Exploring the Impact of Virtual Reality on Developing EFL Learners’ Speaking Skills in Situated Learning

Weijian Yan (yan400@purdue.edu)  
Purdue University West Lafayette

Victoria Lowell  
Purdue University West Lafayette

Li Yang  
JiangSu University of Science and Technology Zhenjiang

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Abstract

The utilization of Virtual Reality (VR) has proven effective in enhancing the speaking skills of English as a Foreign Language (EFL) learners by providing an authentic learning environment conducive to situated learning. This exploratory mixed-method study explored the impact of VR-enhanced instruction on EFL learners' speaking skills and their perception of the learning experience within the context of situated learning. 16 first-year undergraduate students majoring in English at a Chinese public university participated in role-playing speaking exercises through the desktop-based VR application, Immerse. The research employed various instruments, including a pretest and a posttest covering comprehension, pronunciation, fluency, grammar, and vocabulary. Additionally, participants filled out a presurvey detailing demographic information and a post-survey assessing their overall perception of the learning experience in VR. Semi-structured interviews were also conducted. Quantitative analysis of the test results revealed a significant improvement in learners' speaking performance (t (15) = 7.69, p < 0.01, Cohen's d = 1.79), with notable enhancements in vocabulary, fluency, and grammar. A thematic analysis of the interview and open-ended responses in the post-survey supported the quantitative findings, emphasizing that authentic contexts in the VR environment can help EFL learners enhance knowledge comprehension and retention, engagement and motivation, and knowledge transfer to real life, which can facilitate situated learning.

Main text

Speaking skills are integral to language learning, playing a crucial role in fostering effective communication, cultural understanding, and the practical application of language knowledge in diverse contexts (Aulia et al., 2021; Saniboo & Sinwonsuwat, 2016; Suparman, 2017). The importance of speaking skills is underscored by their role in enabling learners to express thoughts and needs in the target language facilitating meaningful interactions with native speakers and fellow learners (Leong & Ahmadi, 2017). Moreover, the ability to engage in speaking is essential for building both personal and professional relationships (Hussain, 2017). Strong speaking skills can open doors to career opportunities, particularly in workplaces where interaction with colleagues, clients, or customers is crucial, as meaningful conversations help learners connect with others, establish rapport, and create lasting bonds (Leong & Ahmadi, 2017). Given that language is a tool for communication in real-life situations, speaking skills are directly applicable in daily interactions, making language learning a more practical, meaningful, and relevant endeavor for learners' lives (Aulia et al., 2021; Saniboo & Sinwonsuwat, 2016; Suparman, 2017).

Traditionally, language educators have employed a variety of methods and activities to teach speaking skills, encompassing repetitive drills, dialogue memorization, role-play, simulation, storytelling, picture description, and brainstorming (Renau Renau, 2016). Instructional materials like textbooks, pair-communication practice resources, exercise handbooks, pictures, and audio materials are commonly utilized by teachers for language-speaking instruction (Richards & Rodgers, 2014). However, classroom activities involving instructional materials, especially textbooks, often lack connections to real-life contexts (Gilmore, 2007; Lan et al., 2015; Lei et al., 2019), and they sometimes fail to provide
opportunities for learners to engage in authentic and meaningful learning within realistic settings (Yang et al., 2020). Additionally, typical language interaction exercises in the classroom do not accurately replicate real-world language use, potentially hindering students' development of comprehensive language proficiency (Ozverir et al., 2016).

An authentic learning environment is a crucial prerequisite for effective language learning, as emphasized by various researchers (Hwang et al., 2016; Ibáñez et al., 2011). Authenticity in learning underscores the importance of meaningful engagement with real-world problems within specific contexts (Reynolds, 2013; Shadiev & Huang, 2016). Recognizing that decontextualized language learning cannot motivate and empower language learners, most foreign language researchers and educators consider learning in authentic contexts pivotal (Godwin-Jones, 2018; Lan, 2015; Mitchell & Myles, 2004). Learning a foreign language in an authentic setting can facilitate the transfer of acquired knowledge to real-life situations (Wong et al., 2018). Consequently, foreign language teachers must provide opportunities for active interaction among students in authentic contexts (Lan, 2020). The ultimate objective of language learning is effective communication in real-life scenarios, and the successful transfer of speaking skills from learning environments to real-life situations is most achievable in authentic learning settings (Chen & Hwang, 2020). Therefore, the absence of authentic language-learning contexts significantly impedes students' development of language-speaking skills (Alharbi, 2015).

