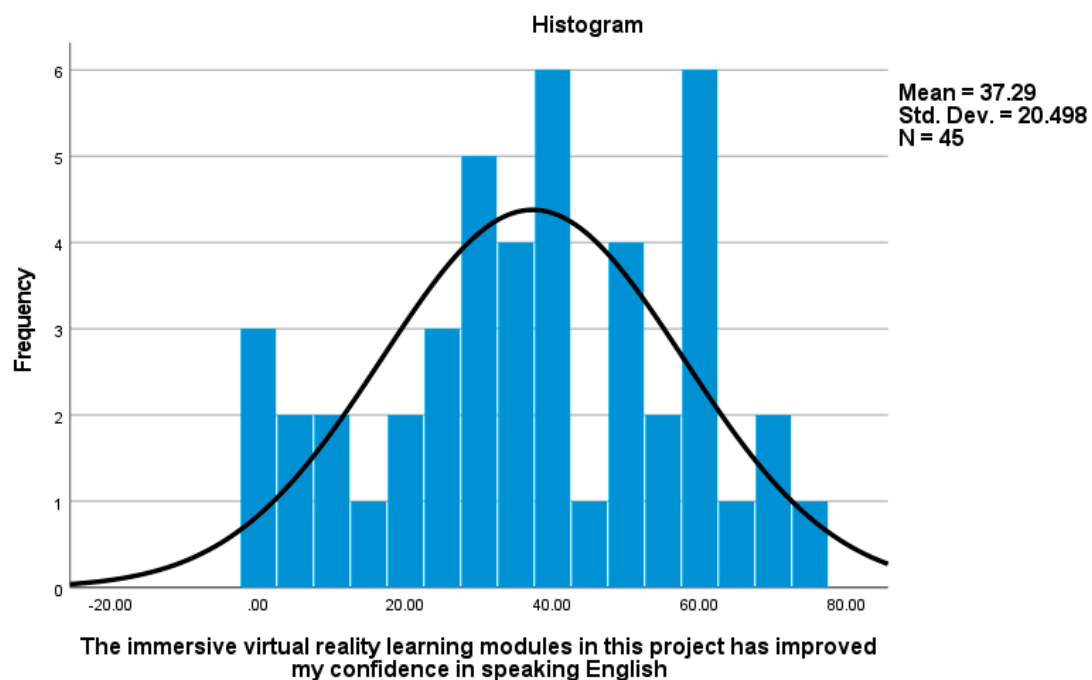

Histogram

Mean = 37.29
Std. Dev. = 20.498
N = 45

The immersive virtual reality learning modules in this project has improved my confidence in speaking English

Table 2: Association between program components (IVs) and improved confidence (DV)

	Kendalls Tau-b	SE	Somers' d	SE	T^b	*Sig*
Q14: Immersion	0.398	0.096	0.397	0.095	4.155	**<0.001**
Q15: Physical Presence	0.291	0.108	0.291	0.108	2.694	**0.007**
Q16: Self-presence	0.330	0.114	0.330	0.114	2.886	**0.004**
Q17: Social presence	0.344	0.110	0.344	0.109	3.127	**0.002**
Q18: Instructional presence	0.412	0.111	0.412	0.111	3.711	**<0.001**
Q19: Agency	0.607	0.059	0.606	0.059	10.207	**<0.001**
Q20: Cognitive load	0.252	0.110	0.252	0.110	2.302	**0.021**

Student perceptions of how the virtual reality program improved their confidence in speaking English were associated with:

- Strongest predictors (p<0.001): Immersion, instructional presence, agency

- Moderate predictors (p<0.01): Physical presence, self-presence, social presence

- Weak predictors (p<0.05): Cognitive load

Q9. The immersive virtual reality learning module in this project has improved my competence in speaking English

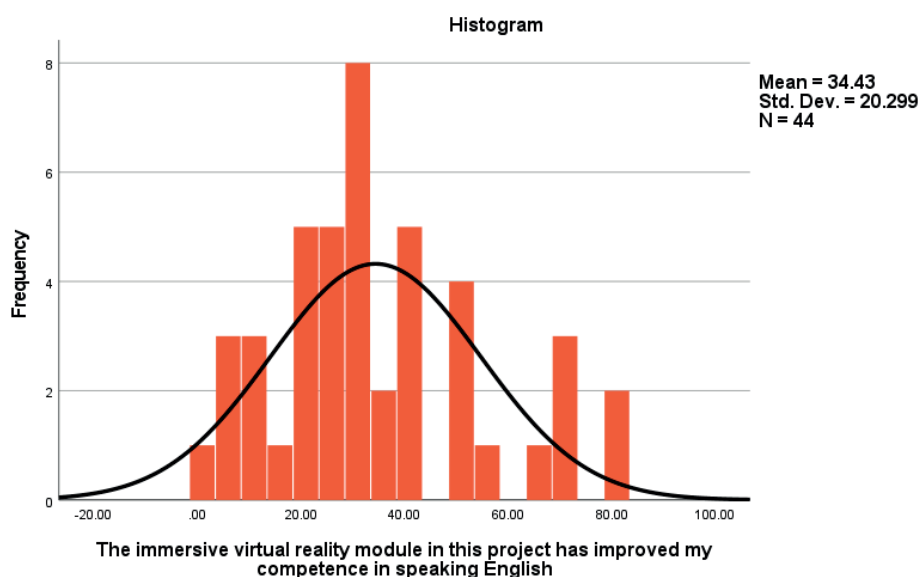*Figure 6: The immersive virtual learning module improved students' competence in speaking English*

Histogram

Mean = 34.43
Std. Dev. = 20.299
N = 44

The immersive virtual reality module in this project has improved my competence in speaking English

Table 3: Association between program components (IVs) and improved competence (DV)

	Kendalls Tau-b	SE	Somers' d	SE	T^b	*Sig*
Q14: Immersion	0.361	0.082	0.364	0.082	4.383	**<0.001**
Q15: Physical Presence	0.180	0.117	0.180	0.117	1.535	**NS**
Q16: Self-presence	0.141	0.113	0.142	0.113	1.248	**NS**
Q17: Social presence	0.346	0.131	0.347	0.131	2.634	**0.008**
Q18: Instructional presence	0.312	0.125	0.314	0.126	2.486	**0.013**
Q19: Agency	0.535	0.083	0.537	0.084	6.373	**<0.001**
Q20: Cognitive load	0.309	0.099	0.312	0.099	3.140	**0.002**

Student perceptions of how the virtual reality program improved their confidence in speaking English were associated with:

- Strongest predictors (p<0.001): Immersion, agency
- Moderate predictors (p<0.01): Social presence, cognitive load
- Weak predictors (p<0.05): Instructional presence

Q12. How much did you enjoy the experience of learning in the virtual reality learning module for this project?

