IMMERSIVE VS DESKTOP VR IN HOTEL ENGLISH EDUCATION: EFFECTS ON ENGAGEMENT OF CHINESE UNIVERSITY STUDENTS

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ABSTRACT

This study examined the effects of immersive VR and desktop VR on engagement in a Hotel English course among Chinese university students. A quasi-experimental pre-test and post-test design was employed with 30 participants, and engagement was measured using a modified Reeve Engagement Questionnaire (REEQ). Results showed that both VR modes increased engagement, with IVR producing greater gains. Female students demonstrated larger improvements than male students, particularly under IVR, suggesting a potential moderating effect of gender. These findings indicate that higher immersion and interactivity can more effectively enhance engagement in ESP courses, while DVR remains a viable alternative for institutions with limited technological resources.

KEYWORDS

Immersive Virtual Reality (IVR); Desktop Virtual Reality (DVR); Hotel English; Student Engagement

1. PROBLEM STATEMENT

The rapid development of China's hotel industry has increased the demand for professionals with strong English communication skills (Duan, 2019; Ma'fiyah&Sumardiono, 2023). However, traditional hotel English courses remain largely teacher-centered, with limited opportunities for interaction and practical language use, resulting in students' low confidence and communication anxiety, which negatively affect their engagement and performance. Internships often fail to provide authentic contexts for practicing English in dynamic service situations, further restricting students' ability to apply language skills effectively.

Immersive and desktop virtual reality (IVR and DVR) technologies offer promising solutions by providing interactive, scenario-based environments that simulate real hotel service contexts, allowing learners to practice communication skills safely and repeatedly. Despite VR's application in language learning, systematic comparisons of IVR and DVR in hotel English education remain limited, and the effects of learner characteristics on engagement is underexplored. This study aims to investigate the effects of IVR and DVR on Chinese university students' engagement in hotel English courses.

2. RESEARCH OBJECTIVES (RO)

RO1: To implement immersive and desktop virtual reality (IVR and DVR) instructional modes in a Hotel English course.

RO2: To assess the effectiveness of the IVR and DVR instructional modes in promoting engagement.

RO3: To compare the effectiveness of the IVR and DVR instructional modes in promoting engagement.

3. RESEARCH QUESTIONS (RQ)

RQ1: How does the instructional mode (IVR vs. DVR) affect Chinese university students' engagement in hotel English learning?
RQ2: How do gender differences influence students' engagement in IVR hotel English courses?
RQ3: How do gender differences influence students' engagement in DVR hotel English courses?

4. RESEARCH HYPOTHESES (RH)

$H_{1.A.1.}$ There is a significant difference in university students' engagement between IVR and DVR instructional modes.
$H_{1.A.2.}$ There is a significant difference in university students' engagement between learners with different gender in the IVR mode.
$H_{1.A.3.}$ There is a significant difference in university students' engagement between learners with different gender in the DVR mode.

5. CONCEPTUAL FRAMEWORK

This study categorizes variables into independent, dependent, and moderator variables. The independent variables are IVR and DVR modes. The dependent variable includes students' engagement. Gender serves as a moderator (Figure 1)

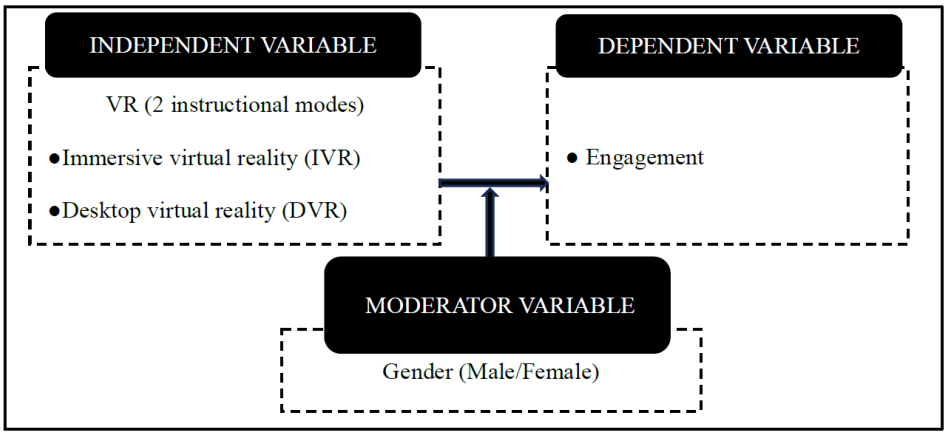

Figure 1. Conceptual framework of this study

6. THEORETICAL FRAMEWORK

To provide a theoretical basis for investigating student engagement in VR-based hotel English learning, this study adopts the Cognitive-Affective Theory of Learning with Media (CATLM). CATLM emphasizes how cognitive and affective processes interact during multimedia learning and offers principles for designing learning experiences that enhance behavioral, emotional, and cognitive engagement.