Virtual reality (VR) serves as an innovative tool for language learners, offering authentic learning environments that enhance speaking skills (Lan, 2020; Scavarelli et al., 2021). This technology generates computer-simulated three-dimensional environments, allowing users to authentically interact with digital content or others (Lowell & Yan, 2023). The term "virtual reality" encompasses the technology itself, the VR environment, and users' experiences in its application (Lowell & Ilobinso, 2023). VR systems, classified based on the level of immersion, include non-immersive (desktop-based VR), semi-immersive (partially immersive experience with awareness of the real world), and fully immersive (head-mounted display connected to a computer) categories (Bamodu & Ye, 2013). Non-immersive VR involves desktop-based interaction, utilizing devices like a keyboard, mouse, game console, or touch screen (Lee & Wong, 2014). Semi-immersive VR provides a partially immersive experience with user-customized navigation through 3D virtual content on a screen (Lowell & Tagare, 2023). Fully immersive VR employs a head-mounted display connected to a computer, enabling users to physically move or navigate within a 3D virtual environment using a joystick (Lee & Wong, 2014; Southgate et al., 2016).

VR serves as a sophisticated system that replicates real-life encounters, offering authentic and pertinent scenarios (Aldrich, 2003). The application of VR extends to language learning across various linguistic domains, with a specific emphasis on refining speaking abilities (Berns et al., 2013; Lan et al., 2019). Research indicates that engaging in learning within a virtual environment not only enhances students' proficiency in speaking skills but also provides enriched learning experiences, heightened motivation, increased physical and social presence, and an enhancement in critical thinking skills (Chien et al., 2020; Liaw, 2019).
Despite these promising findings, there remains a need for further research on the relationship between VR and language learning (York et al., 2021). Existing studies have not yielded sufficient empirical evidence to ascertain the extent to which VR tools can enhance students’ oral proficiency in various aspects (Thrasher, 2022). Moreover, the full potential of VR technology in assisted learning has not been fully realized (Kaplan-Rakowski & Gruber, 2021; Makransky & Petersen, 2021). The current body of research on using VR for speaking in language classrooms is limited, with a notable absence of quantitative studies to comprehensively understand the impact of VR on learning (Kassim et al., 2019; Lin & Lan, 2015; Parmaxi, 2020). Additionally, while investigating whether VR-assisted learning enhances speaking performance is crucial, understanding students’ perceptions of their learning process is equally important (Lowell & Alshammari, 2019). Students’ perceptions provide qualitative data that complement findings from other research questions and offer valuable insights for instructors and designers into learners’ perspectives on the impact of VR on improving speaking skills. Notably, the existing literature lacks a substantial qualitative analysis of students’ perceptions regarding the use of VR to improve speaking skills. Consequently, this study aims to address this gap through a mixed-method approach, investigating whether speaking simulations in a VR environment, specifically, Immerse, can enhance EFL learners’ speaking skills and examining their perceptions of the learning experience with Immerse in role-playing speaking activities to enhance situated learning.

**Literature Review**

**Challenges of Improving Speaking Skills Faced by Language Learners**

Speaking is a vital aspect of language learning as it is a practical application of acquired skills (Suparman, 2017). Widely regarded as the most crucial among the four language skills (Alalou, 2001; Akhter et al., 2020; Leong & Ahmadi, 2017; Rao, 2019; Soomro & Farooq, 2018), speaking often poses a significant challenge for learners, leading to frustration despite years of studying (Sabina, 2018). The complexity of developing speaking skills arises from the simultaneous need to focus on fluency, pronunciation, vocabulary, grammar, and comprehension (Leong & Ahmadi, 2017), demanding diverse skills, strategies, and knowledge (Kauper, 2012). Unlike skills such as reading or writing, speaking is particularly difficult to practice for learners residing outside a language-speaking environment (Sabina, 2018). Proficiency in a foreign language is intricately influenced by factors related to their learning environment (Moeller & Catalano, 2015). Access to an authentic learning environment is crucial for practicing speaking (Richards & Rodgers, 2014) as it emphasizes the importance of real-world engagement (Golonka et al., 2014). Exposure to authentic language learning and speaking environments is essential for enhancing speaking abilities, as studies indicate that insufficient exposure to the target language environment can impede language-speaking skills (Chen et al., 2022; Chen & Hwang, 2020; Lan, 2015; Lan, 2020).

