The Effects of Immersive VR Tour Guiding on English Learning

Yoshiho Satake
Aoyama Gakuin University

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Virtual Reality (VR) technologies have emerged as promising tools in education by enabling immersive and interactive learning environments. This study focuses on the impact of VR tour-guiding activities on Japanese university students' English learning outcomes. Using the Wander app integrated with Google Street View on Oculus Quest 2 headsets, participants engaged in guided virtual tours designed to improve their speaking skills, confidence, and motivation. Data were collected using pre- and post-PROGOS speaking tests and detailed questionnaires. The results showed improvements in phonology, coherence, and speaking confidence as well as reduced foreign language anxiety. However, gains in grammatical accuracy were minimal, suggesting the need for additional grammar-focused tasks.

仮想現実（Virtual Reality, VR）の技術は、没入型でインタラクティブな学習を可能にし、教育において有望なツールとなっている。本研究では、日本の大学生を対象に、VR空間におけるガイド活動が英語学習に与える効果を検証した。Googleストリートビューを仮想空間で活用するWanderというアプリをVRヘッドセット(Oculus Quest 2)で使用し、参加者はVR空間における英語ガイド活動に取り組んだ。この英語ガイド活動は、英語を話すスキルや自信や動機付けを高めるために開発されたものである。事前・事後にPROGOSスピーキングテスト及び事後に詳細なアンケートを行い、分析のためのデータを収集した。結果は、音声の正確さや話の一貫性、スピーキングに対する自信の向上を示し、外国語不安の軽減も確認された。一方で文法の正確性の向上はわずかにとどまり、文法に特化した追加タスクの必要性が示された。

Virtual Reality (VR) has recently emerged as a promising educational tool that offers new opportunities for learners to engage in realistic and interactive environments. Unlike traditional teaching methods that rely heavily on textbooks and classroom-based instruction, VR immerses students in dynamic, simulated scenarios that closely mirror real-world experiences. These virtual environments are particularly advantageous for language learning, where practicing speaking in authentic, low-pressure contexts enhances learners' confidence and proficiency. Many learners, particularly those in non-native English-speaking countries, have limited opportunities to practice speaking in real-life scenarios. VR compensates for this gap by simulating environments where learners can apply their language skills meaningfully (Chen et al., 2021; Dhimolea et al., 2022; Parmaxi, 2023). Given the widespread prevalence of foreign language anxiety (Oteir & Al-Otaibi, 2019; Zhang, 2019), particularly among Japanese learners (Djafri & Wimbarti, 2018), VR is an innovative option for addressing these challenges. By providing a safe space where learners can practice without fear of judgment, VR can foster both linguistic and psychological growth (Dhimolea et al., 2022; Parmaxi, 2023). Anxiety reduction is especially critical, as studies have shown that excessive language anxiety negatively impacts learners' willingness to communicate, their ability to process new language input, and overall performance (Djafri & Wimbarti, 2018; Oteir & Al-Otaibi, 2019; Zhang, 2019). VR's ability to create judgment-free environments directly addresses this barrier, creating conditions conducive to effective language acquisition (Melchor-Couto, 2017; Satake et al., 2024).

This study's primary goal is to evaluate the impact of VR tour-guiding activities on English learning outcomes among Japanese university students. It seeks to answer the following questions: How does VR use influence English speaking proficiency? To what extent does this enhance confidence in speaking and reduce anxiety? How does using VR affect learner motivation and engagement? These questions not only address VR's effectiveness as a learning tool, but also highlight its potential to reshape traditional language learning practices by integrating technology-driven methodologies. By addressing these questions, this study provides valuable insights into VR's pedagogical potential and its implications for language education.

Although the author of this study aims to examine the impact of VR-based tour guiding on English language development, it is important to note several limitations

at the outset. The sample consisted of only nine male undergraduates from a single institution, and the intervention was conducted over 15 weeks, which may not capture long-term effects or broader applicability. These limitations should be kept in mind when interpreting the findings.