Figure 7: The immersive virtual learning module contributed towards students' enjoyment of learning
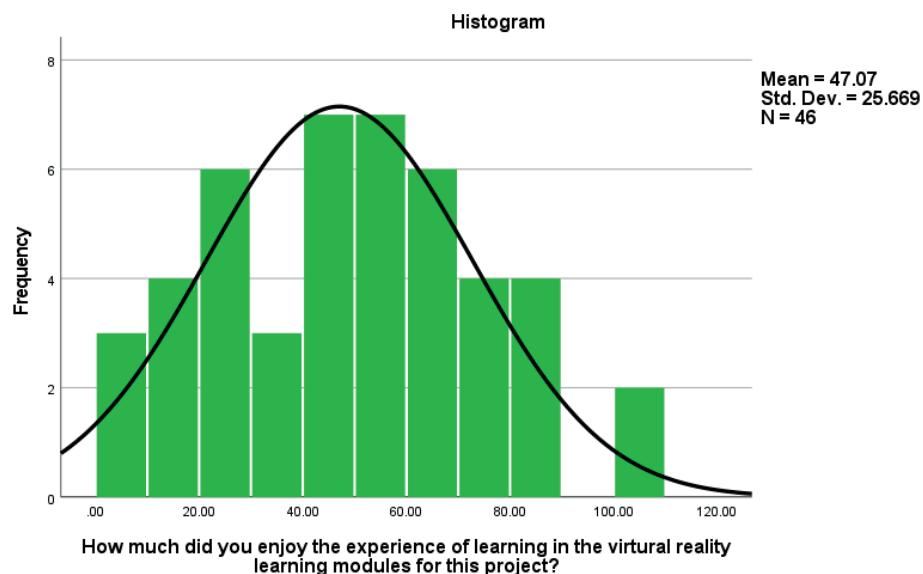
Table 4: Association between program components (IVs) and students' enjoyment (DV)

	Kendalls Tau-b	SE	Somers' d	SE	T[b]	*Sig*
Q14: Immersion	0.675	0.056	0.679	0.056	12.069	**<0.001**
Q15: Physical Presence	0.369	0.112	0.370	0.112	3.317	**<0.001**
Q16: Self-presence	0.476	0.095	0.476	0.096	4.972	**<0.001**
Q17: Social presence	0.397	0.111	0.398	0.112	3.542	**<0.001**
Q18: Instructional presence	0.493	0.093	0.494	0.093	5.305	**<0.001**
Q19: Agency	0.532	0.091	0.532	0.091	5.798	**<0.001**
Q20: Cognitive load	0.551	0.078	0.554	0.078	7.092	**<0.001**

Student enjoyment of the learning experience provided by the virtual reality program were associated with:

- Strongest predictors ($p < 0.001$): Immersion, physical presence, self-presence, social presence, instructional presence, agency, cognitive load

Q23. To what extent did the virtual reality learning experience improve your listening comprehension ability?

Figure 8: The immersive virtual learning module improved students' listening comprehension
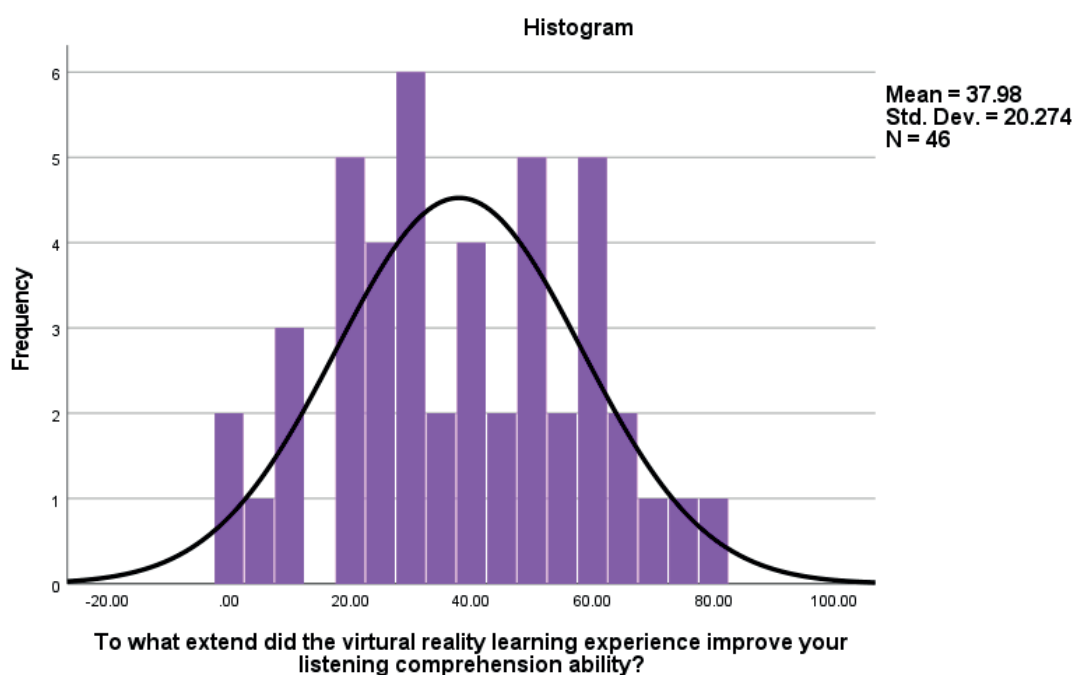

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Table 5: Association between program components (IVs) and listening comprehension (DV)

	Kendalls Tau-b	SE	Somers' d	SE	T^b	*Sig*
Q14: Immersion	0.506	0.070	0.508	0.070	7.146	**<0.001**
Q15: Physical Presence	0.266	0.119	0.267	0.119	2.241	**0.025**
Q16: Self-presence	0.367	0.099	0.367	0.098	3.704	**<0.001**
Q17: Social presence	0.519	0.091	0.520	0.092	5.670	**<0.001**
Q18: Instructional presence	0.640	0.084	0.640	0.084	7.555	**<0.001**
Q19: Agency	0.695	0.045	0.695	0.045	15.123	**<0.001**
Q20: Cognitive load	0.478	0.102	0.480	0.102	4.693	**<0.001**

Student perceptions of how the virtual reality program improved their listening comprehension ability were associated with:

- Strongest predictors (p<0.001): Immersion, self-presence, social presence, instructional presence, agency, cognitive load

- Weak predictors (p<0.05): Physical presence

The results demonstrate that, although students have been learning English for some time and many have exposure to English beyond the classroom environment, they still perceive a lack of confidence and competence in their spoken English. Elements of the design in the i-VR modules and the i-VR environment itself were reported to improve confidence and competence in speaking English and their listening comprehension, as well as their learning satisfaction. The next section analyses their spoken outputs as a result of learning in the i-VR environment.