**VR and Its Main Affordances for Language Learning**
For almost two decades, researchers and educators have been intrigued by the application of VR in language learning (Lan, 2020). The inherent capabilities of VR, such as creation, immersion, and interaction, closely correspond to the fundamental elements crucial for successful language learning, including immersion, participation, interaction, and authenticity (Lan, 2020). As a result, VR stands out as a promising technological tool capable of providing an authentic learning environment for language learners, facilitating the practice and enhancement of speaking skills, as well as fostering the development of linguistic competence and confidence (Lan, 2020; Scavarelli et al., 2021).

VR significantly enhances language learning by providing authentic and immersive environments replicating real-life contexts (Lan, 2020). This dynamic platform offers language learners a space to practice and develop practical language skills virtually. Particularly advantageous in fields where creating realistic learning environments is challenging within traditional classrooms, VR is a viable alternative, enabling students to engage in simulated learning experiences when authenticity is challenging to attain (Huang & Liaw, 2011).

Moreover, VR contributes to learning by simulating various educational scenarios (Alrehaili & Al Osman, 2022). It exposes learners to language in diverse contexts like shopping, dining, or transportation, facilitating the association of language elements with specific situations and fostering a deeper understanding of language use. Through interactive role-playing and simulations, VR enables learners to assume different roles and navigate scenarios aligned with their language learning objectives, thereby enhancing practical language application. The incorporation of multiple senses, including sight and sound, in the VR experience creates a more immersive learning environment, leading to a profound comprehension and retention of language elements (Chang et al., 2012). The immersive and interactive features of VR go beyond enhancing comprehension and retention of knowledge; they also elevate learner motivation by making the language learning experience enjoyable, engaging, and relevant. Motivated learners are more likely to actively participate and persist in their language studies, demonstrating the potential of VR to positively impact language education (Chen & Hwang, 2020; Enkin, 2022; Liaw, 2019; Wu & Hung, 2022).

**Application of VR on English-Speaking Learning**

VR has been validated as an effective pedagogical tool in enhancing the communicative abilities of EFL speakers (Gruber, 2021; Shorey et al., 2020). Extensive research indicates that the unique affordances of VR, including immersion, authenticity, participation, and interaction, have the potential to revolutionize traditional approaches to language teaching and learning, particularly in the improvement of English-speaking skills (Damio & Ibrahim, 2019; Lan, 2020). Students often perceive VR as providing a more natural conversation setting compared to conventional academic environments, thereby enhancing the experience of speaking in the target language (Enkin, 2022).

Moreover, VR offers a more interactive, context-embedded, and immersive learning environment (Bahari, 2021), contributing to the reduction of speaking anxiety (Abal, 2012; Chen & Hwang, 2020; Melchor-Counto, 2017; Thrasher, 2022) and the promotion of motivation (Chen & Hwang, 2020; Liaw, 2019). Students
expressed greater enjoyment in speaking activities conducted in VR (Enkin, 2022; Kassim et al., 2019) and reported a strong sense of presence during their sessions, finding them realistic and immersive (Davis et al., 2020). VR serves as a motivating force for more authentic and enjoyable learning experiences (Wu & Hung, 2022), providing users with the opportunity to develop speaking skills without the social consequences often present in the physical world (Stewart Rosenfield et al., 2019). Additionally, VR stands as a promising avenue for dynamically creating believable scenes for speaking training and role-play, offering an effective approach to improving speaking skills (Chang et al., 2012).

**Theoretical Framework: Situated Learning Theory and VR**

This study is grounded in the Situated Learning Theory (SLT), as proposed by Lave and Wenger (1991), which asserts that learning occurs when individuals actively participate in socially constructed worlds of practice embedded in authentic activities, contexts, and cultures. According to SLT, knowledge is best acquired when learners engage with materials within relevant contexts, fostering a deeper understanding of the significance and utility of knowledge. SLT underscores the contextualization of human activities, emphasizing that learning is a socially interactive and collaborative process that takes place in authentic physical, social, and cultural contexts (Brown et al., 1989).