Literature Review

Ma and Zheng (2011, p.170) offered a comprehensive framework for understanding the different levels of VR immersion, categorizing them into non-immersive, semi-immersive, and immersive environments. Non-immersive VR involves small screens and limited interaction, providing only a superficial sense of engagement. Semi-immersive VR, which incorporates larger screens and basic gesture recognition, offers a moderate level of interaction. However, it fails to create a fully realistic experience. In contrast, immersive VR, achieved using head-mounted displays, allows users to interact with a virtual world in a deeply engaging and realistic manner. This high level of immersion is particularly effective for language learning, as it enables students to practice in environments that closely resemble real-life scenarios (Conrad et al., 2024; Dhimolea et al., 2022; Parmaxi, 2023).

Extensive research has highlighted the numerous advantages of using VR in education regarding its benefits in language learning. Parmaxi (2023) conducted a systematic review of 26 studies and identified several key benefits, including opportunities for authentic interaction, enhanced cultural learning, and reduced learner anxiety. Similarly, Dhimolea et al. (2022) analyzed 32 studies and found that repeated exposure to VR environments not only improved vocabulary acquisition, but also fostered positive attitudes toward language learning. The findings of these meta-analyses suggest that VR can create engaging and supportive environments for language learners. However, it should be noted that the effectiveness of VR in reducing anxiety may be more pronounced among certain learner groups, such as Japanese learners, who tend to experience higher levels of language learning anxiety than learners in other contexts.

Turning to more recent findings, Chen et al. (2021) explored the impact of VR-assisted problem-based learning on vocabulary acquisition and motivation. Their study, conducted with 84 engineering students, revealed that those in the VR group showed significantly greater vocabulary retention and motivation improvements than those in the control group. This demonstrates VR's capacity to create dynamic learning environments that encourage active engagement and facilitate deeper learning outcomes. These findings are particularly relevant for language education, where vocabulary acquisition and learner motivation are key challenges.

Several studies have provided insights into foreign language anxiety, which has long been recognized as a significant barrier to effective communication. Oteir and Al-Otaibi (2019) and Zhang (2019) showed that anxiety can severely impede speaking performance, particularly in judgment-prone settings. Djafri and Wimbarti (2018) further elaborated on this issue, noting that Japanese learners often experience a pronounced fear of making mistakes. VR has been suggested as one possible solution to this problem by providing a potentially less intimidating and more judgment-free environment. Melchor-Couto (2017) demonstrated that even non-immersive VR can reduce anxiety levels, whereas Satake et al. (2024) reported that fully immersive VR enhances confidence and comfort in speaking, particularly among learners who are hesitant to engage in traditional classroom activities.

The literature provides strong evidence of VR's potential to improve language-learning outcomes. VR has proven to be a valuable tool for language educators to reduce anxiety, foster confidence, and promote authentic interactions. This study builds on these findings by focusing specifically on the use of fully immersive VR by Japanese learners and examining its effects on their speaking skills, confidence, and motivation.

Although the literature on VR in language learning is extensive, few studies currently examine the use of VR tour-guiding activities, such as those conducted with the Wander app, for English language learning among Japanese university students. The present study, therefore, addresses a gap in the research by focusing on this unique combination of technology, pedagogical approach, and learner context. The most closely related studies include those by Parmaxi (2023) and Dhimolea et al. (2022), which broadly examine the benefits of VR for language learning, and Chen et al. (2021), who investigated VR-assisted problem-based learning for vocabulary and motivation among university students. Additionally, research by Melchor-Couto (2017) and Satake et al. (2024) provided evidence for the effectiveness of VR in reducing language anxiety and enhancing speaking confidence, which is particularly relevant given the high levels of language anxiety observed among Japanese learners (Djafri & Wimbarti, 2018; Oteir & Al-Otaibi, 2019; Zhang, 2019). By situating the current study within this broader literature, the author highlights its novelty and contribution to technology-enhanced language learning.

Method

Participants

Nine male Japanese undergraduates majoring in economics participated in this study. All the participants were in their early 20s and had received approximately 10 years of English education, corresponding to an average CEFR B1 proficiency level, which was estimated based on the participants' TOEIC scores that the university regularly administers as part of English proficiency monitoring. Institutional ethical approval for this research was obtained, and informed consent was appropriately secured from all participants. These students were selected based on their enrollment in a 15-week English seminar incorporating VR activities as a core curriculum component.

