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The Use of High-Immersion Virtual Reality to Alleviate Speaking Anxiety: A Case Study of Third Year Bachelor Degree EFL Students at the University of Abbess Laghrour Khenchela

Dissertation submitted to the Department of English in Partial Fulfilment of the Requirements for the Degree of Master in Language and Culture

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Dedication

Every journey worth taking is never walked alone.

Behind every achievement, there are souls whose love, strength, and quiet sacrifices light the way.

I dedicate this work first to myself

for daring to dream, for enduring the storms, and for believing in the unseen.

To my beloved parents:

Thank you for your endless love, sacrifices, and prayers. Your unwavering belief in me, even in the most difficult moments, has been the foundation of every success I have achieved. You taught me resilience, patience, and the value of hard work, and for that, I am forever grateful.

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Your constant encouragement, kindness, and quiet presence have meant more to me than words can say. You have always been there in your own special way, and I carry your support in everything I do.

To my little angel, Nourcine:

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And to Achouak Rabehi, more than a friend, more than a partner.

This thesis is the story of two dreams woven together, two journeys walked side by side.

Your strength, your faith, and your endless support are written into every page we created together.

This achievement is ours — as are the memories, the battles, and the victories that led us here.

This accomplishment is not mine alone; it belongs to each of you, with all my love.

Meroua Saighi

Dedication

With the deepest gratitude and boundless love, I dedicate this work to those who have been my unwavering pillars of strength, my guiding lights, and my greatest sources of inspiration.

To my irreplaceable parents, whose endless sacrifices, unconditional love, and unwavering faith in me have shaped the person I am today. Your support has been my anchor, your prayers my shield, and your encouragement my driving force.

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Abstract

This study investigates the effectiveness of High-Immersion Virtual Reality (HiVR) in alleviating speaking anxiety among EFL students, while also exploring their perceptions and attitudes toward the integration of this technology in the learning process. A mixed-method research design was adopted, combining an experimental approach and semi-structured interview with third-year EFL students at the University of Abbes Laghrour, Khenchela, Algeria. The sample consisted of 30 participants, equally divided into a control group and an experimental group. To assess changes in anxiety levels before and after the intervention, the Public Speaking Class Anxiety Scale (PSCAS) was administered. Statistical analysis using a paired-sample T-test revealed that HiVR significantly reduced speaking anxiety among students in the experimental group. Furthermore, qualitative data from the interviews indicated that students viewed HiVR as an engaging, motivating, and less intimidating environment for practicing speaking skills, contributing to increased confidence and reduced fear of negative evaluation. These findings may provide valuable insights for educators and practitioners in the EFL field seeking innovative solutions to address speaking anxiety in the language classroom.

Keywords: Speaking Anxiety, High-Immersion Virtual Reality (HiVR), EFL classes, Public Speaking Class Anxiety Scale, Virtual Reality, Speaking Skill.

List of Abbreviations and Acronyms

AI	Artificial Intelligence
AR	Augmented Reality
CALICO	Computer Assisted Language Instruction Consortium
CALL	Computer-Assisted Language Learning
CAVE	Cave Automatic Virtual Environment
CBT	Computer-Based Training
EEJ	English Education Journal
EFL	English as a Foreign Language
EFLSA	English as a Foreign Language Speaking Anxiety
ESL	English as a Second Language
EUROCALL	European Association for Computer-Assisted Language Learning
FLA	Foreign Language Anxiety
FLE	Français Langue Étrangère (French as a Foreign Language)
FLSA	Foreign Language Speaking Anxiety
HiVR	High-Immersion Virtual Reality
HMD	Head-Mounted Display
HTC	High Tech Computer Corporation (used in VR: HTC Vive)
ICBT	International Conference on Business and Technology
ICETA	International Conference on Emerging eLearning Technologies and Applications

L2	Second Language
MR	Mixed Reality
NASA	National Aeronautics and Space Administration
PC	Personal Computer
PLS-SEM	Partial Least Squares Structural Equation Modeling
PSCAS	Public Speaking Class Anxiety Scale
PTSD	Post-Traumatic Stress Disorder
SCMC	Synchronous Computer-Mediated Communication
STEM	Science, Technology, Engineering, and Mathematics
TOEFL	Test of English as a Foreign Language
VPL	Virtual Programming Language
VR	Virtual Reality
VRT	Virtual Reality Therapy

