# Investigating the impact of online learning platforms on student engagement and learning outcomes: Comparing Zoom with VR

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With the advent of new technologies such as virtual reality (VR), educators have shown interest in using them to enhance the online learning experience. To investigate the impact of VR on students' foreign language learning outcomes and engagement, a longitudinal comparative study was conducted. This study focused on learning small talk skills with two groups, an experimental group using VR and a comparison group using Zoom. Both groups met weekly to discuss small talk skills and bonding strategies in groups and practiced small talk in pairs. The student interactions were recorded on both platforms and graded by two raters at three points during the course. Additionally, students completed an engagement survey and participated in focus group interviews. Results showed that both groups improved their small talk skills over time with no significant difference in learning gains and engagement. Participants were divided into VR enthusiasts, who appreciated the enhanced sense of presence and identity through avatars, and VR sceptics, who doubted the value and usability of VR. To continue this project, the researchers aim to further leverage the benefits of VR in international contexts to promote cross-cultural communication.

*Keywords:* virtual reality (VR), Zoom, student engagement, learning outcomes, mixed-methods research

## Introduction

Online courses are hosted on various platforms, including video-conferencing apps like Zoom. Over the years, the number of individual and institutional Zoom users has increased greatly. Zoom provides video, audio, and text chat functionalities as well as screen share and user assignment to breakout rooms, all of which are essential for synchronous learning. As well as video-conferencing apps such as Zoom, various 2D and 3D virtual reality (VR) platforms are continuously being developed, which share similar features with Zoom but also offer additional affordances that could potentially be beneficial to learners.

Research on VR has shown that there are various benefits for language learning. First, VR provides a realistic and immersive environment in which learners can have authentic interactions and cultural experiences (Shadiev et al., 2021; Yamazaki, 2018). In addition, the interactive and immersive nature of VR can increase learner attention and promote active engagement which can lead to increased motivation and participation (Chen et al., 2021; Nicolaidou et al., 2021). Also, VR can stimulate multiple senses, such as sight and sound and spatial recognition which enriches the learning experience and can facilitate better language retention (Feng & Ng, 2024). Finally, VR can offer a safe space for learners to experiment, make mistakes, and learn without the fear of judgment (Chen, 2022). This can in turn foster confidence and willingness to take language risks. In contrast to the potential benefits that VR can offer, there are several barriers which can limit its impact. VR technology can be costly as it requires suitable hardware and software which may limit its availability to certain learners and educational institutions (Kavanagh et al., 2017). VR can also be technically complex requiring expertise in setup, maintenance, and troubleshooting. Moving beyond the technical side of VR, creating high-quality, language-specific content takes time, resources, and expertise. Expertise is also needed

to integrate VR into language curricula and instructional strategies require careful planning and training in order to be pedagogically effective (Southgate, 2020).

Recognizing both the educational benefits and challenges of VR, the authors launched a longitudinal research project to explore the affordances and limitations of VR for language learning (Cowie & Alizadeh, 2022). The next stage of this ongoing project was to investigate how to upscale the lessons learned to a more usual class size. As a part of this transition the authors conducted a scoping review on VR use in language learning (Alizadeh & Cowie, 2022). Several gaps in the literature were identified and a follow-up study was designed to address them. Three of the main gaps concern a lack of longitudinal studies, methodological inadequacies, and an overemphasis on vocabulary acquisition. In other words, there is a need for more research that examines the long-term effects of VR on student engagement and language learning outcomes.

In response to the above needs, the current study employed a quasi-experimental design featuring pre-, mid-, and post-test assessments to examine the impact of delivery modes, Zoom and VR, on students' learning outcomes and engagement in an online course. The research questions guiding this study were:
1. How does the mode of delivery, comparing Zoom and VR, impact students' learning outcomes?
2. How does the mode of delivery, comparing Zoom and VR, impact students' engagement?

## The study

To answer the research questions, a comparative study was designed involving two groups of volunteer Japanese undergraduate students taking an online English course, hereafter the Zoom group and the VR group. The participants were selected using purposive sampling, with intermediate to higher intermediate English levels based on TOEIC scores. The study was approved by the ethics board of the first author's institution. Each participant provided informed consent and received financial compensation for their participation at the end of the study. Initially, the Zoom group consisted of 37 participants but by the end of the study, the number had reduced to 30 (mean age = 20.07). The gender distribution in the final sample was 19 females and 11 males. The VR group started with 29 participants and by the end of the study, 25 participants (mean age = 21.23) remained. Among the final participants, there were 16 females and 9 males.