In the realm of language learning, SLT suggests that language acquisition can be scaffolded through social interaction, collaboration, and exposure to real-life situations. The importance of presenting knowledge in authentic and relevant settings is highlighted, as articulated by Huang and Liaw (2011). Learning, in this theory, is viewed as a social process wherein knowledge is constructed within authentic contexts. To facilitate this process, instructors are encouraged to provide authentic contexts and activities that reflect real-life applications, enabling situated learning (Herrington & Oliver, 2000).

Falconer (2013) observed from a case study that VR exercises can provide compelling opportunities for situated learning by meeting two crucial elements: authenticity and social interaction. Given that learning always occurs within a specific context, and the context significantly influences the learning process, VR emerges as a feasible technology tool to enhance speaking skills through situated learning. Dawley and Dede (2014) argue that VR offers alternative environments for situated learning, allowing learners to engage in a variety of contexts without physical presence. Consequently, English learners can partake in role-playing speaking activities, and interact with the virtual environment, avatars, and objects to improve their speaking skills. Huang and Liaw (2011) further support the notion that VR, by incorporating authentic and situated problems, can be a valuable tool for EFL learners, enhancing scaffolded learning experiences and contributing to the improvement of speaking skills in a situated context.

**Purpose Statement and Research Questions**

This study aims to explore the potential improvement in EFL learners’ speaking abilities through the application of VR and to comprehend the students’ perspectives on their engagement in role-play speaking activities within a situated learning context.
Q1: Can the use of VR improve EFL learners’ speaking performance in terms of comprehension, grammar, vocabulary, pronunciation, and fluency?

Q2: What are the quantitative perceptions (self-reported ratings) regarding the overall experience of using VR in learning English speaking?

Q3: How did the students perceive their learning experience in role-play speaking activities in VR to facilitate situated learning?

Methodology

This research adopted an explanatory sequential mixed-method design. Quantitative and qualitative data were collected for triangulation and interpretation, as qualitative methods can help explain quantitative findings and surprising results (Bryman, 2006). According to Creswell and Creswell (2017), collecting, analyzing, and mixing quantitative and qualitative data in a single study can better answer the research problem.

Participants and Research Setting

In this pilot study, 16 freshmen, enrolled in an EFL program at a large public university in China, voluntarily participated in supplementary language enhancement activities aimed at improving their speaking skills on a no-credit basis. All participants were proficient in Chinese, with an average of 12 years of EFL study. While there was diversity in their EFL learning experiences, including extracurricular speaking classes and online game-playing, none of the students had prior experience with VR applications.

The students attended six sessions, each conducted in the VR environment provided by Immerse. These sessions served as a novel approach to enhancing speaking skills. Due to Immerse's capacity limitations, the participants were randomly assigned to two groups, each consisting of eight students. Despite the instructor's extensive experience in teaching online EFL courses for over five years using platforms like Zoom, Tencent Meeting, and WeChat, this study marked his first encounter with VR applications.

Throughout the study, both groups engaged in the same speaking activities within Immerse under the instruction of the same experienced online EFL instructor. The sessions were designed to provide participants with a unique VR-based language learning experience, despite their lack of prior exposure to VR applications.

The VR application

This research project employed Immerse (https://www.immerse.online/), a dedicated VR application designed explicitly for real-time language teaching and learning. In contrast to other VR language learning apps utilizing artificial intelligence computer bots for student practice, Immerse fosters direct interaction among students and their teacher in the target language. It serves as a virtual learning experience
platform where learners engage in teacher-led, communicative, task-or-problem-based activities within contextually relevant virtual settings to learn, practice, or develop the target language (Kern, 2021). Throughout the study, Immerse offered access to over 30 distinct and highly interactive environments, such as a home, restaurant, or art studio, enabling students to physically manipulate various objects and collaborate with peers. The selected environments for this study included an airport, a fast-food restaurant, a kitchen, a restaurant, a shopping mall, and a hotel. The pretest was conducted in the Barbecue Scene (See Fig. 1).