Recorded Task-based Spoken Outputs
Tasks
Most of the students in the in-class group responded to the four tasks presented to the students at the end of the i-VR modules to produce a spoken text modelled on those provided within the i-VR environment with most consisting of more than one clause and, in some, cases, more than one genre. In contrast, few students in the LBC group produced a spoken recording and produced only one clause at most, with the exception of one

student who produced several clauses in a coherent response. It can be assumed that students require the structure of the classroom environment and the direction of a teacher to ensure that students actively participate in learning and produce the required outcomes of learning when using such i-VR technologies.

Teacher Interviews

Teacher A (Case Study 1) supplied cardboard goggles provided by the research team to her class of Year 10 English language students to view at home while Teacher B (Case Study 2) used school-supplied plastic goggles to view the modules within classroom lessons. The following reports the perceptions of the two teachers of the value of such technologies in addressing some of the challenges of EFL classroom learning.

Challenges to developing communicative competence in English in South Korea

Both teachers A and B made it clear that South Korea is not an English-speaking country, so few opportunities exist to speak English outside of the classroom. Also, little opportunity is provided in school for interaction in English due to the time constraints caused by the pressure of passing exams. Therefore, students do not see English as a tool for communication. Rather, students see English as a subject with a focus on test preparations. In English tests held in South Korea, students are mainly tested on grammatical knowledge regarding sentential structures in written form. This also leads to the focus of classroom English learning remaining at the sentential level of grammatical knowledge acquisition. Teacher A stated that when students take a speaking test, they memorize the content and then recall it from memory in a very unnatural way. Teacher B suggested that the most challenging aspect of speaking for English language learners in South Korea was transitioning from mere memorisation of sentence patterns and formulas to producing more complex factual or explanatory texts without the need for rote memorisation. According to Teacher B, his English students often encountered this as a linguistic enigma, positioned somewhere between grammar and spoken language. He did not believe that they faced significant difficulties in acquiring English communicative functions through formulas and expressions, as they could memorize and apply them appropriately in various contexts. However, as an educator, he acknowledged the need to address

the afore-mentioned concern for his students. While he possessed the linguistic knowledge to do so, he expressed that integrating such concepts pedagogically into teaching materials proved to be extremely challenging.

Noticeably, Teacher B emphasized that the comparatively boring and artificial English learning resources in English textbooks have become the greatest hindrance for students to learn English well. Teacher B further pointed out that to make learning English more interesting and fun, students have been actively seeking for more authentic and more realistic English learning resources such as YouTube English learning channels. Meanwhile, Teacher A also commented that the influential factors such as "fun" and "authenticity" are crucial in engaging students' learning and encouraging the formation of natural conversations.

In summary, both teachers believe that the time constraints, boring English textbook content and those overly artificial and unnatural language learning scenarios that textbooks could currently provide are the biggest impediments for Korean students to develop their communicative competence.

The benefits of teaching and learning through i-VR modules
Both teachers A and B recognised that learning English through i-VR modules is a beneficial, valuable and fun learning experience due to the opportunities provided by i-VR modules that expose EFL learners to more natural and authentic English conversations and environments than otherwise possible. While Teacher A skipped the spaceship scenes in the project modules and only viewed the parts that she was interested in at home with cardboard VR goggles and predicted that her students would do the same, Teacher B not only enjoyed the i-VR modules himself with better quality plastic VR goggles but also trialled the higher quality goggles with his students. According to Teacher B's observation, his students showed communicative intent while they were watching the i-VR modules. He further suggested that another important advantage of using i-VR in teaching is that immersive VR environments could embed an instructional or pedagogical design that would be difficult to replicate in real-world immersive experiences such as the English-speaking Village near Seoul. For Teacher B, even TV shows or movies do not provide a pedagogical structure for learning language. Thus, he firmly believes that i-VR could provide educators with more opportunities for improving

students' learning and teachers' teaching practices in a more realistic language acquisition context than a classroom setting and textbook can provide.

The challenges of teaching and learning through i-VR modules
Both Teachers A and B thought i-VR has a place in English language learning in South Korea especially in enhancing and extending learning from textbook learning, but Korean smartphones are generally too large for the cardboard goggles which caused a reduction in the quality of the learning experience for students of Teacher A. Whereas the students of Teacher B, who made use of the plastic goggles, did not experience any such problems.

Additionally, Teacher A reported that some of her students who were more advanced than other classmates found the progression of the i-VR modules a little slow and therefore became impatient and moved through the content rather quickly. On the contrary, Teacher B pointed out that the progression of the i-VR modules and the speaking speed of the "personal learning assistant Jarvis" were too fast for some of his lower-level students.

Future development recommendations for i-VR modules
Both teachers A and B implied that the learning quality would be improved if the i-VR modules could be more adaptable towards students' different English levels. Moreover, both teachers agree that if technology allows a real-time interactional conversation between students and the learning facilitator embedded in i-VR learning environments, it would increase the level of realism and authenticity of communicative interactions even more. Furthermore, both teachers agreed that instead of the robotic voice, using a clearer voice for Jarvis would be better. Additionally, they think the rhythm of intensive learning and relaxed learning is very important; for instance, they suggested that the more relaxed learning sections such as swimming with sealions be increased, such as swimming with sealions. Finally, Teacher B suggested that if students were instructed to use earphones or headphones while watching the i-VR modules, the learning experience would be better. Because the learning task was conducted in the classroom settings for students of Teacher B, the sound from other students could be a distracting noise for other students.

Discussion
The project aimed to extend and enhance learning from the relatively static and decontextualised content of a language textbook in a formal classroom setting into the dynamic, explorative and entertaining immersive learning space of a virtual world. This small-scale study has revealed the importance of several considerations in providing a beneficial experience for language learners in such an immersive virtual reality environment. that Overall, student enjoyment of the learning experience provided by the virtual reality program were strongly associated with all of the features of immersion, physical presence, self-presence, social presence, instructional presence, agency, and cognitive load. Student perceptions of how the virtual reality program improved their confidence in speaking English were strongly associated with immersion, instructional presence, and agency. Similarly, student perceptions of how the virtual reality program improved their competence in speaking English were strongly associated with immersion and agency and to a much lower extent, instructional presence. Student perceptions of how the virtual reality program improved their listening comprehension ability were strongly associated with immersion, self-presence, and social presence. Most students preferred to listen to an American accent and were able to produce a few short, fluent, largely coherent and comprehensible clauses as a spoken response to the tasks based on their learning in the immersive virtual reality modules. The teachers agreed that the immersive virtual reality environment had some value when integrated with textbook and classroom learning to extend and enhance that learning to build communicative competence and confidence in spoken English. However, they offered some recommendations for further improvement concerning the nature and delivery of the module content as well as in the equipment used so that a more interactive and immersive experience could be provided.