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General Introduction

1. Background of the Study

Speaking anxiety has long been acknowledged as one of the most significant psychological barriers to effective oral communication in foreign language learning contexts. It has been widely discussed in applied linguistics and second language acquisition research by scholars such as Horwitz et al. (1986), MacIntyre & Gardner (1994), and Dewaele & MacIntyre (2014), who argue that it negatively affects students' confidence, participation, and overall oral performance. Among the most affected learners are university-level EFL students, who often experience a high level of anxiety when engaging in classroom speaking tasks, particularly in formal or evaluative settings.

Recent developments in educational technology have introduced new tools to address these challenges, among which High-Immersion Virtual Reality (HiVR) stands out as a promising approach. HiVR provides learners with realistic and interactive environments that simulate real-world speaking situations without the fear of being judged. As pointed out by researchers such as Peixoto et al. (2021) and Kaplan-Rakowski & Gruber (2021), immersive virtual environments can offer learners a safer space for practice, increase their willingness to communicate, and reduce the intensity of anxiety symptoms associated with public speaking.

Although various studies have investigated the impact of traditional and digital methods on reducing speaking anxiety, not many have focused specifically on the use of HiVR in university EFL settings. As such, this study aims to examine the potential of High-Immersion Virtual Reality to reduce speaking anxiety among third-year EFL students at the University of Abbess Laghrour Khenchela. It also seeks to explore the students' perceptions of VR as a tool for speaking practice and language learning.

This research was conducted with a group of Third Year Bachelor degree students from the English department at Abbess Laghrour University, Khenchela, Algeria. The investigation focused on comparing learners' speaking experiences before and after engaging in HiVR-based speaking tasks, with the aim of measuring changes in anxiety levels, speaking confidence, and oral fluency.

2. Statement of the Problem

It was a traditional assumption in EFL pedagogy that speaking anxiety is an inevitable part of learning a foreign language, and that it can only be reduced through gradual exposure to real-life speaking tasks in the classroom. However, the current educational and technological landscape shows a growing interest in alternative solutions, particularly those involving immersive digital tools such as High-Immersion Virtual Reality (HiVR). Despite this emerging potential, very few studies have statistically examined the actual impact of HiVR on reducing foreign language speaking anxiety, especially within university-level EFL contexts. To the best of our knowledge and based on the literature we have reviewed, studies that investigated HiVR as a tool to alleviate speaking anxiety remains limited, particularly in the Arab world and Algerian academic context. This gap between technological advancement and local pedagogical practice has created a mismatch in how anxiety is addressed in EFL classrooms, where traditional speaking activities continue to dominate without fully exploring the anxiety-reducing potential of immersive virtual environments.

3. Research Objectives

In order to fulfill the aim of this study and after setting the research questions, our research objectives are the following:

1. To investigate whether the use of High-Immersion Virtual Reality (HiVR) significantly reduces speaking anxiety among third-year EFL students.
2. To examine the difference in students' fluency and willingness to speak before and after using High-Immersion Virtual Reality (HiVR).
3. To explore students' perceptions and attitudes toward the use of High-Immersion Virtual Reality (HiVR) as a tool for practicing oral communication in EFL classrooms.

4. Research Questions

Based on the statement of the problem above and to better understand this phenomenon, we touched upon the following questions:

1. Does the use of High-Immersion Virtual Reality (HiVR) significantly reduce speaking anxiety among third-year EFL students?
2. Is there any significant difference in students' fluency and willingness to speak before and after using High-Immersion Virtual Reality (HiVR)?
3. What are the students' perceptions and attitudes toward using High-Immersion Virtual Reality (HiVR) as a tool for practicing oral communication in EFL classrooms?

5. Research Hypothesis

- **H0 (Null Hypothesis):** The use of High-Immersion Virtual Reality has no significant effect on reducing speaking anxiety among third-year EFL students.
- **H1 (Alternative Hypothesis):** The use of High-Immersion Virtual Reality significantly reduces speaking anxiety among third-year EFL students.

