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Immersive vs. Mobile Learning: Impact on EFL Learner Engagement and Motivation

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Abstract

As digital technologies increasingly reshape educational practices, understanding their role in language acquisition has become vital. This mixed-methods study investigates the impact of Virtual Reality (VR) and Mobile-Based Instruction on learner motivation and engagement in English language learning, two approaches gaining prominence in modern classrooms. A total of 48 EFL students, aged 15 to 20, from a private school in Yazd participated in the study. Motivation was measured in terms of intrinsic interest and willingness to learn, while engagement was assessed across cognitive, affective, behavioral, and temporal dimensions. Quantitative analysis of engagement scores and motivation scores revealed no statistically significant difference between the two instructional approaches. However, qualitative findings from semi-structured interviews provided deeper insights into learners' affective responses, cognitive engagement, and learning experiences. Participants described VR-based learning as more immersive, engaging, and confidence-boosting, while Mobile-Based Instruction was valued for its structured approach and teacher support. These findings underscore the importance of integrating immersive technologies with traditional pedagogical methods to enhance foreign language acquisition. The study suggests that a blended learning model may best accommodate diverse learner preferences and optimize language learning outcomes. Such a model could involve weekly VR-based sessions focused on immersive conversational practice, supplemented by mobile-based lessons for grammar, vocabulary reinforcement, and peer collaboration, with the teacher serving as a facilitator and guide across both platforms.

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Introduction

The acquisition of a foreign language involves both internal cognitive processes and external communicative use (De Guerrero, 2018; Zhang, 2020). This development typically progresses from a silent period to early language production, eventually leading to communicative competence. Immersive environments significantly support this progression by enhancing emotional engagement and cognitive involvement. Recent technological advances—particularly in virtual reality (VR)—have introduced scalable, cost-effective tools that simulate authentic linguistic and cultural settings, enabling learners to engage meaningfully with the target language (Zheng et al., 2022; Peixoto et al., 2021; Hua & Wang, 2023).

The broader integration of digital tools has transformed language learning. Since the 1990s, internet technologies have facilitated global communication, with the COVID-19 pandemic accelerating remote and tech-enhanced instruction (Rapanta et al., 2021). Early tools like computer-assisted language learning (CALL) focused on drills and grammar, while newer innovations—such as AR, VR, XR, and educational robots—offer immersive, interactive experiences (Chen et al., 2021; Shadiev & Yang, 2020; Huang et al., 2021).

VR, in particular, has gained traction due to its accessibility, immersive features, and potential to enhance learner motivation and performance (Georgiou et al., 2021; Kusuma et al., 2017). Immersive VR environments support the "three I's"—immersion, imagination, and interaction—which align with language acquisition goals by promoting autonomy and real-world communication (Lan, 2020). In a globalized world, multilingualism enhances intercultural understanding and cognitive development, offering both societal and neurological benefits (Fox et al., 2019; Booton et al., 2021; Pliatsikas et al., 2020). However, these advantages depend on regular, meaningful language use in immersive contexts. The theoretical foundations of VR in language learning are supported by Vygotsky's socio-constructivist theory and Johnson's embodied learning theory. VR fosters active, social, and sensory-rich learning environments that deepen engagement and language acquisition (Horvat et al., 2022; Zhang et al., 2021; Jusslin et al., 2022).

In this study, motivation is defined in accordance with Pintrich et al. (1991) as the degree of students' willingness, interest, and effort directed toward learning tasks. A distinction is made between intrinsic motivation, which reflects students' engagement driven by internal satisfaction and interest in the learning itself, and extrinsic motivation, which is fueled by external rewards or pressures such as grades or approval. Engagement is operationalized using O'Brien and Toms' (2008) User Engagement Scale, which includes four dimensions: cognitive engagement (mental effort and investment), affective engagement (emotional involvement), behavioral engagement (observable participation), and temporal engagement (sense of time spent immersed in the activity). These definitions guide both the design of measurement tools and the interpretation of findings.

Despite promising developments, empirical studies on VR in language education remain limited—particularly regarding its impact on learner motivation and engagement compared to traditional methods (Rojas-Sánchez et al., 2023; Parmaxi, 2020). Additionally, although VR's

potential to replicate real-world experiences and foster interactive learning is well recognized (Lan, 2020; Zhang et al., 2021), few studies have established clear empirical links between these immersive features and measurable improvements in language proficiency. Moreover, issues of cost and accessibility continue to restrict the widespread adoption of VR technologies in educational settings, yet practical solutions to these barriers are rarely explored (Peixoto et al., 2021). Addressing these gaps is crucial for validating the pedagogical value of VR, guiding effective instructional design, and ensuring equitable access to immersive language learning tools. Without empirical evidence and actionable strategies, the integration of VR risks remaining underutilized and unevenly distributed across learning contexts.

This study aims to contribute to the existing body of knowledge by investigating the impact of VR on student engagement and motivation in foreign language learning. By comparing VR-based learning experiences with traditional language learning methods, this research will provide insights into how immersive technologies can enhance language acquisition and inform future pedagogical approaches in foreign language education.

RQ1: Does using virtual reality to learn a foreign language create a difference in EFL learners' engagement and motivation scores compared to traditional methods?

RQ2: How do EFL learners describe their learning experience, motivation, and engagement when using VR for foreign language learning compared to traditional methods?

These questions aim to explore both the measurable impact and personal experiences of students using VR for language learning, providing a comprehensive understanding of its effectiveness.