Immersion for communicative competence development
An immersive environment provides a context for learners to experience language and culture for purposeful communication in situational context (Peixoto et al., 2021; Savignon, 1987). Teacher A acknowledged the entertainment value of the i-VR modules as an enjoyable experience and reported that her students were only interested in swimming with the sealions in the fourth module without having to go through the pre-learning

process. This enforces the notion that without a pedagogical structure as in the formal classroom setting informed by the textbook, context can only be experienced and not learned (Blyth, 2018). Teacher B acknowledged that the immersive virtual reality environment was capable of embedding an instructional design to transform experience into purposeful learning. This has not only been shown to be beneficial for communicative competence development but also for cognitive development by embodying cognition within a real-world environment with scaffolded multimodal learning resources (Kramsch, 2004). In i-VR, learners are presented with dynamic situational encounters in real-world contexts beyond the comparatively static nature of textbook learning in the relatively de-contextualised environment of the formal classroom setting.

I-VR, Enjoyment and Motivation
Motivation is necessary for successful learning (Lamb, 2017). Students in both cohorts reported that all elements of the virtual reality environment were enjoyable. Norton (2014) regards motivation as a form of investment in language learning that requires time and effort for a future reward. In the case of language learning in a school setting, students must invest for imagined long-term benefits. Students are motivated when they can imagine future opportunities and communities that will offer social, symbolic and capital rewards as students enter a future workforce (Norton, 2014). Immersive virtual reality has the potential to bring those imagined futures and communities into the present reality of classroom learning through highly immersive virtual reality encounters with embedded pedagogical design and supports. Immersive virtual reality has the potential for exposure to a range of accents and varieties of English that can be used as authentic models of intercultural communication for spoken communicative competence development for countries such as South Korea. i-VR extends beyond the limited resources of the English language classroom to enable new possibilities for learning and communication.

An additional motivational factor was that the i-VR environment created cultural interest in the lifestyles of people in a different country while conforming to the topic or theme of the classroom textbook in an immersive, tangible, and embodied way. The textbook unit in question was on travelling abroad. Korean students who would not have the opportunity to board a boat to swim with sealions were able to do so virtually in South Australia.

Experiences that are not readily available to young people in Korea but quite possible to most young people who live in another country can be captured on 360-degree video so that Korean students can enjoy the experience in creative and imaginative ways without travelling abroad (Peixoto et al., 2021). Such experiences can motivate interest in future travel and 'entextualise' language learning to a local community of people enjoying a particular lifestyle activity (Blyth, 2018). As reported in many of the students' spoken outputs, they wanted to visit Australia in the future and swim with sealions for real.

Instructional Design for Immersion and Agency
The students reported improvements in both their spoken confidence and competence through exposure to authentic models of communication and scaffolded learning within the i-VR environment which personalised learning for them in a relatively safe space. The procedural genre was modelled most and provided the easiest structure for students to produce themselves. As reported by Teacher B, students tend to rely on memorisation and cannot connect grammatical structures and ideas themselves to produce more complex factual texts. This accounts for why most students produced a procedural text or a personal recount of their experience of swimming with sealions rather than explaining the lifestyle and habitats of sealions as presented in the fourth module.

Both teachers commented that having too much content and too many inputs tended to be overwhelming and created cognitive overload for lower-level students of English, while slowing the pace of progress through the modules with the use of scaffolded processes and high-level revision tended to be unnecessary for the more advanced students of English. The teachers agreed that differentiated learning within the platform was needed so that different pathways and learning outcomes were possible for different levels of learner. This requires an instructional design within the i-VR modules that allows different options and pathways or the ability to speed up, slow down or skip content. To a limited extent, the four i-VR modules in the current project had the capacity to achieve this.

Authentic and Interactive Communication
Additionally, the teachers would have liked a more authentic communicative experience with interactive capabilities for their students, as is possible in immersive study abroad experiences

(Wang et al., 2022). This is currently possible with high-end i-VR platforms and equipment but is not yet affordable for the average school. Such web-based solutions can connect learners across the globe for immersive collaborative school-based interactions but, in the meantime, low-cost solutions as used in the current project have a valid place in the overall language learning process in support of classroom-based language learning (Berti et al., 2020; Parmaxi, 2020).

Regulation, Autonomy, and the Role of the Classroom Teacher
LBC has been shown to offer learners motivation and autonomy (Reinders et al., 2022). The initial aim of the project was to provide a self-regulated experience that extended beyond the formal classroom setting and enhanced learning from the textbook by immersing students in a relevant lifestyle setting in another country. A virtual instructional guide and a linear scaffolded progression of learning with multimodal resources as language inputs were thought to be sufficient to assist learners in a self-regulated experience (Adnan et al., 2020; Divekar et al., 2018; Liang-Yi, 2011). However, perhaps due to cultural notions of learning, few of the LBC cohort produced the requested outcomes without the support of the formal structured guidance of the classroom setting to support and regulate their learning. The participation of the classroom-based cohort with the guidance and facilitation of the classroom teacher to complete the modules and the required tasks suggests that the classroom teacher plays a vital role in supporting learning in autonomous virtual environments such as these and that self-regulation may be insufficient to produce the anticipated learning outcomes. The findings revealed that the teacher must still play an important facilitative and guiding role in the use of i-VR to achieve the anticipated outcomes. This places the teacher as the overall director and convenor of the learning process in and beyond the classroom to facilitate a purposeful and cohesive approach to language learning (Lai et al., 2015; Yuan, 2022). Students experienced some autonomy and control in the i-VR modules as they were able to skip, pause, rewind or fast-forward sections as necessary to meet their own learning requirements.

Conclusion
The teachers considered the project to be beneficial in that it provided a low-cost immersive cultural experience that extended

from classroom learning from the assigned textbook and offered a motivating, entertaining space to learn English in a scaffolded fashion. Students also reported a high level of satisfaction with the experience, whether in-class supported by the English language teacher or learning beyond the classroom setting in the home environment. The quality of the VR headsets, even if low-cost, is an important consideration in providing an immersive experience and quality noise-cancelling headsets are recommended in a classroom setting where many students are using the VR goggles at the same time. The amount of input from an instructional guide and the focus of the experiential learning need to be carefully considered with the teachers recommending authentic conversations with human interactants and human virtual guides, and with sufficient silent periods between interactions for learners to digest content. The type, nature and frequency of multimodal inputs also requires careful consideration. For regulation of learning, it is recommended that a classroom teacher direct and facilitate learning and support task-based production in the form of spoken texts. This may require a closer collaboration between the instructional designers and the classroom teacher for a tailored experience.