6. Research Method and Sample

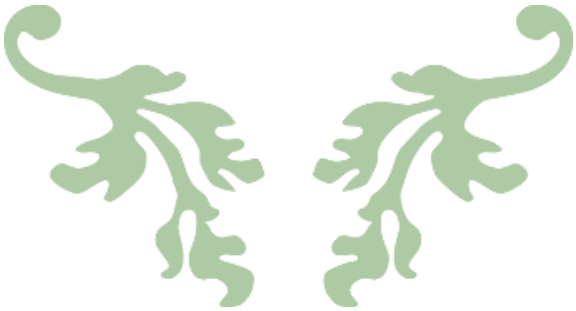
Given the research orientation and objectives, the study was conducted through a mixture of quantitative and qualitative methods. We employed a quasi-experimental design, in the form of an experiment that was conducted with a sample of 30 participants divided into two groups (15 students in each of the experimental and control group) from the English Department at Abbes Laghrour University in Khenchela, Algeria. The participants were later on interviewed to gain better understanding of their experiences and attitudes towards HiVR use and their speaking anxiety.

7. Structure of the study

This research is structured into two main parts. The theoretical part is presented in the first chapter which is divided into two sections: theoretical background and literature review. The field study part is presented in the second chapter which contains the research method, the results, and the discussion

Chapter One:

Theoretical Background and Literature Review



Part One: Speaking Anxiety in EFL Contexts

Speaking Anxiety: An Overview

According to Horwitz et al. (1986), speaking anxiety represents a complex psychological phenomenon that significantly impacts language learning and communication. This condition encompasses communication apprehension, fear of negative evaluation, and test anxiety elements that collectively undermine learners' confidence and willingness to communicate. This anxiety operates cyclically, as MacIntyre and Gardner (1994) explain, with negative experiences reinforcing avoidance behaviors and leading to diminished performance over time.

The learning environment plays a crucial role in anxiety levels, with Young (1991) emphasizing how classroom dynamics, instructor interactions, and task complexity can either intensify or reduce anxiety. Instructors' approach to structure and support significantly affects students' speaking confidence. Scovel (1978) makes an important distinction between facilitative anxiety (which can motivate at moderate levels) and debilitative anxiety (which impairs cognitive processing and speech production in high-pressure situations).

Recent research by MacIntyre and Gregersen (2012) documents the physiological manifestations of speaking anxiety, including elevated stress hormones and autonomic nervous system activation that can trigger fight-or-flight responses, further compromising communication abilities. To address these challenges, Dewaele and MacIntyre (2014) recommend creating psychologically safe learning environments, implementing gradual exposure techniques, and developing learners' metacognitive awareness and emotional regulation skills.

Speaking anxiety thus emerges as a multifaceted construct with profound implications for language education, requiring comprehensive understanding to effectively foster communicative competence and reduce barriers to language acquisition.

1.1 Conceptualizing Speaking Anxiety in Foreign Language Learning

1.1.1 General Definitions of Anxiety

Anxiety is described by Barlow (2000) as a complex emotional state that arises in anticipation of potential challenges or negative events. It is characterized by heightened alertness and emotional preparedness for perceived threats. Craske et al. (2009) distinguish anxiety from fear, noting that while both share some emotional overlap, their triggers and timing differ; fear is an immediate reaction to present dangers, whereas anxiety involves sustained vigilance and anticipation of future risks.

In the context of speaking, anxiety is particularly evident, manifesting through both psychological and physiological symptoms. Spielberger (1971) observes that individuals often experience intense feelings of tension, nervousness, and worry when faced with oral communication tasks. This anxiety becomes more pronounced when individuals feel unprepared for speaking events, leading not only to mental discomfort but also to measurable physical reactions such as elevated heart rate and increased blood pressure (Barlow, 2000).

The intensity of these symptoms can vary based on factors such as the speaking environment, individual personality traits, and past experiences (Spielberger, 1971). This dual nature—anticipatory stress combined with the specific pressures of verbal communication—makes speaking anxiety a uniquely complex phenomenon that significantly impacts performance and well-being in communicative settings.