VR Setup and Tools

The VR activities were conducted using Oculus Quest 2 headsets and the Wander app, a platform that integrates Google Street View (Google, n.d.), to create immersive virtual environments. The Oculus Quest 2 is a standalone VR headset developed by Meta, which features a lightweight design, high-resolution displays, and built-in motion tracking (Meta, 2024a). Its portability and ease of setup make it suitable for classroom use, because it does not require additional hardware or external sensors. This device offers an intuitive and immersive experience, allowing users to naturally interact with virtual environments through handheld controllers and precise head tracking. The Wander app allows users to explore various locations worldwide (see Figure 1, Meta, 2024b), making it an ideal tool for practicing direction-giving and tour guidance in English. The app's user-friendly interface allows participants to navigate these locations seamlessly, creating a realistic sense of presence. In addition, its multiplayer mode supports interactive sessions where learners can guide their peers through selected destinations. This enhances both linguistic and collaborative skills. By simulating real-world scenarios, the application provides learners with a unique opportunity to develop their speaking skills in a highly realistic context (Satake, 2024).

Figure 1

Screenshots of the Wander App.

Lesson Structure

The seminar's VR component was carefully structured to maximize student engagement and learning outcomes. Each cycle spanned three weeks. In the first week, students researched their chosen locations and prepared descriptive content for their tours. During the second week, they practiced their presentations in a VR environment. In the third week, students conducted 10 to 15-minute guided tours in Wander's virtual space, followed by a question-and-answer session in which they answered their peer's questions. The Wander app (Meta, 2024b) includes a feature that allows users to create groups and gather at the same virtual location, enabling all participants to view and move through the same space. However, this application limited the number of participants in a single group to six. To accommodate the app's participation limit, the class was divided into two groups of four and five students, to ensure that each participant had ample opportunities to engage in the VR environment. During the VR tour-guiding sessions,

the author wore an Oculus Quest 2 headset and moved between the virtual spaces of the two groups to observe and assist the students, enhancing their interactive experience.

Assessments

Two instruments were used to evaluate the impact of VR activities. The first was the PROGOS speaking test, which is an AI-based assessment tool designed to measure various aspects of speaking proficiency, including range (the diversity of grammar, vocabulary, and expressions used by the speaker), accuracy, fluency, interaction, coherence, and phonology (PROGOS, 2021). PROGOS uses an adapted version of the CEFR, a globally recognized standard for describing language proficiency across six levels: A1 (beginner), A2, B1, B2, C1, and C2 (proficient) (Council of Europe, 2024). Within the PROGOS system, these levels are further subdivided to include Pre-A1, A1, A1 High, A2, A2 High, B1, B1 High, B2, and B2 and Above (PROGOS, 2021). This allowed for a more granular assessment of speaking skills.

Although this method of assigning numerical values to PROGOS levels was not directly adopted from existing literature, the author converted these levels into a numerical scale for several reasons. First, quantification enhances the objectivity of the analysis. Assigning numerical values to each PROGOS level (e.g., Pre-A1 = 1, A1 = 2, A1 High = 3, etc.) increases transparency and reproducibility in the analysis process. Second, numerical data allows for more straightforward comparisons. Using average scores makes it easier to assess changes over time, such as improvements from pre- to post-test, and to identify patterns across participants. Third, this approach facilitates the integration of qualitative and quantitative data, supporting a mixed-methods research design that can provide a more comprehensive understanding of the impact of VR-based activities on language learning outcomes.

Pre- and post-study PROGOS tests were conducted, and the resulting levels were converted into numerical scores using the point-based system described above. This scoring system enabled clear quantification of participants' speaking proficiency improvements throughout the study.