Immerse has a desktop-based version and a head-mounted display (HMD)-based version. For this research, the desktop-based version of Immerse was utilized, as it did not require an HMD and was accessible to participants in China. Moreover, according to Chun et al. (2016), desktop-based VR plays a crucial role as it enables students to envision and redefine their identities using avatars and encourages greater reliance on linguistic cues rather than physical ones during oral communication. Students accessed VR sessions through their desktop browsers, while the teacher utilized Immerse teacher interface on a desktop computer. This interface included various tools to enhance class management and facilitation, such as a "rally" function gathering all students to one location, and integration of whiteboards, scoreboards, labels, images, YouTube videos, and slides into the virtual environment. The teacher could also create e teams, regulate audio, send pop-up chat messages, and use a "planning hub" to save lesson plans and activate customizable scene elements like graphic organizers and prompt cards (Dooly et al., 2023). In Fig. 1, these tools are displayed at both sides.

Research Procedure

The project spanned ten weeks. In the first week, participants completed a 30-minute presurvey on the demographic information and their experience with VR. Both participants and instructors underwent a one-hour training session conducted by the researcher to familiarize them with navigating and interacting within the Immerse platform. Following this, in the second week, the 16 participants were randomly divided into two groups, and each group of 8 students underwent a pre-test in the Immerse environment—Backyard Barbecue setting (See Fig. 2). In this pre-test, students engaged in a 10-minute free-style conversation with their partners, discussing their most memorable travel experiences. From the third to the eighth week, each group participated in 90-minute role-playing speaking activities across six different topics within six distinct Immerse environments. The ninth week involved a post-test in the Immerse environment—City Center. Participants were tasked with discussing, with their partners, three types of transportation in the city, comparing the advantages and disadvantages of each method, and ultimately deciding on a transportation method to reach the city center. Later in the same week, participants completed a post-survey, providing insights into their overall perception of how Immerse impacted their speaking skills. In the final week, the researcher conducted semi-structured interviews with six participants, aiming to gain a deeper understanding of their perceptions of their learning experience in role-play speaking activities in VR to facilitate situated learning.
**Data Sources**

The study utilized various instruments to comprehensively assess the impact of VR on learning performance and understand students’ perceptions:

Student Oral Language Observation Matrix Revised (SOLOM-R) (Wright, 2015) was utilized to evaluate students’ speaking skills. It assessed five aspects: comprehension, fluency, vocabulary, pronunciation, and grammar. Each aspect had five statements with a rating scale from 1 to 5, reflecting the range of performance levels. Higher scores indicated higher proficiency levels.

Pre-survey and post-survey were adapted from Enkin (2022) in which researchers replaced AltspaceVR with Immerse and Spanish with English and Liaw (2019) in which researchers replaced VR with Immerse, to understand students’ perceptions of VR in improving speaking skills. The pre-survey collected demographic information, while the post-survey assessed overall perceptions of using Immerse and two open-ended questions on the affordances and limitations of using VR in learning speaking skills. Items were rated on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

To gain a deeper understanding of students’ views and encounters with VR, semi-structured interviews were carried out. Six volunteers participated in interviews conducted in English. Their names were changed into pseudonyms. For example, participant 1 was referred to as P1. The interview protocol was adapted from Herrington and Oliver (2000) on situated learning as researchers replaced the multimedia program with VR Immerse.

**Data Analysis**

To analyze the quantitative data, a paired T-test was applied to compare scores obtained from the pre-test and the post-test. The speaking test scores were evaluated by two raters using the provided rubrics (Wright, 2015). The questionnaire items related to students’ overall perceptions of VR were analyzed in terms of percentages to gauge the level of agreement.

The qualitative data derived from the semi-structured interviews and open-ended responses from the post-survey were transcribed verbatim and subjected to analysis using content analysis as outlined by Thomas (2006). This method facilitated the understanding of students’ perceptions by organizing categories and themes (Han, 2020, 2021) with the assistance of Nvivo.

**Results**

The result section includes three parts: the quantitative findings on the difference in speaking performance between the pretest and the posttest, the students’ self-reported rating on the overall perceptions of using VR Immerse, and the qualitative findings on the themes from the open-ended responses in the post-survey and interviews.
Speaking Performance

We conducted a paired samples t-test to examine the effect of VR-enhanced instruction on students’ speaking test scores in a sample of 16 students. Participants were assessed both before and after the intervention. The result revealed a statistically significant difference in test score, $t(15) = 7.69, p < 0.01$, Cohen's $d = 1.79$. (See Table 1 and Table 2). Among five areas of speaking performance, vocabulary, fluency and grammar improved more than comprehension and pronunciation. (See Fig. 3).