1. Literature Review

The integration of Virtual Reality (VR) in education represents a multifaceted pedagogical approach underpinned by diverse theoretical foundations. In the context of immersive language learning, VR facilitates a transformative learning experience wherein learners are not only exposed to content but are also actively engaged within an interactive environment. This setting enables the construction of new knowledge through the synthesis of prior experiences and novel stimuli (Horvat et al., 2022). Such cognitive engagement aligns closely with Vygotsky's (1978) socio-constructivist theory, which emphasizes the essential importance of social interaction and collaborative meaning-making in the development of linguistic competence.

Moreover, VR expands the instructional possibilities by offering environments that allow learners to embody the language, engaging in socially driven, dynamic interactions that reinforce both understanding and proficiency (Zhang et al., 2021; Jusslin et al., 2022). This immersive and interaction-rich format finds its theoretical grounding in Johnson's (1989) embodied learning theory. Together, Johnson's embodiment and Vygotsky's socio-constructivism theory present a robust framework for exploring how VR technologies can enhance learner motivation, engagement, and language acquisition.

Socio-constructivism posits that learners construct internal knowledge through active engagement with others, progressively transforming it into more complex understandings (Wong et al., 2021; Iba & Burgoyne, 2019; Newman & Latifi, 2020). Originating from Vygotsky's work, this perspective is particularly relevant to language acquisition, where the

social nature of communication plays a central role. Wong et al. (2021) further emphasize the importance of collaborative inquiry and reflection, suggesting that when embedded in technologically rich settings, socio-constructivist principles enable more effective knowledge application. VR-enhanced environments exemplify such settings, offering immersive and socially interactive experiences that support deeper engagement with content (Rojas-Sánchez et al., 2023; Mystakidis, 2022; Hatzilygeroudis et al., 2021). These environments not only foster interaction but also promote internal motivation, key elements of socio-constructivist learning. Consequently, VR learning scenarios often lead to heightened learner focus, confidence, and participation in communicative tasks (Hatzilygeroudis et al., 2021).

Embodied learning, by contrast, emphasizes the full-body experience of knowledge acquisition, viewing the learner as a socially situated agent engaged in both verbal and physical interactions. This theory reframes language learning from a purely cognitive or communicative process to one that incorporates physical movement and environmental context (Jusslin et al., 2022). In VR-based language education, embodied learning principles are operationalized through the creation of authentic, immersive environments that mirror real-world linguistic contexts (Bian et al., 2023; Al-Jundi & Tanbour, 2022; Bahari, 2022). Within these settings, learners navigate and interact through natural bodily movement and tactile interfaces, enabling tangible engagement with virtual objects (Bian et al., 2023). Effective embodied learning in VR is contingent on two primary factors: environmental vividness and responsiveness.

Vividness refers to the degree to which sensory modalities, visual, auditory, and kinesthetic, are activated, while responsiveness reflects the environment's capacity to adapt to user inputs in real time (Al-Jundi & Tanbour, 2022). High levels of both dimensions contribute to increased learner immersion, motivation, and cognitive presence, thereby enhancing the overall language learning experience. When combined with embodied learning, the use of VR in foreign language education enables learners to experience a heightened sense of presence, leading to vivid recollection of virtual experiences as if they were real (Al-Jundi & Tanbour, 2022). This phenomenon fosters embodied cognition, where the mind and body collaboratively engage in the learning process. Learner engagement, encompassing attention, effort, curiosity, and emotional involvement, is central to educational effectiveness (Chiu, 2021) and is conceptually grounded in Vygotsky's (1978) socio-constructivist theory.

In VR-enabled learning environments, the construct of engagement remains consistent, with technology serving as a mediating tool that enhances learning experiences. According to O'Brien and Toms (2008), user engagement in such contexts is defined by the depth of involvement experienced during interaction. Regardless of specific VR learning scenarios, ranging from avatar interactions to gamified tasks or language immersion experiences—numerous studies have reported heightened levels of engagement (Zelenskaya & Harvey, 2019; Singh et al., 2022; Pyae, 2021b; Irshad & Perkis, 2020; Chen & Kent, 2020). This engagement is typically marked by sustained attention, active participation, intrinsic motivation, and emotional investment, which contribute to deeper learning outcomes (Rojas-Sánchez et al., 2023; Mystakidis, 2022).

An expanding body of research has demonstrated a positive correlation between user engagement in VR environments and improved learning performance across diverse disciplines

(Tai et al., 2022; Li et al., 2022; Lei et al., 2022; Katz et al., 2021; Boffi et al., 2023). This correlation is attributed to VR's ability to deliver interactive, multisensory learning tasks that encourage learner participation through sensorimotor embodiment. By manipulating virtual objects and navigating immersive spaces, learners actively construct meaning, leading to enhanced cognitive and affective engagement.

Despite its promise, empirical evidence supporting the effectiveness of VR in foreign language learning remains limited (Peixoto et al., 2021; Cowie & Alizadeh, 2022; Klimova, 2021). Several barriers contribute to this research gap. Chief among them is the high cost associated with developing and implementing VR systems, which poses challenges for widespread adoption in educational institutions. Additionally, a lack of specialized expertise required to design pedagogically sound VR content for language learning further constrains its integration. Consequently, VR applications in this domain are largely driven by commercial entities or confined to experimental use in higher education settings (Peixoto et al., 2021; Klimova, 2021).