The second instrument was a questionnaire designed to capture the students' perceptions of their VR learning experiences (see Insights from the Questionnaire, Table 1). The questionnaire was not adapted from existing literature but was originally developed by the author and was based on this study's specific objectives and pedagogical focus. The items were constructed to elicit feedback on aspects such as perceived learning outcomes, confidence in speaking, and overall impressions of the VR tour-guiding activity. To ensure comprehensibility and the accuracy of responses, all items were originally written in Japanese. Although the questionnaire was not drawn from previously validated instruments, its content was carefully developed to align with key constructs in language learning motivation (e.g., Pranawengtias, 2022; Ushioda, 2020) and affective engagement (e.g., Hiver et al., 2024; Philp & Duchesne, 2016), which are commonly examined in similar studies. Eight out of nine participants responded, and the data from all eight were used in the analysis. Responses were converted into numerical values for analysis using a five-point Likert scale, allowing for straightforward comparison: Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, and Strongly Disagree = 1. This approach facilitated a systematic evaluation of subjective feedback, providing both quantitative and interpretive insights into participants' experiences and the perceived effectiveness of VR-based English learning activities.

Procedure

This study followed a structured five-step procedure designed to evaluate the impact of VR-based English learning activities on students' language proficiency and attitudes. First, a pre-study PROGOS speaking test was conducted in class, lasting 15–20 minutes. This test established a baseline for students' speaking proficiency levels.

Subsequently, the students participated in weekly English lessons and VR presentations on Japanese tourist sites. These sessions, conducted once a week for 45 minutes, followed a repeated three-week instructional cycle: Week 1 was dedicated to preparation, Week 2 to practice, and Week 3 to delivering a VR-based guided tour presentation. This three-week cycle was repeated five times, resulting in a total period of 15 weeks. All VR activities were carried out using the Wander app, which allowed students to explore real-world locations in an immersive environment and use English as they guided others through the virtual space.

After completing the 15-week cycle of lessons and VR activities, students took a post-study PROGOS speaking test, again conducted in class and lasting 15–20 minutes, to measure any changes in their speaking proficiency.

Additionally, after the last lesson, students completed a detailed questionnaire outside class regarding their VR learning experiences. The author designed the survey to capture their perceptions, attitudes, and self-assessed language skill improvement. The collected data comprised two distinct datasets: quantitative results from the PROGOS speaking test scores and qualitative insights from questionnaire responses. Each dataset was first analyzed independently. PROGOS scores were statistically analyzed to measure

changes in proficiency, while qualitative survey responses underwent thematic analysis to identify recurring perceptions and attitudes. The findings from these analyses were then integrated during the discussion phase, enabling a comprehensive interpretation of how VR activities influence both students' measurable language proficiency and their subjective motivation and attitudes toward learning English in a VR-enhanced environment.

Results and Discussion

Improvements in Speaking Proficiency

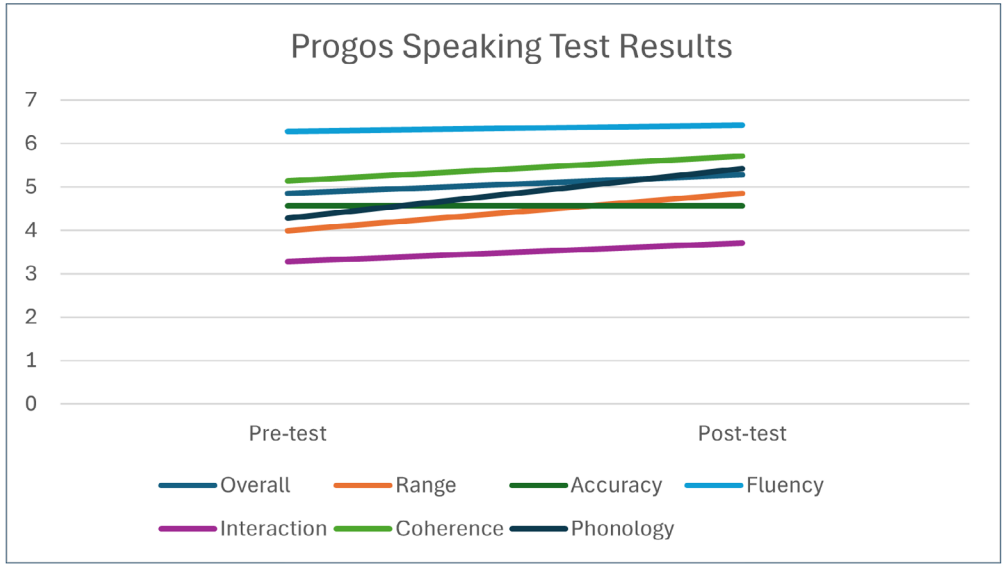
For their VR tour guide activities, students primarily selected places they were familiar with, such as their homes, schools they had attended in the past, or destinations they had visited during travel. Despite the Wander app's ability to explore global landmarks and foreign locales, students overwhelmingly chose domestic sites. Of the nine participants, only two selected international locations—and only once each—with all other presentations focusing on domestic destinations. Initially, some expressed curiosity about presenting foreign locations during classroom discussions. However, in the end, their final choices reflected familiarity. This preference indicates that students may have naturally gravitated toward visualizing realistic scenarios, relying on their personal experiences to enhance their authenticity and confidence during their presentations.