Table 1
Paired Sample Test Result

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
<th>95% Confidence Interval of the Difference</th>
<th>t</th>
<th>df</th>
<th>One-Sided p</th>
<th>Two-Sided p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1 posttest-pretest</td>
<td>3.438</td>
<td>1.788</td>
<td>.447</td>
<td>2.495-4.390</td>
<td>7.691</td>
<td>15</td>
<td>&lt; .001</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>

Table 2
Paired Sample Effect Sizes

<table>
<thead>
<tr>
<th></th>
<th>Standardizer</th>
<th>Point Estimate</th>
<th>95% Confidence Interval</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1 posttest-pretest</td>
<td>Cohen's $d$</td>
<td>1.788</td>
<td>1.923</td>
<td>1.073-2.751</td>
</tr>
<tr>
<td></td>
<td>Hedges' correction</td>
<td>1.884</td>
<td>1.825</td>
<td>1.018-2.611</td>
</tr>
</tbody>
</table>

*The denominator used in estimating the effect sizes.
Cohen's $d$ uses the sample standard deviation of the mean difference.
Hedges' correction uses the sample standard deviation of the mean difference, plus a correction factor.

Students’ Self-reported Ratings on Overall Perceptions of Using VR

The second research query examines the overall perceptions of students regarding the utilization of VR for learning English speaking. A total of 16 participants completed the questionnaire, and Table 3 illustrates the outcomes of their perceptions. The participants exhibited positive attitudes towards most aspects, with 87.5% expressing agreement that VR facilitated their engagement in the learning process (Item 3), 93.7% concurring that VR offered an active learning experience (Item 5), and the same percentage (93.7%) indicating their intention to practice oral communication in a VR format in the future. Additionally, 93.7% believed that the use of VR generated interest in participating in speaking simulations, and an equal percentage (93.7%) perceived VR as providing a safe environment for learning and
language use (Item 10, Item 11, Item 12). However, a notable 63.5% felt that using VR gave them a sense of playing rather than engaging in instructional lessons (Item 3).

Table 3
Students' Overall Perception of VR in English-Speaking

<table>
<thead>
<tr>
<th>Statements</th>
<th>Strongly disagree 1</th>
<th>Disagree 2</th>
<th>Neither agree nor disagree 3</th>
<th>Agree 4</th>
<th>Strongly agree 5</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like the visualization in immerse that is not possible in the traditional classroom.</td>
<td>0.00%</td>
<td>12.50%</td>
<td>6.25%</td>
<td>56.25%</td>
<td>25.00%</td>
<td>3.94</td>
</tr>
<tr>
<td>I feel like playing instead of taking lessons while using immerse.</td>
<td>0.00%</td>
<td>31.25%</td>
<td>6.25%</td>
<td>56.25%</td>
<td>6.25%</td>
<td>3.38</td>
</tr>
<tr>
<td>I think Immers helps me engage in learning.</td>
<td>0.00%</td>
<td>6.25%</td>
<td>6.25%</td>
<td>50.00%</td>
<td>37.50%</td>
<td>4.19</td>
</tr>
<tr>
<td>Immers provides me with active learning.</td>
<td>0.00%</td>
<td>6.25%</td>
<td>0.00%</td>
<td>62.50%</td>
<td>31.25%</td>
<td>4.19</td>
</tr>
<tr>
<td>I think using Immers fits my learning style.</td>
<td>0.00%</td>
<td>12.50%</td>
<td>31.25%</td>
<td>43.75%</td>
<td>12.50%</td>
<td>3.56</td>
</tr>
<tr>
<td>I enjoyed using Immers as part of a language course.</td>
<td>0.00%</td>
<td>0.00%</td>
<td>18.75%</td>
<td>62.50%</td>
<td>18.75%</td>
<td>4</td>
</tr>
<tr>
<td>Speaking English in Immers is a helpful way to practice speaking.</td>
<td>0.00%</td>
<td>6.25%</td>
<td>6.25%</td>
<td>43.75%</td>
<td>43.75%</td>
<td>4.25</td>
</tr>
<tr>
<td>I enjoyed using Immers avatar for English-speaking practice.</td>
<td>0.00%</td>
<td>6.25%</td>
<td>12.50%</td>
<td>50.00%</td>
<td>31.25%</td>
<td>4.06</td>
</tr>
<tr>
<td>Given the chance, I would practice my English oral communication in a virtual reality format again</td>
<td>0.00%</td>
<td>6.25%</td>
<td>0.00%</td>
<td>62.50%</td>
<td>31.25%</td>
<td>4.19</td>
</tr>
<tr>
<td>I think the use of Immers created interest in working on my speaking simulations.</td>
<td>0.00%</td>
<td>6.25%</td>
<td>0.00%</td>
<td>62.50%</td>
<td>31.25%</td>
<td>4.19</td>
</tr>
<tr>
<td>I think it provides a safe environment for me to learn and use language.</td>
<td>0.00%</td>
<td>6.25%</td>
<td>0.00%</td>
<td>62.50%</td>
<td>31.25%</td>
<td>4.19</td>
</tr>
<tr>
<td>I can feel the presence of others while using Immers.</td>
<td>0.00%</td>
<td>0.00%</td>
<td>12.50%</td>
<td>62.50%</td>
<td>25.00%</td>
<td>4.13</td>
</tr>
</tbody>
</table>