This contrasts sharply with more established use cases in fields like healthcare and engineering, where VR has demonstrated considerable success in simulating complex, real-world environments (Cowie & Alizadeh, 2022). Some studies typically assess the effectiveness of VR applications through various instructional models. Researchers and educators have increasingly sought to leverage VR to enhance linguistic proficiency, particularly in applications like Mondly (Tai & Chen, 2021; Repetto et al., 2021; Radianti et al., 2020; Hamilton et al., 2021; Di Natale et al., 2020). Immersive software such as Mondly have substantially enhanced learners' progress, particularly in listening and speaking skills.

The Mondly VR application includes both a mobile version, allowing learners to complete lessons on smartphones or browsers, alongside its VR counterpart (Mondly, n.d.). Studies comparing the effectiveness of VR and mobile versions have produced varying results. Jensen and Cadierno (2022) found a slight advantage in learning outcomes for vocabulary acquisition using the VR version, attributed to the intervention design that allowed learners to revisit content and repeat the learning process. Similar findings were reported by Tai et al. (2020), who noted that the immersive environment provided by the VR version facilitated real-time interactivity and immediate feedback, contributing to enhanced knowledge construction. In contrast, Nicolaidou et al. (2021) found that both VR and mobile versions produced similar results, suggesting that the mobile version was equally effective in increasing learners' vocabulary. These findings align with the work of Parmaxi (2020), Huang et al. (2021), Chen et al. (2021), and Chen (2018), which indicate that research in this field remains experimental but promising, warranting further exploration.

Recent empirical studies have compared immersive virtual reality (IVR)-based classroom learning with traditional methods. Villena Taranilla et al. (2022) integrated IVR into an elementary school history lesson, where students took a virtual tour of a Roman archaeological site, while a control group engaged with the same content via traditional tools such as PowerPoint and videos. The study found that students using IVR showed higher motivation and academic achievement. Conversely, Riner et al. (2022) conducted a mixed-methods study in a 9th-grade social studies classroom, comparing fully immersive VR with non-immersive

VR. Although no statistically significant differences in knowledge development or engagement were found, the qualitative data indicated enhanced historical empathy in the IVR group. Similarly, Parong and Mayer (2021) assessed IVR's effect on student learning in a history class, with one group using IVR and another engaging with the same material via 3D interactive video. The results revealed that the 3D video group outperformed in academic achievement, while the IVR group exhibited higher emotional arousal levels.

Despite the growing body of literature on VR in education, several critical gaps remain in understanding its role in foreign language learning, particularly concerning student engagement and motivation. While previous studies have explored the theoretical underpinnings of VR-based learning through socio-constructivism (Vygotsky, 1978) and embodied learning (Johnson, 1989), empirical evidence on its effectiveness in foreign language acquisition remains limited (Peixoto et al., 2021; Klimova, 2021; Cowie & Alizadeh, 2022). Much of the existing research has focused on VR's application in other disciplines, such as healthcare and engineering, where simulated environments have yielded measurable benefits (Boffi et al., 2023; Katz et al., 2021). However, foreign language education has yet to see widespread adoption of VR, largely due to financial constraints, technological barriers, and limited institutional expertise (Klimova, 2021; Peixoto et al., 2021).

Furthermore, while engagement and motivation are frequently cited as key advantages of VR-enhanced learning (Singh et al., 2022; Pyae, 2021b; Irshad & Perkis, 2020; Chen & Kent, 2020), few studies have directly measured these factors in the context of foreign language learning. Existing studies, such as those on the Mondly VR application (Tai & Chen, 2021; Repetto et al., 2021; Radianti et al., 2020; Hamilton et al., 2021; Di Natale et al., 2020), have demonstrated positive impacts on listening and speaking skills but have not comprehensively examined students' engagement and motivation compared to traditional learning methods. Additionally, conflicting findings regarding VR's effectiveness versus mobile-based learning highlight the need for further research to determine the specific conditions under which VR enhances language learning outcomes (Tai et al., 2020; Jensen & Cadierno, 2022; Nicolaidou et al., 2021).

Another critical gap lies in the comparison between fully immersive VR experiences and conventional classroom-based approaches. While studies in history and social sciences (Parong & Mayer, 2021; Riner et al., 2022; Villena Taranilla et al., 2022) have suggested that VR can enhance motivation and emotional engagement, results regarding knowledge retention and academic achievement remain mixed. There is a lack of rigorous experimental studies in foreign language education that directly compare VR-based instruction with traditional methods to assess its impact on engagement, motivation, and learning outcomes. Given these gaps, this study seeks to provide empirical evidence on the impact of VR on student engagement and motivation in foreign language learning. By directly comparing VR-based learning with traditional methods, this research aims to contribute to the ongoing discourse on immersive learning technologies and offer insights for educators and policymakers on the pedagogical value of VR in language education.

2. Methodology

2.1. Design

This study employs a mixed-methods approach, combining quantitative and qualitative approaches to investigate whether the use of Virtual Reality (VR) significantly influences students' motivation and engagement in foreign language learning. This approach is particularly well-suited to the research questions, which seek to explore both measurable outcomes (RQ1) and subjective learner experiences (RQ2). The quantitative component assesses motivation and engagement using validated Likert-scale instruments, providing objective, comparable data across instructional modalities. Meanwhile, the qualitative component—based on semi-structured interviews—offers in-depth insights into learners' perceptions, emotional responses, and engagement strategies, thereby enriching the interpretation of numerical results. By integrating both methods, this design offers a more comprehensive and nuanced understanding of the instructional impact than either method alone could provide. It allows for the triangulation of findings, enhancing validity and capturing both the breadth and depth of learner engagement and motivation in VR versus traditional mobile-based instruction.