The results of the PROGOS speaking test revealed a moderate overall improvement in English proficiency following the VR activities. As Figure 2 shows, the students demonstrated gains in phonology, range, and coherence. Accuracy and fluency remained largely unchanged. The overall average score increased from 4.9 in the pretest to 5.3 in the post-test, indicating a gradual enhancement in speaking proficiency.

Among the tested components, phonology exhibited the most significant improvement, with an average post-test increase of over one point. This outcome suggests that VR's immersive nature, which requires students to speak extensively during presentations and answer questions in real-time, positively contributes to their pronunciation and listening skills. Repeated exposure to speaking and listening tasks in the VR environment likely encouraged students to refine their pronunciation. Although no native speaker was present in the sessions, students reported becoming more aware of their articulation through frequent practice. Additionally, classmates with relatively good pronunciation may have served as informal models, prompting others to mimic clearer speech patterns. This environment fostered self-monitoring and peer-influenced improvement, leading to noticeable advancements.

Figure 2

PROGOS Speaking Test Results



Other aspects, including range, interaction, and coherence, showed moderate improvements. The increase in range reflects the students' ability to employ a wider vocabulary and more diverse expressions during their presentations. Interaction scores improved slightly, highlighting growing confidence and comfort levels as students responded to their peers' questions in real-time. The coherence scores also increased, likely because the VR presentations' structured format required the students to organize their descriptions logically and effectively. Although the structured nature of the task likely contributed to the improvement in coherence, previous research suggests that immersive VR environments can enhance users' sense of coherence and task engagement beyond what is typically observed in non-immersive settings (Huang et al., 2021; Zheng et al., 2023). These findings support the notion that the observed improvement in coherence may not be solely attributable to the structured task itself, but also to the affordances of the VR medium.

In contrast, no improvement in accuracy was observed. This may be attributed to the VR activities' emphasis on communication and interaction, rather than grammatical

precision. Fluency was also only enhanced slightly, possibly because the students had already demonstrated relatively high fluency levels at the study's commencement, which left less room for noticeable advancement.

These findings suggest that VR environments foster skills that rely on interaction and immersion, such as phonology, vocabulary range, and real-time communication. However, the limited focus on grammatical feedback within VR sessions suggests the need for supplementary grammar-focused exercises to complement these activities. Overall, VR proved valuable for supporting practical language use, offering students an engaging and immersive context to refine their speaking abilities. These results were obtained using Oculus Quest 2 headsets and the WANDER app, which offer a high level of immersion and real-time interaction. It remains to be investigated whether similar outcomes can be expected across different types of VR devices and applications with varying degrees of fidelity and interactivity.

Insights from the Questionnaire

The survey results provided valuable insights into the students' experiences and perceptions of using VR for English learning, as Table 1 shows.

One of the most significant findings was the high level of enjoyment reported by students, with an average score of 5.0 for the question "VR made English learning enjoyable. (No. 1)" This reflects the VR platform's engaging nature, which offers innovative and interactive alternatives to traditional learning methods. Similarly, students reported a strong sense of immersion in the VR environment, scoring 4.5 (No. 2), and noted significantly reduced anxiety compared with face-to-face interactions, providing a score of 5.0 (No. 3). These results suggest that an immersive and judgment-free VR setting plays a crucial role in creating a comfortable and enjoyable learning experience. No corrective feedback was provided during the sessions to promote fluency. The instructor (the author), a non-native English speaker, entered the VR environment alongside the students as an observer and task facilitator, deliberately refraining from evaluative comments to maintain a low-anxiety setting. This judgment-free environment may have increased the students' comfort and enjoyment. Similar benefits might also be observed in peer-based practice without instructor intervention, as previous studies have shown that learner-to-learner interaction in VR can effectively support language development even in the absence of direct feedback (Dhimolea et al., 2022; Özgün & Sadık, 2023).