1.1.2 Definition of Foreign Language Speaking Anxiety (FLSA)

Foreign Language Speaking Anxiety (FLSA) is widely recognized as a multidimensional construct that significantly affects second language acquisition, particularly in oral communication. Horwitz et al. (1986) conceptualize it as a unique form of language-specific anxiety, incorporating communication apprehension, test anxiety, and fear of negative evaluation elements that collectively disrupt learners' linguistic performance. Expanding on this foundation, Spielberger (1983) emphasizes the emotional and neurobiological dimensions of anxiety, noting how physiological responses such as autonomic nervous system activation can erode a learner's self-assurance during speaking tasks. Similarly, MacIntyre and Gardner (1991) highlight the cognitive dimension, suggesting that learners' self-evaluative processes distort their perception of linguistic ability and amplify anxiety in social settings. In contrast, Woodrow (2006) offers a more adaptive perspective, framing speaking anxiety as a defensive mechanism that shields individuals from communicative threats, even if it paradoxically impedes language development. Meanwhile, Scovel (1978) introduces a valuable distinction between facilitative and debilitative anxiety, asserting that while mild anxiety may enhance performance, excessive anxiety can severely hinder cognitive processing and fluency. Taken together, these perspectives portray FLSA as a complex interplay of emotional, cognitive, neurophysiological, and socio-cultural elements. A comprehensive understanding of these layers is essential for developing targeted pedagogical strategies to reduce communicative apprehension and foster effective oral language learning.

1.1.3 Definition of English as a Foreign Language Speaking Anxiety (EFLSA)

English as a Foreign Language Speaking Anxiety (EFLSA) is a complex psychological phenomenon that specifically emerges in foreign language learning contexts. It is marked by distinctive patterns of cognitive strain, emotional discomfort, and behavioral adjustments that are

uniquely tied to the challenges of oral communication (Horwitz et al., 1986; MacIntyre & Gardner, 1994). Unlike typical communication apprehension, EFLSA arises from the intricate interaction between linguistic demands and the pressure to maintain one's identity in cross-cultural speaking environments (Allwright & Bailey, 1991). In classroom settings, this anxiety significantly influences learners' speaking performance by activating a network of self-perceptions, beliefs, and emotional reactions closely linked to the difficulties of producing language effectively (MacIntyre, 1999).

EFLSA is expressed across three major dimensions: cognitive, emotional, and behavioral. Cognitively, learners often worry persistently about their linguistic abilities, feel heightened self-consciousness during speaking tasks, and experience intense fear of negative evaluation from peers and teachers (Horwitz et al., 1986). Emotionally, students may feel extreme anxiety, inadequacy, and vulnerability during oral activities, even when their proficiency is sufficient (MacIntyre & Gardner, 1994). Behaviorally, this anxiety can trigger avoidance strategies, leading to reduced participation in speaking tasks and the adoption of protective habits that ultimately hinder language development (Melough, 2013).

What makes EFLSA particularly challenging is its context-specific nature—it tends to intensify during specific speaking tasks, undermining learners' true linguistic abilities by fostering negative self-views and performance-limiting behaviors (Horwitz et al., 1986). This is often part of a cyclical process, where negative speaking experiences amplify future anxiety, leading to avoidance and further performance setbacks (MacIntyre, 1999). In educational environments, this anxiety is frequently accompanied by physiological reactions like sweating, trembling, and

increased heart rate, which further contribute to the stress learners feel during speaking activities (Allwright & Bailey, 1991).

1.2 Characteristics, Causes and Factors of EFLSA

Foreign Language Anxiety (FLA) represents a distinct psychological phenomenon within second language acquisition. Horwitz et al. (1986) identify FLA as encompassing three interconnected dimensions: communication apprehension, test anxiety, and fear of negative evaluation. MacIntyre and Gardner (1991) assert that these interrelated factors significantly impede not only learners' emotional well-being but also their language acquisition outcomes. Horwitz and Young (1991) emphasize that communication apprehension manifests as hesitation to engage in target language discourse, while test anxiety emerges during performance evaluations. Aida (1994) notes that fear of negative evaluation reflects concerns about others' judgments during language production. Young (1990) suggests that the unique nature of FLA distinguishes it from other academic anxieties, as it challenges learners' self-perception and communicative identity when expressing themselves in an unfamiliar linguistic system.