2.2. Participants

Participants were selected from a private school in Yazd using convenience sampling, totaling 48 students, aged between 15 and 20, reflecting the typical age range of students in the school's foreign language program. While this sample is representative of the local population, the findings may have limited generalizability to other age groups or educational contexts. Students were randomly assigned to either the treatment group (n = 24), which received foreign language instruction through a VR application featuring interactive, AI-supported, real-life scenario-based lessons, or the control group (n = 24), which followed the same curriculum delivered through traditional mobile-based instruction. For the qualitative component, a subgroup of 12 students from both groups volunteered to participate in semi-structured interviews, ensuring a range of perspectives.

2.3. Instruments

2.3.1. User Engagement Scale (UES)

This 12-item Likert-scale instrument (O'Brien and Toms (2008)) measures four dimensions of engagement: cognitive, temporal, affective, and behavioral. Scores range from 1 (Strongly Disagree) to 5 (Strongly Agree). The User Engagement Scale (UES), originally developed by O'Brien and Toms (2008), was designed to measure user engagement with digital systems by first establishing a theoretical foundation based on existing literature and human-computer interaction (HCI) theories. This process involved defining engagement and its components, which led to the development of a multidimensional model that was later refined in subsequent studies for broader applicability (O'Brien, 2016; O'Brien et al., 2018). The UES captures four key dimensions of engagement: cognitive (mental focus), temporal (perception of time), affective (emotional involvement), and behavioral (observable actions). The scale has demonstrated consistently high reliability, with Cronbach's alpha values typically exceeding 0.80, and its validity has been confirmed through widespread use across various digital

contexts. Studies such as those by Bitrián et al. (2021), Flavián et al. (2021), and García-Jurado et al. (2021) have shown that the UES is a robust and versatile tool applicable in multiple domains, including e-commerce, e-learning, and interactive media.

2.3.2. Learning Motivation Questionnaire

Based on Pintrich et al. (1991), this 3-item scale uses a 5-point Likert format to assess intrinsic learning motivation, with a reported Cronbach's alpha of 0.79. To ensure content validity within the context of English as a Foreign Language (EFL), the items were reviewed by a panel of EFL experts, including university-level instructors and applied linguistics scholars. These experts evaluated the items for clarity, cultural appropriateness, and relevance to intrinsic motivation in EFL learning contexts. Feedback from the panel confirmed that the items adequately capture the construct of intrinsic learning motivation and are understandable to EFL learners across varying proficiency levels.

2.3.3. Semi-Structured Interview

Qualitative data were collected through an interview protocol adapted from Hwang et al. (2009), consisting of 15 open-ended questions exploring feedback, support, engagement, collaboration, and learning autonomy. The original protocol focused on general user experiences in mobile learning environments. For this study, the questions were modified to align specifically with VR and mobile-based language instruction contexts. Adaptations included rephrasing items to address immersive experiences (e.g., "How did the virtual environment affect your language learning?"), emotional responses (e.g., "How motivated did you feel when using the VR/mobile app?"), and perceived autonomy and collaboration within the digital platforms. These changes were made to better capture learners' unique experiences with the instructional modalities under investigation. The adapted protocol was reviewed by two experts in educational technology to ensure content validity and was pilot-tested with three students to confirm clarity and relevance. Interviews were audio-recorded, transcribed, and thematically analyzed.

2.4. Procedure

Participants were randomly assigned to either the treatment or control group. Both groups received four English language instruction sessions, each lasting 60 minutes, conducted over the span of two weeks. The sessions were designed to align with learners' intermediate proficiency levels and focused on practical communicative skills. Specific topics included:

Session 1: Greetings, introductions, and daily routines

Session 2: Asking for and giving directions

Session 3: Ordering food and making reservations

Session 4: Describing past events and personal experiences

The treatment group used Oculus Quest 2 headsets to access Mondly VR lessons, which provided immersive and interactive learning environments aligned with each session's topic. These VR lessons incorporated voice recognition, AI-driven conversation simulations, and contextual scenarios to reinforce vocabulary and grammar usage. The control group used iPads

to complete the same lessons via a mobile application, ensuring content parity with the VR sessions. However, their experience lacked the immersive, 3D context and interaction offered by VR.

To ensure instructional consistency, the teacher conducted all sessions for both groups and received four training workshops on VR integration prior to implementation. These workshops covered the use of headsets, instructional design within VR, safety protocols, and basic troubleshooting. All participants completed the quantitative instruments (User Engagement Scale and Learning Motivation Questionnaire) in paper format after the final session. Additionally, a subgroup of 12 students participated in semi-structured interviews to provide qualitative insights into their experiences. Confidentiality and anonymity were maintained throughout the data collection process.

2.5. Data Analysis

Data from the engagement and motivation scales were analyzed using Multivariate Analysis of Variance (MANOVA) to identify significant differences between the treatment and control groups. Group means were compared, and linear relationships between variables were visually inspected to verify assumptions (Gall et al., 2007). Interview transcripts were analyzed using thematic analysis. The process involved open coding, identifying recurring patterns, and categorizing data into themes (e.g., engagement strategies, learner autonomy, and collaborative experiences). These findings served to enrich and explain the quantitative results. Findings from both datasets were triangulated during interpretation to understand the convergence or divergence between measured outcomes and personal experiences.