Higher end solutions are available that provide opportunities for more enriched interactive experiences where target language speakers and a teacher can be available within the environment to learners; however, this requires an on-going subscription to an online virtual reality platform, often using the Unity or Unreal engines, and expensive dedicated head-mounted displays (HMDs), which is not feasible to most schools or teachers compared to the perceived benefits. Low-cost solutions of the kind used in this small-scale project require only developmental costs, which could be covered by training teachers in how to construct the environments themselves or to employ an instructional/curriculum designer of the environments within a school or regional setting.

Students could also be involved in the capture and editing of suitable 360-degree videos for immersive experiences with classmates for communicative purposes. The advent of generative artificial intelligence technologies has the potential to support the development of such technological resource development and provide efficiencies. In any case, teachers should be trained and experienced in the possibilities and use of a variety of such technologies for use in LBC or formal classroom settings in order to best support and direct students in their use. In many instances,

such technologies complement classroom practices and resources in the overall language learning process, maximising opportunities and minimising disadvantage.

The project contributes to a more holistic process of learning within and beyond the classroom, managed and facilitated by the classroom teacher. This holistic process has the potential to transforms learning into immersive cultural experiences beyond the classroom setting in which the linguistic knowledge and competence developed through textbook learning in classrooms is applied to immersive situational settings. Multi-sensory semiotic resources embedded in the i-VR environment scaffold learning to develop confidence and competence in spoken discourse and potentially in intercultural communication. Further research could focus on the higher-end potential of i-VR or on addressing some of the issues identified in this paper with low-cost solutions. More thorough testing and possible refinement of the CAMIL model for the design of i-VR environments for language learning is also recommended.

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Appendix 1: Online Student Questionnaire
Online Survey for Student Participants
By completing and submitting this questionnaire, you are indicating that you have read and understood the Participant Information Sheet and give your consent to be involved in the research.

Q1. How long have you been learning English?
❏ Less than 3 years   ❏ 3-5 years   ❏ 6-10 years
❏ more than 10 years

Q2. Where do you hear English spoken?
❏ mostly in the English classroom   ❏ mostly at school
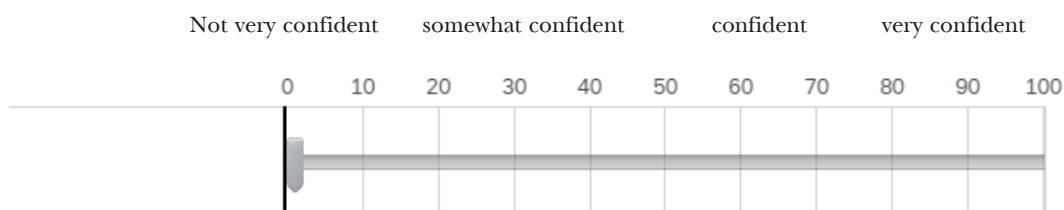❏ at school and sometimes after school ❏ mostly after school

Q3. Where do you speak in English?
❏ mostly in the English classroom   ❏ mostly at school
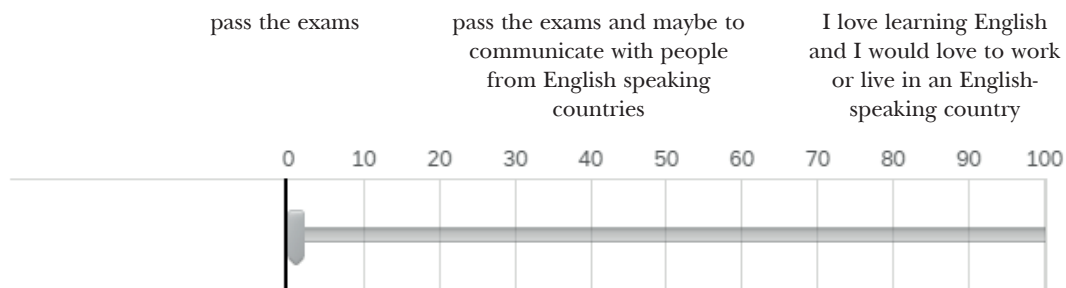❏ at school and sometimes after school ❏ mostly after school

Q4. I speak English in:

| single words | phrases and clauses | sentences | conversations |

| 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
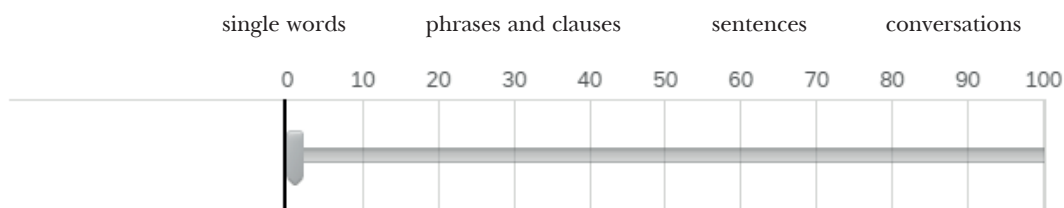
Q5. Compared to your classmates, how confident are you in speaking English?

| Not very confident | somewhat confident | confident | very confident |

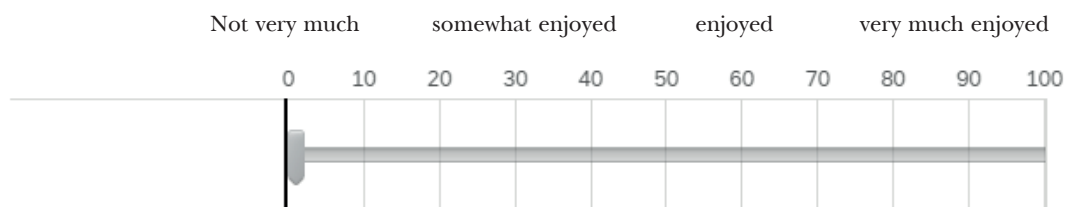| 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

Q6. Why do you learn English? (to test the "motivation" factor, intrinsic motivation and integrative orientation Vs extrinsic motivation and instrumental orientation)

| pass the exams | pass the exams and maybe to communicate with people from English speaking countries | I love learning English and I would love to work or live in an English-speaking country |

```
      0   10   20   30   40   50   60   70   80   90   100
```