Confidence and motivation also showed notable improvements, with a score of 4.75 (No. 4, 5). The students highlighted that their ability to choose locations for VR tour-guiding activities contributed to their motivation. This personalized approach likely enhanced their engagement by allowing them to focus on areas of personal interest. Moreover, the opportunity to practice guiding in VR helped the students feel more confident in their English-speaking abilities.

Regarding skill development, the responses indicated moderate improvement in explaining skills, with a score of 3.5 (No. 6), and in spontaneous speaking, with a score of 4.0 (No. 7). Although these areas showed less pronounced growth than other areas, they still reflect the potential of VR as a tool for enhancing specific speaking skills. The structured nature of the VR presentations and real-time question-and-answer sessions likely supported the students in these areas, albeit to a lesser extent than in confidence and motivation.

The students also valued the opportunity to reflect on their English proficiency, with an average score of 4.5 (No. 11). Self-awareness is an important step in language learning, because it helps students identify strengths and areas for improvement. Additionally, there was a strong interest in continuing VR-guided activities in the future, with a score of 4.75 (No. 15). This suggests that the students found the experience valuable and wanted to explore similar activities further.

The findings from the questionnaire align well with previous studies on the use of VR in language learning. For example, recent meta-analyses have shown that VR-based EFL learning is significantly more effective than traditional methods, with a small to medium positive effect on both linguistic and affective outcomes (Chen et al., 2022; Qiu et al., 2024). The high scores for enjoyment and immersion in the current study and the reported reduction in anxiety are consistent with these findings.

Furthermore, improvements in confidence and motivation observed in this study are also supported by existing literature. VR's ability to provide a safe, judgment-free environment has been shown to encourage learners to take risks and practice speaking more freely (Dhimolea et al., 2022; Melchor-Couto, 2017). The opportunity for learners to choose their locations and topics in VR, as was the case in this study, has been identified as a key factor in enhancing engagement and personal relevance (Dhimolea et al., 2022).

Regarding skill development, although the current study found moderate improvements in explaining and spontaneous speaking skills, this is in line with previous research indicating that VR is particularly effective for boosting confidence and motivation, with more variable results for specific linguistic gains (Chen et al., 2022; Qiu et al., 2024). The structured nature of the VR activities and real-time question-and-

answer sessions in this study likely contributed to these outcomes, mirroring findings from other studies suggesting task design's importance in VR-based language learning.

Finally, the strong interest in continuing VR-guided activities in the future reflects a broader trend in the literature, where learners often desire more immersive and interactive learning experiences (Dhimolea et al., 2022; Qiu et al., 2024).

These findings suggest that VR can foster a supportive and engaging environment for language learning, though more comparative and long-term research is needed to confirm its effectiveness across different contexts. High enjoyment, reduced anxiety, increased confidence, and strong motivation were the most prominent outcomes, whereas moderate improvements in specific language skills highlight areas for potential enhancement. Overall, the results indicate the potential of VR for language education, particularly for activities that emphasize immersion and interaction.

Table 1

Questionnaire on English Learning hrough VR Tour Guiding

No.	Questionnaire Item	Average Score (1-5) and Answer Choices
Section 1: Experience with VR and the Wander App		
1	1. Did using VR and the Wander app make learning English enjoyable?	5.0
2	To what extent did you feel immersed, as if you were actually in the location, during the VR experience?	4.5
3	Did using English in a VR environment feel less stressful than speaking face-to-face?	5.0
Section 2: Improvement in English Skills and Motivation		
4	Did the experience of guiding in VR increase your confidence in speaking English?	4.75
5	Did choosing and guiding a location of personal interest increase your motivation to learn?	4.75
6	Did participating in the VR tour guide activity improve your ability to explain things in English?	3.5
7	Did the experience of explaining and answering questions in English improve your ability to speak spontaneously?	4.0
8	Did participating in the VR experience reduce your hesitation to communicate in English?	4.75
9	Did learning English through VR make speaking more enjoyable?	4.75
10	Did the VR activity improve your conversation skills in English?	3.75
11	Did preparing and performing the VR tour allow you to reflect on your English skills?	4.5
12	After the VR experience, which skill do you want to focus on in your English learning?	Speaking (All participants)
Section 3: Overall Impressions and Learning Outcomes		
13	Did using VR increase your interest in learning English?	4.75
14	Did you feel you could learn at your own pace?	4.75
15	After this VR tour experience, do you want to engage in more English learning activities like tour guiding?	4.75
Overall Average Score		4.54