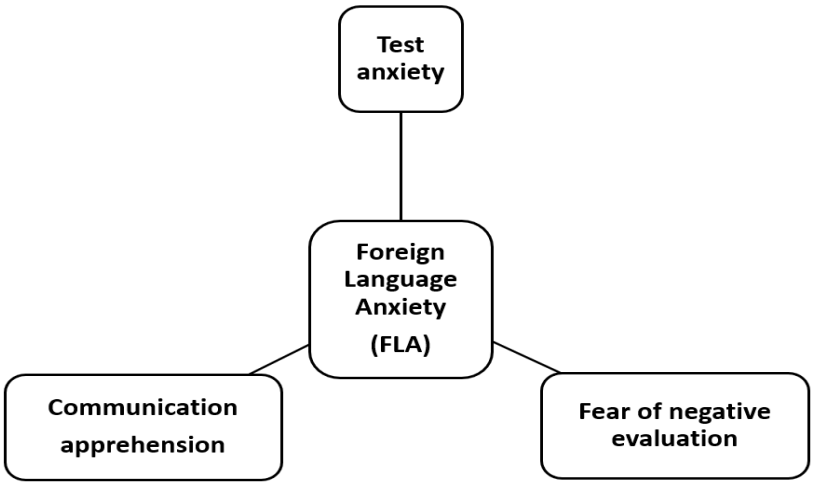


Figure 1: *FLA categories proposed by Horwitz et al. (1986)*

1.2.1 Characteristics of EFL Speaking Anxiety

1.2.1.1 Fear of Negative Evaluation: MacIntyre and Gardner (1991) describe this as the pervasive concern about potential judgmental responses from others during linguistic performances. Learners experience intense psychological distress about potential criticism, leading to decreased communicative participation.

e.g: A PhD student repeatedly rewrites and rehearses her English conference presentation for hours, obsessing over every word choice and pronunciation, because she fears that academic colleagues will judge her non-native accent as a sign of lesser intellectual capability.

1.2.1.2 Communication Apprehension: Defined by Horwitz et al. (1986) as the inherent fear of engaging in oral communication, particularly in unfamiliar or high-stakes scenarios. This characteristic manifests through psychological barriers that inhibit spontaneous linguistic interactions.

e.g: During a team meeting conducted in English, a highly competent manager who is a non-native speaker experiences sudden panic attacks when asked to give an impromptu project update, despite having complete mastery of the project details.

1.2.1.3 Self-Perceived Incompetence: A psychological construct involving learners' internalized doubts about their linguistic capabilities. MacIntyre and Gardner (1991) suggest these perceptions often diverge from actual language proficiency, creating significant psychological barriers.

e.g: A TOEFL-certified English teacher with a perfect score consistently doubts her ability to speak during parent-teacher conferences, believing her English isn't "native enough" despite years of successful teaching experience.

1.2.1.4 Avoidance Behaviors: Young (1991) characterizes this as strategic mechanisms learners employ to minimize exposure to potentially threatening communicative situations. These behaviors represent adaptive psychological responses that ultimately restrict language development opportunities.

e.g: A business professional consistently delegates phone calls with international clients to colleagues, claiming to be "busy" but actually fearing real-time English conversation, ultimately limiting their career advancement opportunities.

1.2.1.5 Physiological Manifestations: Scovel (1978) identifies specific bodily responses including increased heart rate, perspiration, and autonomic nervous system activation. These physiological indicators reflect the profound psychological stress associated with speaking anxiety.

e.g: During an important job interview in their second language, a qualified candidate experiences such severe dry mouth and trembling hands that they need to pause repeatedly to drink water, potentially impacting their performance.