Q7a. Have you experienced any other Virtual Reality activities (i.e., VR games, VR tours or VR movies etc.) before participating this research? And when? (To test students' previous knowledge towards VR technology and to test students' preference towards the psychological affordances that IVR provides)
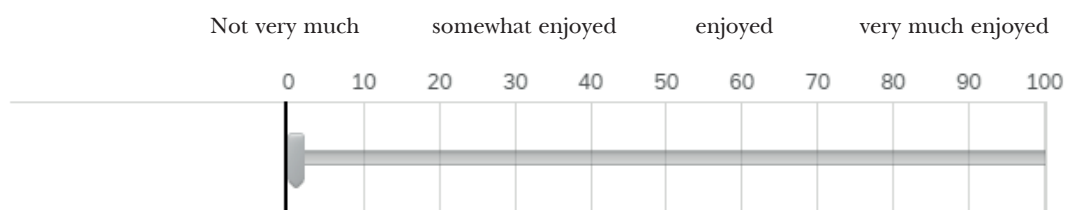
❏ Yes, just recently   ❏ Yes, more than one year ago
❏ Yes, more than two years ❏ No, I never had any VR experience before participating this project

Q7b. If yes above, how much did you enjoy the latest VR experience before participating in this project?
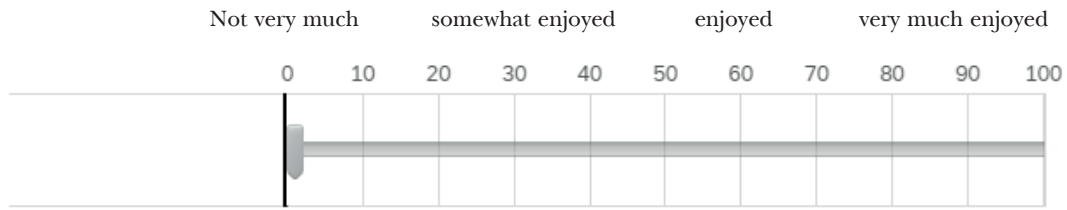
| Not very much | somewhat enjoyed | enjoyed | very much enjoyed |

```
      0   10   20   30   40   50   60   70   80   90   100
```

Why? [   ]

Q8. The immersive virtual reality learning module in this project has improved my **confidence** *in speaking English:*

| Not very much | somewhat enjoyed | enjoyed | very much enjoyed |

```
      0   10   20   30   40   50   60   70   80   90   100
```

Q9. The immersive virtual reality learning module in this project has improved my **competence** *in speaking English:*

Not very much	somewhat enjoyed	enjoyed	very much enjoyed

0   10   20   30   40   50   60   70   80   90   100

Q10a. Have you tried to complete the final two tasks (i.e. Describe what you have experienced during this trip; Explain why sealions like to live near Langton Island) from the VR learning videos?
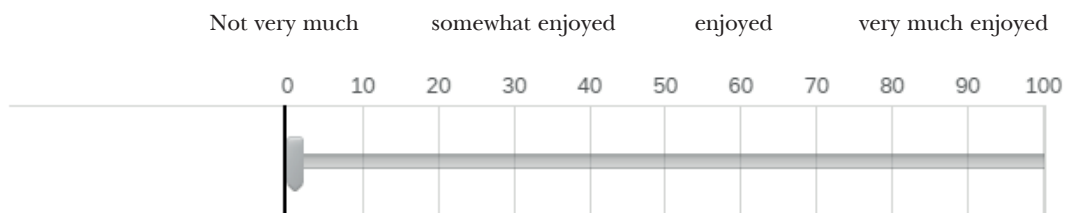
❏ Yes   ❏ No

Q10b. If you have, how well do you think you have completed them?

poorly	okay	reasonably good	very good

0   10   20   30   40   50   60   70   80   90   100
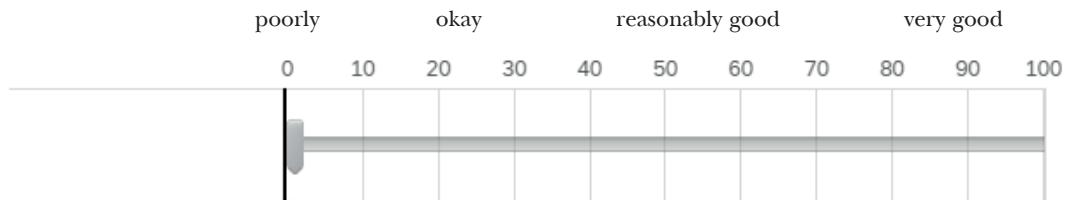
Q11. Which element(s) of the immersive virtual reality learning module were most helpful in improving your English? (please prioritise – rank item by dragging it up or down)

❏ Jarvis AI personal assistant
❏ Text panels
❏ Video clips
❏ People talking
❏ Korean translation assistance

Q12. How much did you enjoy the experience of learning in the virtual reality learning module for this project?

Not very much	somewhat enjoyed	enjoyed	very much enjoyed

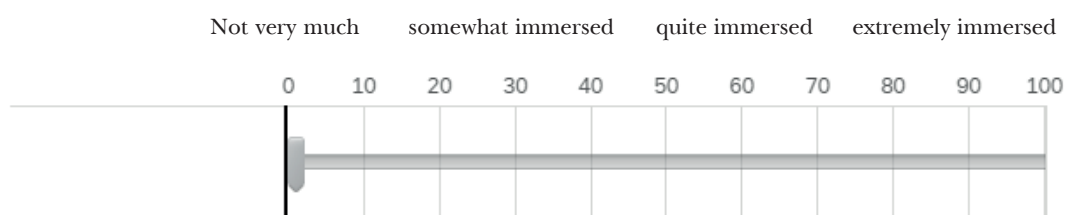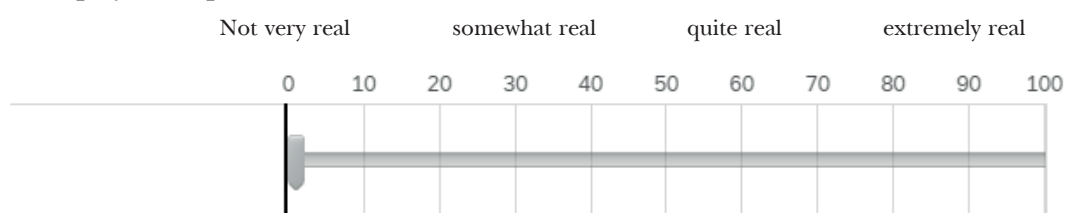0   10   20   30   40   50   60   70   80   90   100

Why?