Both studies took place in an online remote flipped classroom environment. The students were given a total of 14 video lessons on the topic of small talk, providing them with the necessary knowledge and understanding of this communication skill. The videos taught students how to initiate and sustain small talk to create bonds with other people. Each week the participants were required to watch two videos of about five minutes each that were made available on a Google Site, making it convenient for them to access and review the video lessons. The learning activities in the weekly hour-long Zoom and VR lessons included group discussions, where participants had the opportunity to engage in meaningful conversations and share their ideas about various small-talk-related topics. Moreover, the participants practiced small talk in pairs, alternating twice at the end of each lesson. This allowed them to actively apply what they had learned, enhance their practical skills, and build their confidence in initiating and maintaining conversations.

The Zoom group participated in the study from December 2022 to February 2023, spanning 9 weeks including an orientation. During this period, a pre-test assessment was conducted at the start of the course, mid-test assessments were conducted during the fourth and fifth weeks, and a post-test assessment was conducted at the end of the ninth week. The VR group participated in the study using a WebVR platform called Frame from October 2023 to January 2024, spanning 11 weeks. More time was needed for the VR group due to synchronous training conducted on Zoom and similar to the Zoom group, pre-test, mid-test and post-test assessments were conducted. To measure engagement, the Japanese version of the engagement scale developed by Sun and Rueda (2012) was used with some adaptation to assess participants' emotional (EE), behavioural (BE), and cognitive engagement (CE) with 19 items rated on a 5-point scale from 1 (strongly disagree) to 5 (strongly agree). Three of these items were reversed in the original survey and were kept reversed in the translated version as well. The technical setup for the study included the use of ten PCs for

screen recordings, which allowed recording of the students' interactions and discussions in breakout rooms on Zoom and private voice zones in VR.

## Results

### Research question 1 - learning outcomes

To answer the first research question, recorded student interactions in pairs were curated to construct a comprehensive dataset that included videos from three different time points throughout the course: the beginning (pre-test), middle (mid-test), and end (post-test). Two raters used a rubric consisting of five criteria (i.e., fluency and coherence, lexical resources, grammatical range and accuracy, pronunciation, and interaction and communication strategies) for evaluation. Each rater independently scored the students' performance by evaluating at least three videos per participant per group, wherein they engaged in small talk with a partner. The maximum attainable score for each of the pre-, mid-, and post-tests was 25. To ensure consistency between the raters, two norming sessions were organised prior to each round of rating. After an initial assessment, any disagreements among the raters were discussed, resulting in inter-rater reliability indices above .80. Table 1 presents the mean and standard deviation values for the Zoom and the VR groups.

Table 1
*Zoom and VR Group Mean and Standard Deviation Values*

|  | Pre-test | Mid-test | Post-test |
|---|---|---|---|
| Zoom Mean (SD) | 17.88 (2.54) | 18.46 (2.72) | 20.02 (1.80) |
| VR Mean (SD) | 17.50 (1.60) | 18.54 (2.05) | 19.83 (1.40) |

To examine the differences in learning outcomes between the two groups, a null hypothesis was formed stating that there is no significant difference in the learning outcomes between them. To test this hypothesis, a repeated measures ANOVA was performed incorporating both within-subjects (time: pre-, mid-, post-test) and between-subjects (treatment: Zoom, VR) factors. As shown in Table 2, the results yielded significant improvements in students' small talk skills over time. Pairwise comparisons using Bonferroni as the adjustment method showed significant results across all three measurements. However, there was no significant improvement observed across the Zoom and the VR groups, indicating that the null hypothesis was confirmed and that both groups improved equally over time.

Table 2
*Repeated Measures ANOVA Test Comparing Zoom and VR Groups*

| Effect |  | Value | F | Hypothesis df | Error df | Sig. | Partial $\eta^2$ |
|---|---|---|---|---|---|---|---|
| Time | Wilks' Lambda | .316 | 56.359 | 2.000 | 52.000 | <.001 | .684 |
| Time * Treatment | Wilks' Lambda | .984 | .423 | 2.000 | 52.000 | .657 | .016 |

### Research question 2 - engagement

In response to the second research question, a survey was conducted at the end of each study to measure students' engagement levels. Figure 1 is a visual summary of the participants' mean scores to the 19 items of the Likert type engagement survey. As the bar graph indicates, there is no visible difference between the two groups in terms of engagement. To confirm this observation, a Mann-Whitney U Test was performed to compare the participants' mean ranks in the two groups. Similar to learning outcomes, no significant difference was found for engagement, meaning that the participants in both groups were highly engaged.