In VR learning contexts, CATLM has been applied to define parameters and evaluation criteria for learner-centered instructional design, including visualization (Birt et al., 2015), human-

computer interaction (Shu et al., 2019), and instructional concepts and procedures (Ta, 2018). It has also informed pedagogical strategies aimed at improving learning outcomes, such as knowledge construction (Spek et al., 2008), knowledge transfer (Petersen et al., 2020), and behavioral engagement (Sajjadi et al., 2018). Guided by CATLM, this study focuses on how immersive and desktop VR environments can influence student engagement in hotel English learning. The model of CATLM is shown in Figure 2 (adapted from Moreno & Mayer, 2007).

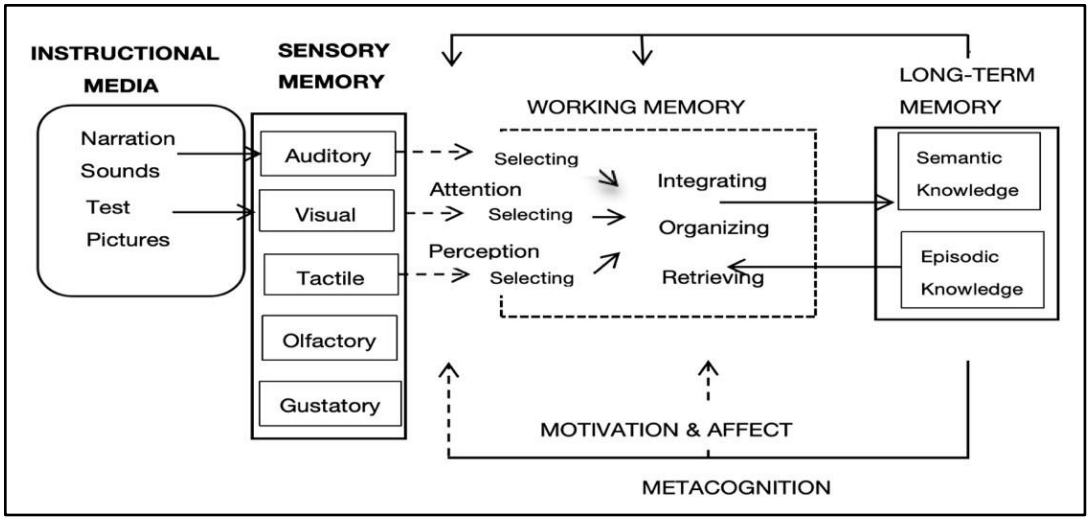

Figure 2. Cognitive-Affective Model of Learning with Media

7. PREVIOUS RESEARCH WITH STUDENT ENGAGEMENT

Student engagement refers to the active involvement of students in learning activities (Christensen et al., 2012). Engagement can be viewed as a visible manifestation of energy in action. The attention and support for student engagement in classrooms stem from its association with higher learning achievement (Appleton et al., 2008). This link places student engagement at the forefront of researchers and educators and increasingly becomes a focus of higher education reforms (Marks, 2000). Engagement is malleable (Fredricks et al., 2004), a viewpoint that educators favor as it can be fostered through interpersonal and task characteristics. Furthermore, because engagement reflects motivation (Skinner et al., 2009), it serves as a barometer for understanding students' underlying traits. This study will focus on students' engagement levels while learning hotel English courses in IVR and DVR environment.

Furrer and Skinner (2003) defined the concept of engagement as well as its opposite, disaffection. Thus, engagement involves goal-directed and sustained interactions with physical and social environments. In contrast, disaffection is characterized by apathy, exhaustion, and alienation. As previously mentioned, engagement can be seen as a manifestation of motivation. Therefore, energetic and purposeful actions reflect motivation. Because of the feedback loop with social partners, engagement or disaffection can impact the classroom environment. For instance, engagement is seen as a valuable energy resource noticed by both students and teachers, and it can elicit responses in enthusiastic and participatory ways (Skinner et al., 2009).