Q13. Which element(s) of the immersive virtual reality learning module did you like most? (please prioritise – rank item by dragging it up or down)

❏ Jarvis AI personal assistant
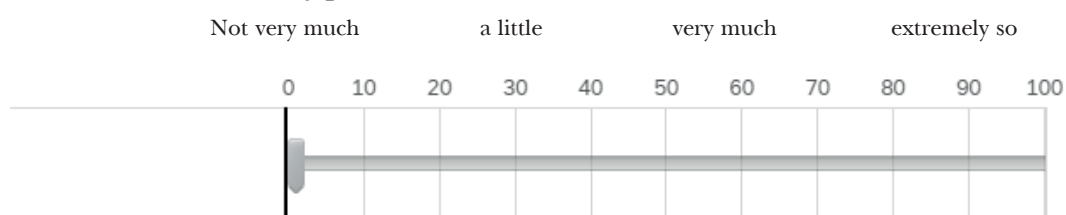❏ Text panels
❏ Video clips
❏ People talking
❏ Scenery

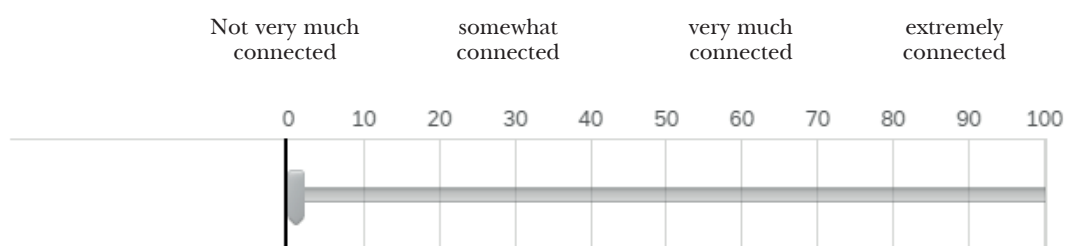*Q14. How immersed did you feel in the environment? (immersion)*

Not very much   somewhat immersed   quite immersed   extremely immersed

0   10   20   30   40   50   60   70   80   90   100

Q15. To what extent did you feel the virtual environment was real to you? (physical presence)

Not very real   somewhat real   quite real   extremely real

0   10   20   30   40   50   60   70   80   90   100

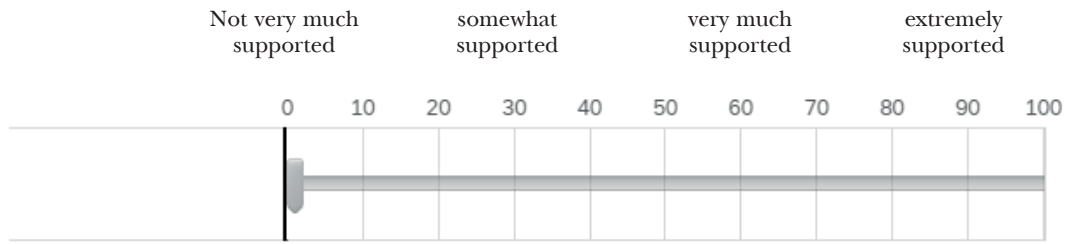*Q16. To what extent did you feel like you were snorkelling underwater with the sealions? (self-presence or embodiment)*

Not very much   a little   very much   extremely so
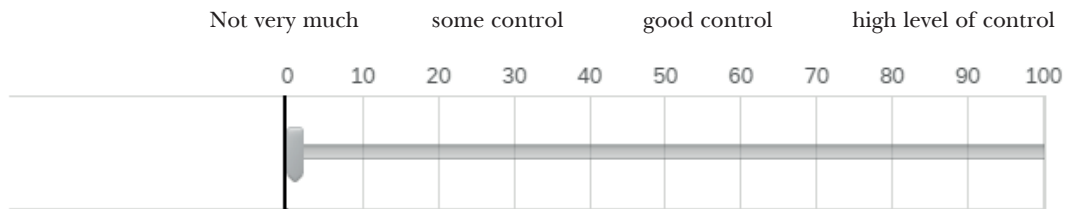
0   10   20   30   40   50   60   70   80   90   100

Q17. To what extent could you relate to Jarvis, the AI personal assistant? (social presence)

Not very much connected   somewhat connected   very much connected   extremely connected

0   10   20   30   40   50   60   70   80   90   100

Q18. To what extent did Jarvis support your learning in the environment? (instructional presence)

| Not very much supported | somewhat supported | very much supported | extremely supported |

| 0 10 20 30 40 50 60 70 80 90 100 |

Q19. To what extent did you feel you had control over your learning in the environment by pausing and replaying sections of the video? (agency/self-efficacy/self-regulation)

| Not very much | some control | good control | high level of control |

| 0 10 20 30 40 50 60 70 80 90 100 |

Q20. To what extent did you feel there was too much new learning in the environment? (cognitive load)

| Not very much | some new content | a lot of new content | too much new content |

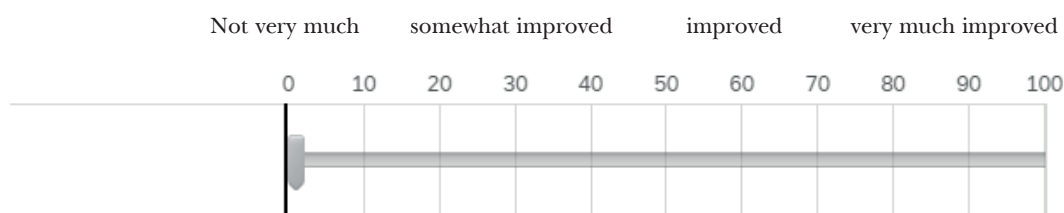| 0 10 20 30 40 50 60 70 80 90 100 |
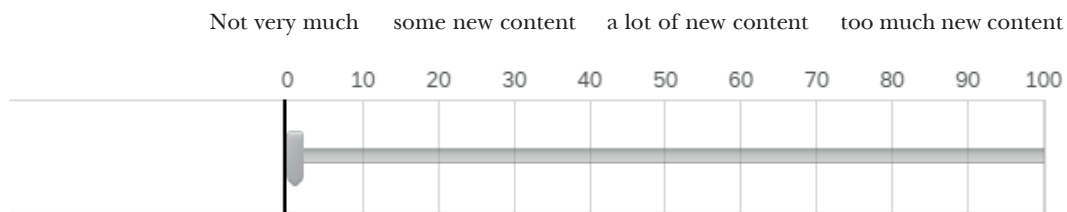
Q21. To what extent was the environment and its content different to what you are used to?

	No difference	Somewhat different	Different	Very different	Extremely different
Vocabulary	o	o	o	o	o
Grammar	o	o	o	o	o
Accent	o	o	o	o	o
Speed of talking	o	o	o	o	o
Lifestyles	o	o	o	o	o

Q22. What did you like most about the immersive virtual reality learning experience?

Why?

Q23. To what extent did the virtual reality learning experience improve your listening comprehension ability?

Not very much   somewhat improved   improved   very much improved

0   10   20   30   40   50   60   70   80   90   100

Q24. Were the accents used in the VR environment comprehensible to you?