3. Findings

3.1. Quantitative Analysis

To address the research question 1: Does using virtual reality to learn a foreign language create a difference in EFL learners' engagement and motivation scores compared to traditional methods?

A Multivariate Analysis of Variance (MANOVA) was conducted to examine the effect of instructional method (Virtual Reality vs. Mobile/Traditional) on two dependent variables: engagement and motivation scores.

Preliminary analyses confirmed that assumptions for MANOVA were met (see Table 1):

Table 1. *Tests of Normality Covariance Matrices*

Static	df	Sig.
.109	48	0.217
0.96	48	.080

Table 2. *Box's Test of Equality of*

Box's M	F	df1	df2	Sig.
3.045	.967	3	380880.000	.407

Based on Table 2, Homogeneity of variance-covariance matrices was confirmed with Box's M Test, which was not significant (*p = .407*).

Table 3. *Levene's Test of Equality of Error Variances*

Dependent variables	F	df1	df2	Sig.
engagement score	.970	1	46	.330
motivation score	1.872	1	46	.178

Based on Table 3 Levene's Test for homogeneity of error variances was also non-significant for both engagement (*p = .330*) and motivation (*p = .178*), indicating equal variances across groups.

Descriptive statistics for engagement and motivation scores by group are presented in the table below:

Table 4. *Descriptive Statistics*

Dependent variables	Group	Mean	Standard Deviation	N
engagement score	Mobile	36.13	5.56	24
	VR	36.83	4.69	24
	Total	36.48	5.10	48
motivation score	Mobile	47.42	7.00	24
	VR	46.75	5.24	24
	Mobile	47.08	6.13	48

Table 5. *Multivariate Tests*

Effect	Multivariate Test	Value	F	Hypothesis df	Error df	*p*	Partial η^2
Intercept	Pillai's Trace	.986	1577.68	2	45	< .001	.986
	Wilks' Lambda	.014	1577.68	2	45	< .001	.986
	Hotelling's Trace	70.12	1577.68	2	45	< .001	.986
	Roy's Largest Root	70.12	1577.68	2	45	< .001	.986
Group	Pillai's Trace	.020	0.47	2	45	.631	.020
	Wilks' Lambda	.980	0.47	2	45	.631	.020
	Hotelling's Trace	.021	0.47	2	45	.631	.020
	Roy's Largest Root	.021	0.47	2	45	.631	.020

Table 6. *Tests of Between-Subjects Effects*

Source	Dependent Variable	Type III Sum of Squares	Df	Mean Square	F	P	Partial η²
Corrected Model	Engagement Score	6.02		6.02	0.23	.635	.005
	Motivation Score	5.33		5.33	0.14	.710	.003
Intercept	Engagement Score	63,875.02		63,875.02	2416.41	< .001	.981
	Motivation Score	106,408.33		106,408.33	2783.76	< .001	.984
Group	Engagement Score	6.02		6.02	0.23	.635	.005
	Motivation Score	5.33		5.33	0.14	.710	.003
Error	Engagement Score	1,215.96		26.43			
	Motivation Score	1,758.33		38.23			
Total	Engagement Score	65,097.00					
	Motivation Score	108,172.00					
Corrected Total	Engagement Score	1,221.98					
	Motivation Score	1,763.67					

Follow-up univariate ANOVAs indicated (Table6):

No significant difference in engagement scores, $F\ (1, 46) = 0.228$, $p = .635$, *partial* $\eta^2 = .005$.

No significant difference in motivation scores, $F\ (1, 46) = 0.140$, $p = .710$, *partial* $\eta^2 = .003$.