Most researchers specify three different aspects of student engagement: behavioral, emotional, and cognitive (Fredricks et al., 2004; Skinner et al., 2009). Additionally, Reeve (2011) introduced a new dimension of student engagement known as agentic engagement. Below, each

dimension will be described (Figure 3). However, it is worth noting that there are many different views on the conceptualization of student engagement (Sinatra et al., 2015).

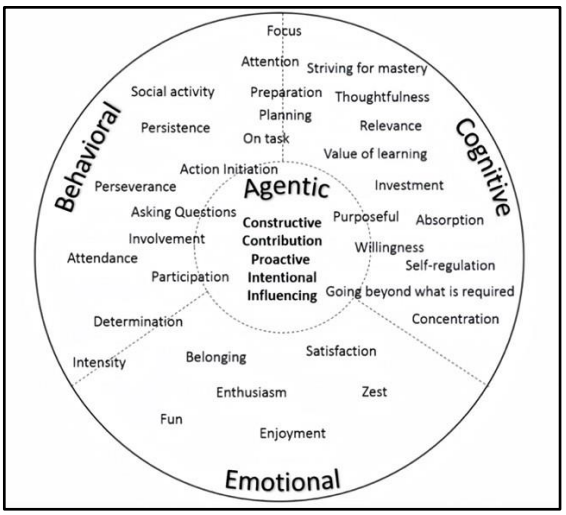

Figure 3. The Four Dimensions of Engagement (Wakefield, 2016)

7.1. Behavioral Engagement

Behavioral engagement primarily centersaround the concept of participating in school-related tasks, requiring active behaviors such as effort, persistence, attentiveness, focus, involvement, and asking questions. This also includes refraining from disruptive behaviors and engaging in learning tasks (Wang & Eccles, 2013). Participating in classroom discussions, asking questions, and overall involvement characterize this type of engagement (Fredricks et al., 2004). Although engagement is an ideal outcome, it is passive rather than proactive. For example, a teacher poses a question, and students respond. Behavioral engagement typically involves responses or reactions to teachers and learning activities.

7.2. Emotional Engagement

Emotional engagement refers to emotional reactions in the classroom, including interest, boredom, joy, sadness, anxiety, and others (Fredricks et al., 2004). Emotional engagement also involves evaluations of school activities (Voelkl, 1997). Additionally, emotional engagement generally pertains to emotional responses towards teachers or the school environment.

7.3. Cognitive Engagement

Fredricks et al. (2004) categorized cognitive engagement into two components: strategic learning and self-regulation strategies, and the willingness to exert effort (Wang & Eccles, 2013). Additionally, cognitive engagement involves the desire and preference for actively coping with challenges or facing failures (Fredrickset al., 2004). Cognitive engagement can also be described as initiative and metacognition.

7.4. Agentic Engagement

Reeve and Tseng (2011) introduced the concept of agentic engagement, defining it as the constructive contributions students make to the teaching process they receive. They introduced

this dimension of engagement to explain how students consciously contribute to classroom instruction. Their argument is that classroom interactions are reciprocal, and traditional engagement dimensions do not fully capture students' proactive, intentional contributions to the instructional process.

Bandura (2001) laid the foundation for defining agency as the proactive and intentional capacity of individuals to effect change through their actions. Reeve and Tseng (2011), when introducing agentic engagement, described it as proactive, intentional, personalized, purposeful, and influential. In educational contexts, agentic engagement is evident when students constructively influence teachers during instruction and actively take ownership of their learning rather than adopting a passive role. Although some scholars argue that agentic engagement overlaps with behavioral, cognitive, and emotional dimensions due to varying definitions (Reschly& Christenson, 2012; Lawson & Lawson, 2013), this study adopts the position that it constitutes a distinct and meaningful component of student engagement. As illustrated earlier in Figure 3, conceptual overlaps among the four dimensions exist; however, such overlaps do not negate the unique contribution of each. Distinct from behavioral or emotional engagement, which are often reactive or internally oriented, agentic engagement is proactive and emphasizes students' collaboration with teachers and peers to co-create optimal learning conditions (Reeve, 2013). This distinction underscores its theoretical significance and supports its inclusion as a separate dimension in this study.

In this study, the four dimensions of student engagement are reflected under the two VR instructional conditions as follows: active involvement in simulated tasks (behavioral), emotional responses and interest in immersive learning scenarios (emotional), the application of strategies and perseverance in addressing communication challenges (cognitive), and proactive contributions to shaping learning interactions (agentic). This framework provides a comprehensive perspective for analyzing student engagement in hotel English learning under IVR and DVR conditions.