❏ Yes   ❏ No

If not, why not? [   ]

Q25. What standard of English accent do you prefer?

❏ *British English*   ❏ *US English*   ❏ *Australian English*

Why? [   ]

Q26. Do you think it is helpful to hear a variety of English accents?

❏ Yes   ❏ No

If not, why not? [   ]

Q27. Overall, do you think the virtual learning experience can support your English language speaking ability?

❏ Yes   ❏ No

If so, how? [   ]

If not, why not? [   ]

Appendix 2: Tasks, Modelled Texts, and Speaking Samples
The tasks presented at the end of the i-VR learning modules were:

Task 1
Learn how to go to the snorkelling location (**procedural text**)

Task 2

Learn how to put on snorkelling gear **(procedural text)**

Task 3

Explain why sealions like to live near Langton Island **(Explanatory Text)**

Task 4

Describe your experience during this trip **(Personal Recount)**

The procedural tasks as presented in the i-VR modules are as follows:

Task 1 Learn how to go to the snorkelling location (procedural text)
First, we need to follow the map and walk to the Marina.

Then, we need to "board" the boat and sail as close as possible to Langton Island.

After that, we have to take a tender to the coast of Langton Island area. (And that is where we can experience snorkelling and swim with sealions)

Task 2 Learn how to put on snorkelling gear (procedural text)
First of all, you need to wear a snorkel mask which fits on your face like this.

Then you need to attach the snorkel to your snorkel mask like this.

After that, you need to put on a pair of snorkel fins that fit your feet size like this.

Finally, if the weather is cool or cold, you need to wear a snorkelling wetsuit to keep yourself warm.

Colour coding for Analysis of Student Voice Recordings

Explaining procedures :

- how to get to the snorkelling location
- how to prepare for snorkelling

Explaining the habitat and lifestyle of sealions (informed by an embedded video in module 4)

Recounting experience (of snorkelling with sealions in i-VR)

Sample Recordings of Student Responses to the Tasks

Out-of-class group (7 responses)
Using own syntax – not emulated from the immersive virtual environment

1: All you need to prepare for snorkelling is a suit, flippers and mask equipment.

Brief – not providing any detail

2: We need to prepare snorkelling equipment in advance.

Realism of the experience of VR

3: When I look at the VR made me think that I am actually swimming. I felt as if I floating.

7: It was not realistic but it was good and cute because the seal was expressed well.

Interesting experience – hope that all will be able to share in future

4: Obviously it was an interesting experience to meet many animals within the sea of Australia far away and I hope that students will able to experience this in school classes in the future.

Enjoyable experience

5: The sealions were very cute and very fun. I hope to have this experience next time.

Step-by-step procedure

6: The first thing we need to do in order to get to the Langton Island is to follow the map and walk to the marina. Then we need to board the boat and sail as close to the Langton Island. After that, we need...we have to take a tender to the coast of Langton Island area.

Classroom-based group (21 responses)
Step-by-step procedure (12 recordings that were similar but variations of the example below)

11: You need to follow four steps to snorkel: First, you need to wear a snorkel mask which fits on your face; Second, you need to attach the snorkel to your mask; Third, you need to put on your snorkel fins; And, finally, you need to wear a wetsuit to keep yourself warm.

Some were combinations of genre – almost all responses were clear and intelligible but this one was not so intelligible due to pronunciation and volume with ambient classroom noises and chatter.

14: To snorkel you must wear a snorkel mask, snorkel fins, a wetsuit sealions like...and (unintelligible) you have to take a boat to the snorkelling site to Langton Island swimming with the sealions (unintelligible).

30: First, go to marina. Second, boat (board?)...get on the boat and go to Langton Iceland (Island). Then, tender...then take a tender and go to snorkelling location and then dive to...diving to sea and meet the sealion and swim with sealion. Funny...funny swim.

18: Wear a snorkel mask which fit to the face. Attach the snorkel mask. Put on a pair of fins. If weather is cold, wear a wetsuit. Sealions swim in shallow water and eat fish.

19: In order to snorkel you must wear a mask that fits your face and wear a snorkel on the mask. Next, you should wear a snorkel outfit and wetsuit if it's cold. Sealions live on Iceland (island) and swim in the sea and eat fish. Swimming with sealions really felt cool. I felt I wanted to try the thing.

A couple of examples of the personal recount:

23. When swimming with sealions, it's very funny and wonderful. And I surprised because sealions is very big. So it's funny and wonderful. Yes.

29. My first VR experience. The seal looks so real I really like it. I want to go to the Australia see right away. I was so interested. I like Australia. I love VR. Thank you very much.

Appendix 3: Questions for Teacher Interviews

Teacher Interview Questions
(Guiding semi-structured interview questions)

What are some of the challenges that students face in learning English generally in South Korea?

What do you see as the greatest challenge for English language learners in South Korea?

Do varieties or standards of English matter in South Korea? If so, why? If not, why not?

What are the main challenges that your Year 10 students have faced in learning English?

What are the most difficult aspects of English to teach in South Korean classrooms?

Have you had much experience with immersive virtual reality environments?

Have you viewed all of the immersive virtual reality modules that we've developed? If yes, do you think that immersive virtual reality learning environments have a place in learning English?

What potential can you see in students using such environments outside of school to extend their classroom learning?

Do you think any of the elements of the learning modules are helpful in addressing some of the challenges that your Year 10 students face in learning English? If so, which? If not, why not?

What do you think the greatest strengths of the modules are for your Year 10 students, if any?

What would you change about the modules and why?

If further learning modules were available based on different situational settings and different topics would you promote them for use to your students?

What advice would you give for further development of such immersive language learning experiences for South Korean English learners?

Do you think there are better activities within or beyond the classroom that students can engage in to improve their communicative competence in English? If so, what might they be?

Dr Greg Restall is a Lecturer in TESOL in Education Futures at UniSA. Dr Restall qualified as a secondary school teacher of foreign languages and ESL before commencing his teaching and academic career. He taught EAP to adult international students for 14 years before lecturing in TESOL at UniSA. He has extensive local and international experience with particular interest in the use of technologies to support language learning. He has supervised doctoral students to completion in TESOL.

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Ms Ada (Yixuan) Yao has recently completed a M.Ed. (TESOL) at UniSA from which she has developed interest, experience and expertise at developing virtual reality learning environments to support foreign language learning. She has applied her expertise to the current i-VR project and is a current PhD student of Dr Greg Restall.

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Miss Belle Niu is a current Ph.D. student of Dr Greg Restall. She has completed education degrees in both Australia and China from which she has developed experience and expertise at ESL teaching and learning. She also has expertise in dance and performance arts which were applied to the current i-VR project.

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