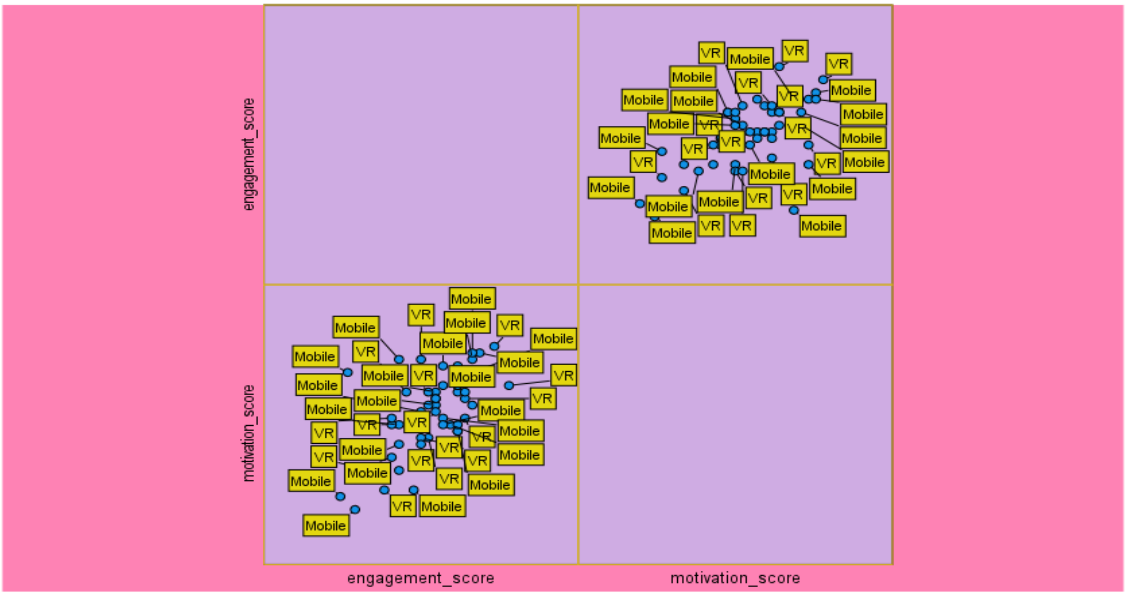

Figure1. *The scatterplot matrix*

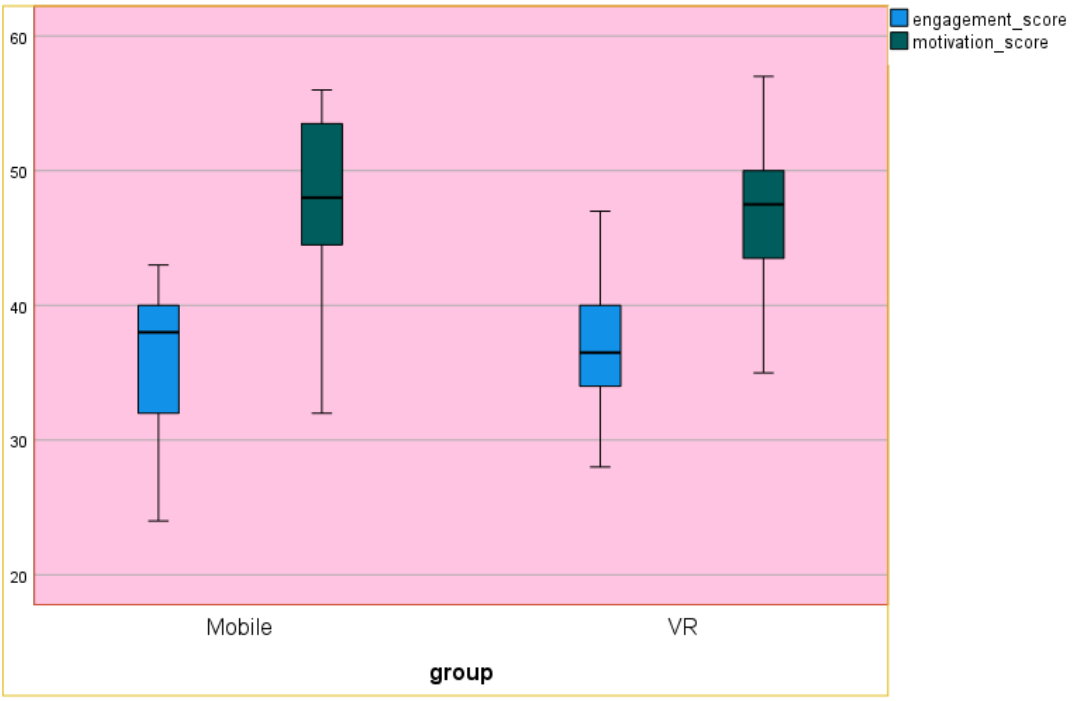

Figure2. *The Boxplot*

To explore potential differences in engagement and motivation between Mobile and VR instructional conditions, a scatterplot matrix and boxplot were generated. The scatterplot matrix shows a wide but overlapping distribution of scores across both variables and groups, with no clear separation between Mobile and VR participants. Similarly, the boxplot reveals comparable medians and interquartile ranges for both engagement and motivation scores across the two groups. These visualizations support the results of the MANOVA, which found no statistically significant differences between the instructional conditions. Collectively, the data suggest that the mode of instruction (Mobile vs. VR) does not substantially impact participants' engagement or motivation.

The results suggest that the mode of instruction (VR vs. Mobile/Traditional) did not have a statistically significant impact on students' engagement or motivation in learning a foreign language. Both groups reported similar levels of engagement and motivation, as reflected by the small mean differences and low effect sizes.

3.2 Qualitative Analysis

To address the research question 2: How do students describe their learning experience, motivation, and engagement when using VR for foreign language learning compared to traditional methods? the findings are organized into themes, as is common in qualitative research, and reflect common trends, contrasts between VR and traditional methods, and students’ perceptions of motivation and engagement.

Table 7. *Thematic Analysis*

Theme	Sub-theme	Description
Student Engagement	Active Participation (VR)	Students reported higher attention and activity during VR sessions
	Passive Learning (Traditional)	Traditional lessons led to passive engagement and boredom
Motivation	Intrinsic Motivation (VR)	Learners were internally motivated by immersive, game-like VR tasks
	Extrinsic Motivation (Traditional)	Motivation was driven by requirement or fear of assessment
Confidence and Anxiety	Reduced Anxiety in VR	VR environment reduced fear of making mistakes
	Performance Anxiety (Traditional)	Learners expressed fear when speaking in front of others
Social Interaction	Limited Interaction in VR	VR limited natural peer interaction
	Surface-level Interaction (Traditional)	Traditional settings encouraged repetition but lacked deep collaboration
Preference and Suggestions	Preference for VR	Majority preferred VR for its immersive and fun experience
	Recommendation for Blended Learning	Some students suggested combining VR and traditional methods

The qualitative data collected through semi-structured interviews revealed several key themes regarding students' motivation and engagement when learning English through virtual reality (VR) compared to traditional methods. These themes include enhanced engagement in VR environments, increased motivation through immersion, improved learning confidence, social interaction and collaboration, and student preferences (Table 7).