### Focus group insights

To gain deeper insights into the students' perceived learning experiences and engagement, focus group interviews were conducted with three to five students in each group. These semi-structured interviews

covered various topics, including general course evaluation, video materials, group and pair work and perceived learning outcomes. Additionally, the VR group was asked a set of VR-specific questions. Below is a brief summary of some of the main issues that the students raised.
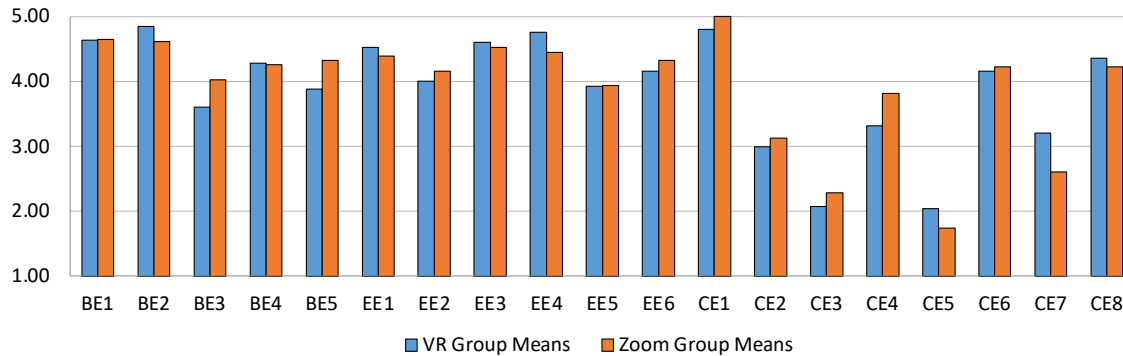


*Figure 1.* Zoom and VR group engagement mean values

Many positive aspects about learning in Zoom and VR were mentioned. The participants in both groups highlighted the unique opportunity to learn about small talk in an all-English course. They appreciated the chance to interact with students from different universities and backgrounds. Most respondents felt motivated throughout the sessions and actively responded to quiz questions, indicating a high level of engagement. Furthermore, all students found the videos interesting, looking up new words to enhance their understanding and using different playback speeds to suit their learning preferences. Regarding pair and group work, both groups generally found these activities successful. The participants enjoyed meeting new people and discussing familiar topics such as university life and part-time jobs, sometimes taking the lead and other times listening. Both groups reported significant perceived learning outcomes. They learned about small talk and how to initiate and continue conversations in English as well as built up their self-confidence in speaking.

For many VR group participants, this was their first experience taking lessons in VR. They noted the absence of facial expressions, which impacted communication both positively and adversely. Additionally, some technical issues were reported, affecting the overall experience. Participants in the VR group discussed aspects such as immersion, sense of presence, and the use of avatars. Opinions were divided into two camps. VR enthusiasts enjoyed the gamified experience and felt it resembled being together in the same space. They also appreciated the use of avatars to personalise their identity. Conversely, VR sceptics were not keen on the VR-specific features, believing that VR is not yet sufficiently advanced or user-friendly. Regarding technical challenges, both the Zoom and VR groups pointed out occasional network problems. Although Frame, the VR platform used in this study, works on mobile devices, some features and functions may be restricted. Therefore, participants who joined the VR lesson on mobile devices may have experienced some difficulties. Additionally, for about three weeks during the course, audio interference issues were experienced due to system bugs, which were later fixed. Given that VR has been shown to enhance language learning outcomes and increase student engagement, it remains a promising area of research. Future studies could explore leveraging new features of these platforms, such as facial expression recognition and AI bot communication.

## Conclusion

To sum up, this study focused on investigating the impact of online learning platforms on students' learning outcomes and engagement by making a comparison between Zoom and VR. The results showed that students in both groups improved their learning outcomes over time and reported similar levels of engagement at the end of the study, corroborating findings from the literature. Focus group interviews provided deeper insights into the students' learning experience and their preferences. The researchers aim to employ these findings in designing a future study aimed at leveraging the benefits of VR for cross-cultural communication.

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