Recent studies have demonstrated the effectiveness of IVR in enhancing students' engagement in English learning. Tai & Chen (2021) reported that mobile rendering head-mounted displays (MVR) improve memory and engagement among learners of English as a Foreign Language (EFL). Wilang (2019) found that head-mounted devices significantly enhance learners' engagement, motivation, and autonomous learning, and are effective for vocabulary acquisition and following instructions. Shi et al. (2024) showed that IVR supported project-based learning improves oral English skills and classroom participation in hotel management students. Nicolaidou et al. (2021) demonstrated that IVR applications increase university students' vocabulary performance, engagement, attention, and sense of immersion. Moreover, Peixoto et al. (2021) reported improvements in behavioral, emotional, and cognitive engagement, while Matovu et al. (2023) highlighted enhanced agentic engagement, encouraging learners to actively shape and interact with learning materials. Overall, existing studies primarily emphasize the advantages of IVR in promoting engagement across all four dimensions. However, research on DVR and its effects on behavioral, emotional, cognitive, and agentic engagement remains limited, highlighting an important gap that this study aims to address.

Furthermore, the influence of gender on the learning process has been extensively studied and may play a significant moderating role in virtual reality learning environments. Universities, in supporting student development, should help students build confidence in their own gender and ensure educational equity, enabling students of both genders to fully realize their learning potential (Stevenson &Lavigne, 2021). In virtual reality learning environments, students of different genders may exhibit different learning preferences and adaptation styles; therefore, exploring the moderating role of gender has significant theoretical and practical implications.

Existing research indicates that gender differences are particularly pronounced in language learning, and these differences may further influence student engagement in immersive and desktop VR environments. Studies have found that women generally outperform men in English learning engagement, test scores, and the use of language learning strategies (König&Surkamp, 2016). In contrast, men may be more motivated to learn by interest in new technologies (Montero-SaizAja, 2021). Based on the above analysis, whether male learning engagement in VR environments is enhanced by their technological interest, and whether female learning engagement is higher in such environments, still warrants further investigation. Therefore, this study aims to optimize VR teaching system design to better meet the needs of students of different genders by exploring the moderating role of gender in immersive and desktop VR hotel English courses, and to provide theoretical basis and practical guidance for the future application of educational technology in hotel English teaching.

8. RESEARCH GAP

This study also systematically reviewed 36 relevant studies published between 2020 and 2025 on the application of virtual reality in English learning, aiming to summarize its current use and research trends, highlight key focus areas and limitations in the field, and identify potential research directions to provide theoretical support and reference for future studies. The research gaps identified in this study include:

i. Limited research on specific disciplines**:** Existing studies largely focus on general university students or English majors, while research targeting students in specific disciplines, such as hospitality management, is relatively scarce.
ii. Low attention to professional scenario simulations**:** Although some studies have explored the use of IVR in English learning, most are limited to general language contexts, such as daily conversation or classroom interaction. Few studies have designed English learning scenarios tailored to the practical needs of the hospitality industry, particularly cross-cultural professional communication training, which remains an underexplored area.

9. METHODOLOGICAL PROCEDURES

9.1. Research Design

This study adopted a quantitative research design with a quasi-experimental approach to examine the effects of IVR and DVR on Chinese university students' engagement in hotel English instruction. A pre-test–post-test design was employed, in which comparable intact classes were purposively assigned to either the IVR group or the DVR group. Prior to the intervention, all participants completed a pre-test to assess their initial level of engagement in hotel English learning, which served as baseline data for subsequent comparison. Following the instructional intervention, students in both groups completed a post-test to evaluate and compare the effects of IVR and DVR on student engagement.

9.2. Participants

In the quantitative research section, this study employed purposive sampling to select an intact Hotel English class at a university in a northern city of China, with a total of 30 undergraduate students participating. The sample size was considered appropriate for a small-scale quasi-experimental design. Following participant selection, the students were randomly assigned to either the IVR group or the DVR group to receive different instructional treatments.

9.3. Instruments

In this study, Reeve's Engagement Questionnaire (REEQ) was employed with certain adaptations. The REEQ, developed by psychologist James C. Reeve, is a tool designed to assess students' engagement in classroom settings (Reeve & Tseng, 2011). The REEQ exists in different versions, including the standard 21 item version, the brief 9 item version, the internalization research version, and the interpersonal relatedness survey. These versions vary in the number of items and subscales, making them suitable for diverse research needs (Reeve, 2013).