1. **Enhanced Engagement in VR**
   Students described VR lessons as "fun" and "exciting," contrasting them with the "boring" and passive nature of traditional sessions. One student noted, *"I felt like I was really there—it made me want to learn more."*

2. **Motivation Through Immersion**
   VR sparked intrinsic motivation by placing students in goal-oriented, interactive tasks. As one student put it, *"The missions made me try harder to understand."* Traditional learners often cited obligation rather than interest as their reason for participating.

3. **Greater Confidence in VR**
   Learners felt more confident using English in VR, where fear of peer judgment was reduced: *"I wasn't afraid to make mistakes because no one was staring at me."*

4. **Mixed Views on Social Interaction**
   While VR fostered individual exploration, some students missed peer dialogue. In contrast, classroom interactions, though more frequent, were described as formulaic: *"We talked more, but it was just repeating the teacher."*

5. **Overall Preferences and Suggestions**
   The majority preferred VR for its realism and autonomy, though a few raised concerns about technical issues and headset fatigue. Several students suggested a hybrid model: *"I liked VR more, but I think we need both to learn well."*

Overall, the interviews indicate that VR environments can significantly enhance students' motivation and engagement in learning English, largely due to their immersive and interactive nature. While traditional methods still offer benefits such as real-time teacher support and peer collaboration, many students expressed a clear preference for VR-based learning, particularly in terms of enjoyment and confidence.

4. Discussion

This study set out to explore the effectiveness of Virtual Reality (VR) in enhancing EFL learners' motivation and engagement compared to traditional mobile-based instruction. The research addressed two central questions:

RQ1: Does using virtual reality to learn a foreign language create a difference in EFL learners' engagement and motivation scores compared to traditional methods?

RQ2: How do EFL learners describe their learning experience, motivation, and engagement when using VR for foreign language learning compared to traditional methods?

In relation to RQ1, the quantitative findings indicated no statistically significant difference in engagement or motivation scores between the VR and mobile-based instruction groups. This result contrasts with previous studies that highlight VR's potential to improve engagement and motivation in educational contexts (Rojas-Sánchez et al., 2023; Hatzilygeroudis et al., 2021; Mystakidis, 2022). One plausible explanation lies in the novelty effect—the initial excitement surrounding VR technology may enhance engagement temporarily but diminish over time, resulting in outcomes comparable to more familiar technologies. Additionally, learners' digital literacy and comfort with VR technology could have influenced their ability to fully benefit from the immersive features (Checa & Bustillo, 2020).

Despite the absence of statistically significant differences, qualitative data provided a richer perspective in answering RQ2. For educators, this suggests that the decision should not be solely data-driven in terms of measurable outcomes but should also consider the qualitative dimensions of student experience. VR appears to foster greater emotional engagement, curiosity, and confidence, particularly in speaking tasks—qualities that may not immediately translate into higher motivation scores but can profoundly influence learner persistence and affective development. Mobile-based instruction, while less immersive, supports greater accessibility, familiarity, and opportunities for face-to-face interaction, making it especially valuable in contexts where collaboration and teacher-led guidance are essential. Therefore, educators should weigh these trade-offs based on their specific instructional goals, technological resources, and learner profiles. Integrating both approaches in a blended format may offer the most pedagogically balanced and inclusive solution, aligning immersive engagement with structured support and interaction. Learners in the VR group frequently described their experiences as "fun," "exciting," and "immersive." These descriptors resonate with socio-constructivist learning theory (Vygotsky, 1978) and embodied learning theory (Al-Jundi & Tanbour, 2022; Bahari, 2022), both of which emphasize the role of contextual, interactive, and sensory engagement in fostering deeper learning. In contrast, mobile-based learners described their experiences as "repetitive," "passive," and primarily driven by external obligations, suggesting a lower degree of intrinsic motivation.

Despite widespread assumptions about VR's pedagogical superiority, the quantitative results of this study found no statistically significant difference in engagement or motivation between VR and mobile-based learning groups. This finding complicates the prevailing narrative that immersive technologies inherently produce better learning outcomes. One possible explanation is the novelty effect, where initial enthusiasm for new technology temporarily boosts motivation and engagement. Over time, as students become accustomed to the VR format, the motivational boost may diminish, resulting in comparable outcomes to more familiar technologies like mobile learning platforms. Furthermore, this result suggests that engagement and motivation may not be solely dependent on the medium, but rather on instructional design, content relevance, and learner autonomy. While VR may provide an immersive and emotionally engaging environment, these attributes alone may not sustain long-term improvements in motivation without continuous pedagogical support and adaptation. It is also possible that learners' digital literacy or technical discomfort with VR could mitigate potential advantages, especially if they encounter usability issues that distract from learning objectives. In contrast, mobile-based learning, while less immersive, may benefit from being more intuitive, portable, and socially integrated, thus leveling the experiential playing field.

Another key theme that emerged from the qualitative data concerned the effect of VR on learner confidence**,** particularly in speaking tasks. Several VR users reported feeling less anxious and more confident when engaging in communicative scenarios. This aligns with Krashen's Affective Filter Hypothesis, which posits that lower anxiety levels create a more conducive environment for language acquisition. Mobile learners did not report similar reductions in anxiety, indicating that VR's immersive environment may be more effective in supporting affective aspects of language learning.