Themes in Open-ended Responses and Interviews

Qualitative or open-ended responses underwent a thematic analysis, as per the approach outlined by Saldaña (2021), performed by the researchers. Initially, the data were categorized based on recurring topics relevant to the third research question and were subsequently organized into broader, overarching themes.
Table 4 presents the outcomes of the thematic analysis, delineating six principal and recurring themes derived from the data pertaining to speaking in Virtual Reality (VR), accompanied by samples of the responses. These six themes are outlined as follows: (1) Authentic context in VR helps better understand the speaking topics better, (2) Authentic context in VR helps better retain the memory of words and sentences, (3) Authentic context in VR keeps students focused and curious in their learning process, (4) Authentic context in VR motivate students’ interest in learning speaking skills, (5) Authentic context in VR helps knowledge transfer to real life.

### Table 4

Main Themes and Sample Open-ended Responses

<table>
<thead>
<tr>
<th>Themes</th>
<th>Sample Open-ended Responses</th>
</tr>
</thead>
</table>
| Theme 1: Authentic context in VR helps better understand the speaking topics better. | *we can have a better understanding of the new words and vocabulary by going through the environment, because like experiencing it in the real life (P1).*  
*Learning in VR is like experiencing the things by myself and it really helps me understand the topic more (P4).*  
*I'm not quite familiar with the procedures on how to check in a hotel or check out the hotel. after the lessons we will gets a deep insight in this kind of topic (P3).* |
| Theme 2: Authentic context in VR helps better retain the memory of words and sentences. | *When you are met with something similar in real life, you can easily remember how to start and end the conversation and what one can talk about in the context in English (P2).*  
*In real life if I see the object, it will remind me of the learning experience in Immerse (P2).*  
*If you want to learn some word, memorize it. it will help if we can see real things connected with the word so that we can remember the words (P6).* |
| Theme 3: Authentic context in VR keeps students focused and curious in their learning process. | *In Immerse, I'm curious about everything (P2).*  
*In Immerse, with all objects in front of you, you feel it is real and authentic, which makes me more focused (P4).* |
| Theme 4: Authentic context in VR motivate students’ interest in learning speaking skills. | *I think it's very wonderful. it's like magic. I feel I am unveiling a mak (P2).*  
*Immerse makes learning English more interesting and immerse you in a realistic scenes (P4).* |
| Theme 5: Authentic context in VR helps knowledge transfer to real life. | *You know when you travel to a remote place, you have to take an airplane.*  
*When you are hungry, you will go to some restaurants and order what you like. All these activities will be included and used when you talk with other people (P3).*  
*In real life, if I am in the same scenario, I will remember the learning experience in Immerse (P2).* |
Discussion

In general, authentic contexts create a contextualized setting that supports situated learning. As Herrington and Oliver (2000) assert, the authentic context is the foundational element of the situated learning environment, forming the core principles of the theory. Students perceived the VR environment as authentic due to its 3D nature and the ability of their avatars to freely navigate the space, providing a sense of realism. Furthermore, they highlighted the significant resemblance between the virtual environment and real life.