In this study, the standard 21 item version was chosen. The rationale for this choice lies in its comprehensiveness and reliability. The standard 21 item version covers four major dimensions of engagement: behavioral, emotional, cognitive, and agentic. It has been extensively validated to provide accurate and in-depth assessments of students' engagement. Although the brief version or other specialized versions may have advantages in certain activities or research contexts, they generally cover fewer dimensions or are designed for specific situations, which limits their applicability. By using the standard version, this study ensures the scientific rigor and comparability of the results and supports a more comprehensive understanding of students' engagement.

In addition, although the original literature does not specify the completion time for the engagement questionnaire, Núñez and León (2021), when applying the Engagement Questionnaire developed by Reeve and Tseng (2011) to a university student sample, reported that completing 12 items took approximately 5 minutes. Based on this estimation, the 21-item version used in this study is expected to be completed within 10 minutes. To ensure that participants have sufficient time to respond and to reduce answering pressure, 10 minutes were allocated for the task, with the option to extend the time if needed. This arrangement was made to enhance both the validity and completeness of the questionnaire data. The reliability result of the REEQ used in this study is presented in Table 1.

Table 1. Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.851	.852	21

9.4. Research Procedure

The procedure of this study consisted of 5main stages. First, informed consent was obtained from all participants, and a short orientation session was conducted to familiarize them with the IVR or DVR system and its basic functions. In the pre-test stage, students completed an engagement questionnaire to establish their initial level of engagement in hotel English learning. During the intervention stage, participants received hotel English instruction through IVR or DVR over a period of four weeks. The instructional content included simulated hotel service scenarios such as reception, check-in, and cross-cultural communication tasks, designed to create authentic and interactive learning experiences. After the intervention, students completed the same engagement questionnaire as a post-test, allowing for comparison of engagement levels before and after the IVR and DVR based instruction.

9.5.Data Analysis

Data analysis was conducted for the quantitative phase of the study. Data collected from the pre-test and post-test engagement questionnaires were analyzed using SPSS. Descriptive statistics were calculated to summarize students' engagement levels. To examine the effects of instructional mode on student engagement, paired-sample t-tests were used to compare pre-test and post-test scores within each group, while independent-sample t-tests were conducted to compare engagement differences between the IVR group and the DVR group. In addition, the internal consistency of the engagement questionnaire was assessed using Cronbach's alpha to ensure measurement reliability.

10. THE FINDINGS

Table 2 present the descriptive statistics for the pre-test and post-test results across the two VR modes (IVR and DVR). The tables summarize students' responses to REEQ measuring their sense of engagement in the Hotel English learning environment. For each item, the mean and standard deviation are reported for both the pre-test and post-test phases.

Table 2. Descriptive Statistics for Engagement in IVR and DVR Conditions

Condition	Gender	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD
IVR	Male	80.65	6.855	98	12.965
	Female	82.63	6.212	107.86	13.094
DVR	Male	78.73	6.934	87.23	7.233
	Female	80.68	6.855	102.93	13.91

Table 2 presents descriptive statistics of student engagement under immersive (IVR) and desktop (DVR) VR conditions, separated by gender. Pre-test scores indicated comparable baseline engagement across all groups, ranging from 78.73 to 82.63. Following the intervention, engagement increased in all conditions. In the IVR group, males' engagement rose from 80.65 to 98.00, while females' engagement increased from 82.63 to 107.86. In the DVR group, males' engagement increased from 78.73 to 87.23, and females' engagement from 80.68 to 102.93. These results indicate that both VR modes enhanced engagement in hotel English learning, with IVR producing greater gains overall. Furthermore, females exhibited larger increases than males, particularly under IVR, suggesting a potential moderating effect of gender on the impact of VR type. Although IVR demonstrated the strongest effect, DVR also contributed to engagement, indicating it remains a viable alternative for VR-based language learning.

11. CONCLUSION

This study examined the effects of IVR and DVR on Chinese university students' engagement in hotel English learning. A quasi-experimental pre-test and post-test design was employed to evaluate changes in engagement under the two instructional conditions.

Results showed that both IVR and DVR increased engagement, with IVR producing larger gains. Female students demonstrated greater improvements than male students, particularly in the IVR condition, suggesting a potential moderating effect of gender.

These findings indicate that higher immersion and interactivity can more effectively enhance engagement in ESP courses, while DVR remains a viable alternative for institutions with limited technological resources.

The study is limited by a small, single-site sample and its focus on engagement rather than long-term learning outcomes or transfer of skills to real-world contexts. Future research should include larger and more diverse samples, employ longitudinal designs, and explore multiple learning outcomes to further validate the benefits of VR-based language learning.

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