However, the findings also revealed limitations associated with VR, particularly regarding peer interaction. While the VR environment fostered individualized learning and autonomy, some participants noted reduced opportunities for collaboration. On the other hand, mobile-based instruction, although less immersive, allowed for more face-to-face, teacher-led interaction. This reflects earlier findings that mobile learning platforms are more socially integrated, though sometimes at the expense of deeper engagement (Deng & Yu, 2022; Hua & Wang, 2023). These contrasting strengths underscore the need for instructional designs that can balance immersive, self-directed learning with collaborative opportunities.

Practical considerations also play a crucial role in evaluating the viability of VR. While it offers a unique and emotionally resonant learning environment (Peixoto et al., 2021), VR implementation presents challenges such as high costs**,** technical difficulties**,** and user discomfort (Checa & Bustillo, 2020). Some learners reported issues such as dizziness and hardware malfunction, which may disrupt the learning process. In contrast, mobile-based instruction is generally more cost-effective, user-friendly, and accessible, especially in contexts with limited infrastructure.

Given these findings, a blended learning model emerges as a promising solution. Many students expressed a preference for combining VR-based immersive experiences with the structure and interpersonal interaction of mobile or classroom-based learning. This approach is supported by studies such as Peixoto et al. (2021) and Repetto et al. (2021), which found that

VR's pedagogical potential is enhanced when integrated with teacher guidance and peer collaboration.

In summary, this study provides nuanced answers to both research questions. While RQ1 showed no significant quantitative difference between VR and mobile-based instruction**,** RQ2 highlighted meaningful distinctions in learner experiences and perceptions. VR was particularly effective in fostering intrinsic motivation and emotional engagement, whereas mobile learning supported accessibility and social interaction. Together, these findings suggest that rather than viewing these technologies as competing alternatives, educators should consider how they might be strategically integrated to enhance foreign language acquisition. Future research should investigate long-term impacts, explore diverse learner populations, and refine hybrid instructional models to maximize both engagement and learning outcomes.

Conclusion

This study investigated the impact of instructional modality, Mobile versus Virtual Reality (VR) on learners' engagement and motivation. Quantitative analysis revealed no statistically significant difference between the two groups in either engagement or motivation scores, suggesting both Mobile and VR platforms can support learners effectively on these dimensions. However, qualitative data from student interviews painted a more nuanced picture.

Students in the VR group consistently reported higher levels of engagement and motivation, describing their experiences as immersive, enjoyable, and game-like. The interactive nature of VR and the sense of "being there" appeared to fuel intrinsic interest, with students expressing a desire to continue learning. These insights provide valuable context to the quantitative results, suggesting that while overall scores may be similar, the nature and quality of engagement in VR may be more dynamic and emotionally resonant. Furthermore, VR learners reported greater confidence in using English, noting reduced anxiety and a stronger sense of autonomy during practice. Though some felt socially isolated in VR, others appreciated the independent learning environment. Conversely, students in the Mobile (traditional) group appreciated teacher interaction and peer collaboration but often described their lessons as repetitive and less stimulating. Despite the absence of significant score differences, the qualitative findings underscore VR's potential to foster deeper emotional and psychological engagement. This highlights the importance of not relying solely on numerical measures, as they may not fully capture learners' affective experiences.

Educators should consider integrating VR environments as a supplementary approach to traditional or mobile-based learning to enhance student engagement and motivation, particularly in language practice scenarios. Given the strengths of both VR and Mobile-based methods, a blended instructional model that leverages VR for immersive tasks and mobile platforms for collaborative or teacher-guided activities may yield optimal results. Institutions adopting VR should ensure proper technical infrastructure and address usability concerns such as headset comfort, session duration, and motion sickness to prevent learner fatigue or disengagement.

Practically, this blended model could be implemented through a weekly schedule in which learners participate in VR-based sessions (e.g., using platforms like ENGAGE or Mondly VR)

for task-based, immersive speaking practice and situational dialogues, while mobile-based lessons (via apps such as Duolingo, Quizlet, or Google Classroom) are used throughout the week for grammar drills, vocabulary building, and teacher-facilitated discussions. Teachers would act as orchestrators—designing tasks, monitoring learner progress across both environments, providing real-time or asynchronous feedback, and creating opportunities for peer interaction via mobile-supported group projects or discussion forums. Instructional designers should develop VR content that supports learner autonomy while also facilitating meaningful peer and teacher interaction, balancing immersion with collaboration. Teachers should receive professional development to effectively integrate and manage VR tools in ways that align with learning objectives and support student well-being.

Limitations of the study

Despite its valuable findings, this study presents several limitations. First, the sample size may limit generalizability, and the absence of long-term follow-up restricts understanding of sustained motivation and language retention. Second, technical inconsistencies across devices and VR headsets may have influenced user experience, potentially skewing participant responses. Additionally, while the study captured self-reported perceptions, it did not measurelanguage proficiency gains directly, which would provide a more comprehensive assessment of learning outcomes.

Recommendations for Further Research

In summary, while both modalities can facilitate engagement and motivation, VR offers unique immersive qualities that may lead to enhanced learner satisfaction, confidence, and motivation—benefits that could be particularly valuable in language learning contexts. Future research should further explore these affective dimensions over longer periods and with varied learner populations to better understand how immersive technologies shape learning experiences. Future research should investigate the longitudinal effects of VR and Mobile-based learning on language acquisition, integrating performance-based assessments and larger, more diverse samples. Exploring hybrid instructional frameworks, as well as learners' cognitive load and emotional states during immersive experiences, may further illuminate how best to design effective, inclusive, and scalable language learning environments.

Data Availability Statement

The raw data supporting the conclusion of this article will be made available by the authors, without undue reservation.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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