The qualitative results indicate that students highly value authentic context, believing it aids in their comprehension of speaking topics, enhances memory retention of words and sentences, keeps them focused and curious during the learning process, motivates their interest in learning speaking skills, and facilitates the transfer of knowledge to real-life situations.

The first theme centers on improved comprehension. Exposure to authentic contexts contributes to overall language proficiency, offering a comprehensive understanding of language, including its pragmatic use. For instance, displaying all objects in a virtual environment allows students to visually perceive and interact with them, enhancing their language understanding.

The second theme underscores enhanced retention. Experiencing language in authentic situations boosts memory retention, aligning with Kaplan-Rakowski and Gruber's (2021) findings that learners are more likely to remember vocabulary, phrases, and grammatical structures when encountered in context.

The third and fourth themes revolve around motivation and engagement. Learning within authentic contexts makes the language-learning process more captivating and motivating. Authentic materials, such as newspapers, videos, or real-world conversations, capture learners' interest by connecting language skills to meaningful, real-world content.

The fifth theme pertains to transferability to real-life situations. The ultimate goal of language learning often involves effective communication in real-life scenarios. Authentic contexts facilitate the transfer of language skills from the learning environment to practical, everyday interactions, making language learning more pertinent and rewarding, as highlighted by Bonner and Reinders (2018).

Limitations and Implications

Acknowledging the limitations of this study is crucial, along with considering the implications for both future research endeavors and advancements in pedagogy. Given the exploratory nature of this study, the participant count was relatively low, influenced by the supplementary nature of the language enhancement activities conducted outside the regular class setting and the capacity constraint of Immerse, allowing a maximum of 8 students per class. Additionally, the study comprised only six learning activities spanning a total duration of 9 hours. Considering research indications that students benefit from repeated exposures to VR learning experiences and need time to acclimate to VR (Lowell & Yan,
2023), future research might benefit from a larger participant pool and an extended duration of VR-enhanced learning.

The findings presented in this exploratory study also lay the foundation for potential future research inquiries. For instance, given that Immerse has two versions—the desktop-based version and the HMD-based version—subsequent studies could explore variations in learning outcomes and students' perceptions of learning benefits at different levels of immersion. Moreover, since this study marked the instructor's initial experience with teaching in VR, interviewing with the instructor could offer insights into his perceptions of the learning affordances provided by VR and the challenges faced as a novice teacher using VR technology. These findings would prove valuable in guiding and offering suggestions to language teachers unfamiliar with VR, aiming to integrate VR-assisted instruction into language classrooms.

**Conclusion**

The primary aim of this study was to investigate the influence of VR on the enhancement of EFL learners' speaking skills and to comprehend the students' perspectives on their learning experience in role-play speaking activities within VR for the promotion of situated learning. Analysis of the test results through quantitative methods revealed a noteworthy improvement in learners' speaking proficiency, particularly in vocabulary, fluency, and grammar. Thematic analysis of the open-ended responses from interviews and surveys corroborated these quantitative findings, emphasizing that the authenticity provided by VR environments aids EFL learners in better comprehension, retention, engagement and motivation, and the transfer of knowledge to real-life situations—all of which contribute to the effectiveness of situated learning. The findings align with reports of Bahari (2021) that VR can be used as a pedagogical tool for situated learning as it can offer a more interactive, context-embedded, and immersive learning environment.

**Declarations**

- The authors declare they do not have competing interests.
- The authors declare they did not receive support from any organization for the submitted work.
- The authors declare they have NOT collected human subjects' research data from humans or research data from animals for this manuscript.

**Author Contribution**

W.J.Y. contributed to the conceptualization, methodology, collecting and analyzing the data, and writing the original draft. V.L. contributed to the conceptualization, methodology, and editing of the manuscript. L.Y. contributed to the data analysis. All authors reviewed the manuscript.
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Figures
Figure 1

*Role-Play Speaking Activity in Immerse*

*Note.* The interface is from the teacher's desktop with tools on both sides.
Figure 2

*Barbecue Scene in Immerse*

Note. This is the Barbecue Scene where the pre-test was conducted.

![Graph showing speaking scores of pretest and posttest](image)

Figure 3

*Comparison of Speaking Scores on Pretest and Posttest*