1.2.1.6 Task-Specific Anxiety: Spielmann and Radnofsky (2001) highlight how certain speaking tasks particularly unstructured or improvisational activities can exponentially intensify anxiety levels, demonstrating the context-dependent nature of communicative apprehension.

e.g: A language learner who excels at prepared presentations becomes visibly distressed during spontaneous class debates, experiencing memory blanks and struggling to form coherent arguments despite having advanced language proficiency.

1.2.2 Causes of EFL Speaking Anxiety

According to Mahmuda (2023), English as a Foreign Language (EFL) students face various challenges that contribute to their speaking anxiety. These obstacles can be broadly categorized into two main areas: affective-related causes and linguistic-related causes.

1.2.2.1 Affective-Related Causes

Fear of Being Judged

Mahmuda (2023) states that students experience intense anxiety due to the fear of receiving negative evaluations from both teachers and peers. This persistent worry about making mistakes creates a mental block, preventing students from engaging in natural communication. Many learners prefer to remain silent rather than risk potential embarrassment in front of their classmates.

Self-Confidence Issues

Mahmuda (2023) highlights that students often develop negative self-perceptions, which hinder their active participation in speaking activities. The fear of becoming a target for ridicule significantly affects students' willingness to speak. Past negative experiences reinforce these confidence issues, leading to a recurring cycle of speaking anxiety.

Learning Environment Impact

Mahmuda (2023) argues that competitive classroom dynamics place excessive pressure on students to perform flawlessly in speaking tasks. Students become overly self-conscious about maintaining their social image, further increasing their reluctance to participate. The absence of a

supportive and collaborative learning atmosphere prevents students from engaging in natural language practice.

1.2.2.2 Linguistic-Related Causes

Knowledge Gaps

Mahmuda (2023) asserts that an insufficient command of grammar structures restricts students' ability to express their thoughts clearly. A limited vocabulary prevents students from articulating their ideas precisely. A poor understanding of discussion topics makes meaningful participation challenging. Students struggle to bridge the gap between knowing the language and using it effectively in real-life communication.

Practice Limitations

Mahmuda (2023) points out that an excessive focus on grammar rules reduces students' opportunities to engage in actual speaking practice. Many learners lack sufficient opportunities to develop natural conversation skills. Traditional teaching methods often prioritize memorization over practical language application. Limited exposure to real-world speaking situations negatively impacts students' confidence in oral communication.

Accuracy Pressure

Mahmuda (2023) emphasizes that teachers' strong focus on grammatical accuracy increases students' anxiety during speaking activities. Students feel compelled to mentally review every grammar rule before speaking, which disrupts fluency. The fear of making grammatical mistakes overshadows the primary goal of effective communication. Constant correction of errors discourages students from participating spontaneously in speaking tasks.

1.2.3 Factors of EFL Speaking Anxiety

Speaking anxiety is widely acknowledged as a major psychological obstacle in learning English as a Foreign Language (EFL), significantly impacting learners' oral performance and their willingness to communicate (Sari, 2017). According to Hanifa (2018), this form of anxiety is triggered by a combination of factors, including cognitive difficulties, emotional distress, and external pressures within the classroom environment. Sari (2017) highlights that major contributors to heightened anxiety levels include fear of negative evaluation, self-doubt, and performance-related stress, which often cause learners to withdraw from speaking activities.

Additionally, Hanifa (2018) emphasizes the role of pedagogical practices and classroom settings in either alleviating or intensifying speaking anxiety. Elements such as the teacher's feedback approach, peer interactions, and the structure of speaking tasks can significantly influence students' anxiety levels. Supportive teaching strategies and positive classroom dynamics can help reduce anxiety, while overly critical feedback or high-pressure tasks may exacerbate it.

Sari (2017) concludes that understanding the core factors that influence EFL speaking anxiety is crucial for educators. By recognizing these elements, teachers can implement effective strategies that promote a low-anxiety environment, thereby enhancing learners' confidence and improving their oral proficiency.