Implications for Language Education

These findings align with the existing research (e.g., Park et al., 2025; Satake et al., 2024), reaffirming VR's potential as a tool for creating engaging and low-anxiety learning environments. Significant improvements in phonology and coherence highlighted VR's ability to enhance practical language skills through repeated immersive practice. However, the limited gains in grammatical accuracy suggest that additional targeted interventions, such as grammar-focused exercises, may be necessary to address this aspect of language learning. Furthermore, the high levels of enjoyment and motivation reported by participants indicate that VR-based activities may enhance learner interest in

the short term, while it is unclear whether they have the lasting impact of such increases in motivation and engagement.

Although this study demonstrates the immediate benefits of VR activities on students' communicative skills and motivation, the long-term sustainability of these effects remains uncertain. Future longitudinal studies are needed to examine whether these improvements persist over time. In addition, incorporating findings from meta-analyses that focus on the durability of VR-based language learning outcomes would further enrich this discussion.

Conclusion

The author of this study addressed the need for innovative, immersive language learning environments to support Japanese university students who often experience limited opportunities for meaningful spoken English practice and face high levels of foreign language anxiety. Using fully immersive VR tour-guiding activities with the Wander app, participants improved their English-speaking skills, particularly in phonology, while experiencing reduced anxiety, increased confidence, and heightened motivation for language learning.

The survey results from this study align closely with existing literature emphasizing VR's strengths in enhancing learners' engagement and confidence through realistic and judgment-free interactive contexts (Dhimolea et al., 2022; Melchor-Couto, 2017). Consistent with prior findings (Chen et al., 2022; Qiu et al., 2024), participants in the current study expressed intense enjoyment, reduced anxiety, and increased motivation, suggesting VR's potential for positively influencing affective aspects of language learning. However, moderate increases in spontaneous speaking and explaining skills also mirrored earlier studies, indicating that while VR effectively boosts confidence and motivation, its impact on specific linguistic competencies may vary and benefit from complementary instructional approaches.

Although the results are promising, several important limitations must be acknowledged. First, the sample size was very small (n=9), consisting exclusively of male students from one university, limiting generalizability across genders, institutions, and cultural contexts. Second, the duration of the intervention (15 weeks) may not have been sufficient to reveal long-term effects or the sustainability of observed gains. Third, the focus was only on speaking skills. The other core language skills were not addressed and remain unexamined within this VR context. Additionally, it is possible that the novelty of VR technology positively biased student perceptions and self-reported improvements. These caveats mean that the improvements in speaking skills and anxiety reduction observed here should be interpreted as preliminary.

Integrating VR technologies into educational settings also involves significant financial costs, including purchasing and maintaining VR hardware, and poses ethical concerns related to user privacy and data security. Therefore, institutions must carefully evaluate whether the pedagogical benefits of immersive VR activities justify these additional costs and potential risks. Clear guidelines for ethical VR use and robust privacy measures are essential to mitigate these concerns and ensure responsible implementation.

Future research should include larger, more diverse participant samples, extend the duration of interventions, and incorporate control or comparison groups using traditional instructional methods. Longitudinal studies and qualitative investigations could further clarify the lasting impact of VR and differentiate genuine learning effects from initial excitement or novelty. Additionally, future researchers could explore integrating grammar-focused exercises into VR activities and investigate VR's long-term impact on broader language competencies and the three remaining core skills.

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Bio Data

Yoshiho Satake is a professor at Aoyama Gakuin University. Her research interests include data-driven learning and using VR for language learning and teaching. <t31330@aoyamagakuin.jp>

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