1.2.3.1 Mental Processing and Knowledge Foundations

Students' confidence in speaking is largely influenced by their level of cognitive preparedness. According to Sari (2017), learners who are mentally equipped and well-prepared

tend to experience lower levels of anxiety during speaking activities. Furthermore, familiarity with the topic plays a crucial role in reducing performance anxiety; students are generally more confident and articulate when discussing subjects they know well and have chosen themselves.

Hanifa (2018) adds that understanding different speaking contexts and formats is vital for managing anxiety, particularly in high-pressure situations like public speaking and formal presentations, which often trigger higher stress levels. Sari (2017) also emphasizes the cognitive load that arises from managing multiple language aspects—such as grammar, vocabulary, and pronunciation—during oral communication. This mental strain can significantly increase anxiety, especially when learners are required to maintain accuracy and fluency simultaneously.

Moreover, Sari (2017) notes that anxiety tends to heighten in larger audience settings or when students sense a lack of interest from their listeners. This perception of disinterest can undermine confidence and further disrupt speaking performance.

1.2.3.2 Emotional and Psychological Components

Hanifa (2018) argues that students' connection with a given topic directly influences their preparation, motivation and anxiety levels. Sari (2017) identifies that teacher personality and peer attitudes significantly impact student stress levels, particularly during speaking activities. Hanifa (2018) observes that evaluation situations typically intensify students' anxiety, as they fear making mistakes under scrutiny. Hanifa further notes that the fear of peer judgment frequently results in reluctance to speak publicly, further heightening students' discomfort. Sari (2017) indicates that the relationship between students and their conversation partners greatly affects anxiety levels, with supportive interactions building confidence. Sari also suggests that approaches to error

correction can significantly influence student confidence, as excessively critical feedback may discourage participation.

1.2.3.3 Performance and Environmental Elements

Sari (2017) asserts that public speaking scenarios generate more anxiety than private conversations, making performance under observation particularly challenging for students. Hanifa (2018) observes that students experience greater anxiety when speaking individually rather than in group settings, where distributed responsibility reduces pressure. Hanifa also notes that limited control in teacher-dominated activities increases student frustration, as they feel restricted in expressing themselves freely. Sari (2017) maintains that insufficient preparation time directly correlates with heightened anxiety, as students struggle to organize their thoughts under pressure. Hanifa (2018) states that time constraints during speaking tasks increase stress levels, resulting in rushed and less effective communication. Hanifa further suggests that traditional teacher-centered methodologies often diminish student participation, further discouraging learners from engaging in speaking activities.

1.2.3.4 Specific Anxiety Manifestations

Hanifa (2018) describes communication apprehension as a fundamental fear of interaction in English, preventing students from speaking comfortably. Hanifa also explains that test-related anxiety manifests in performance issues, even among well-prepared students, due to formal assessment pressure. Sari (2017) observes that fear of negative evaluation significantly affects classroom participation, causing students to hesitate before speaking. Hanifa (2018) characterizes how students experience unique anxiety specific to English language classrooms, where speaking constitutes a core learning component. Hanifa further notes that public error correction and

feedback can severely impact student self-esteem, discouraging risk-taking in communication. Sari (2017) concludes that the English classroom environment itself can trigger heightened stress compared to other subjects, as students are continuously required to demonstrate speaking abilities.

1.3 The Impact of Speaking Anxiety on EFL Learners' Oral English Performance

Speaking anxiety constitutes a formidable barrier to oral proficiency development among EFL learners, manifesting through intricate psychological, physiological, and behavioral dimensions that significantly impair performance (Liu, 2007). These multifaceted manifestations create a detrimental cycle that profoundly undermines both immediate communicative effectiveness and long-term language acquisition trajectories (Kasap & Power, 2023).

1.3.1 Psychological Impact

Liu (2007) demonstrates how speaking anxiety fundamentally disrupts essential cognitive mechanisms, resulting in profound impediments to effective speech production and comprehensive oral competence. This cognitive interference severely compromises vocabulary retrieval processes, precipitating noticeable hesitations and extended pauses during verbal expression. Concurrently, robust mental barriers emerge that significantly undermine grammatical precision, leaving students struggling to construct syntactically sound utterances. Critical cognitive processing functions become substantially impaired, obstructing the formation of coherent, articulate discourse and detrimentally affecting overall fluency.

Liu further elucidates that speaking anxiety engenders substantial emotional challenges that compound cognitive difficulties. Students frequently exhibit heightened apprehension regarding evaluative judgments from instructors and peers alike, generating elevated stress responses. This anxiety progressively erodes self-confidence, leading to systematic avoidance of

speaking opportunities and exacerbating communication reluctance. Additionally, learners experience profound discomfort and frustration during attempts at linguistic self-expression, further reinforcing their anxiety response patterns.

Kasap and Power (2023) offer a nuanced perspective, acknowledging that a small subset of learners may experience anxiety as a performance-enhancing catalyst. Nevertheless, they emphasize that the predominant empirical evidence indicates anxiety functions primarily as a debilitating force that significantly impedes learning trajectories. Persistent anxiety substantially diminishes learners' willingness to engage in speaking activities, severely restricting opportunities for authentic oral practice and curtailing language development.

1.3.2 Physical Manifestations of Speaking Anxiety

Liu (2007) establishes that extensive research has documented how anxiety triggers distinctive physiological responses that significantly impair speaking capabilities. Common manifestations include cardiovascular acceleration and respiratory irregularities, resulting in pronounced breathlessness that disrupts speech production. Additionally, fine motor control becomes notably compromised, evidenced by visible tremors and excessive perspiration, further intensifying students' discomfort. Vocal stability deteriorates markedly, substantially compromising pronunciation clarity and overall articulatory precision.

Kasap and Power (2023) identify postural alterations as another critical indicator of speaking anxiety. Students consistently demonstrate avoidance of direct visual engagement with instructors and peers, significantly undermining their confidence during verbal interactions. Physical tension manifests through various observable indicators, including rigid postural configurations or excessive, uncoordinated movements that clearly signal psychological distress and communicative unease.

1.3.3 Behavioral Modifications and Classroom Performance

Liu (2007) articulates how speaking anxiety induces distinctive alterations in classroom conduct, predominantly characterized by diminished participation and reduced academic engagement. Among the most prevalent avoidance behaviors is students' pronounced reluctance to initiate voluntary participation in verbal exchanges. Many learners systematically circumvent oral presentations and interactive communicative activities, demonstrating a marked preference for written expression over verbal communication as an anxiety-minimization strategy.

Kasap and Power (2023) further delineate how speech paralysis and hesitation phenomena constitute common behavioral responses to speaking anxiety. During acute anxiety states, students frequently experience complete verbal immobilization, rendering them temporarily incapable of articulating coherent responses. Furthermore, their communication becomes characterized by excessive verbal fillers and protracted pauses, significantly compromising discourse fluency.

Liu (2007) additionally observes that students often develop distinctive nervous coping mechanisms in response to anxiety. Some exhibit inappropriate laughter or engage in repetitive physical behaviors, such as persistent fidgeting, as distress management strategies. Others adopt accelerated speech patterns as an avoidance mechanism, frequently resulting in compromised pronunciation accuracy and substantially reduced comprehensibility.

1.3.4 Long-Term Consequences on Language Learning Speaking Anxiety

Liu (2007) demonstrates that the implications of speaking anxiety extend significantly beyond immediate performance challenges, profoundly impacting long-term language acquisition trajectories. A principal consequence involves substantial reduction in speaking practice opportunities. Students experiencing persistent anxiety systematically avoid participation in communicative activities, severely limiting their exposure to authentic interaction. This practice

deficit directly undermines fluency development, creating substantial barriers to oral proficiency improvement over time.

Kasap and Power (2023) further illuminate how speaking anxiety perpetuates a detrimental learning cycle with cumulative effects. High-anxiety learners consistently avoid speaking opportunities, progressively reinforcing pre-existing insecurities and creating increasingly formidable barriers to confidence development in verbal expression. This avoidance pattern ultimately leads to pronounced stagnation in oral proficiency development, preventing learners from advancing to sophisticated levels of language production.

Liu (2007) additionally emphasizes that speaking anxiety affects learners across diverse proficiency levels, though with varying manifestations. Beginners typically struggle with fundamental aspects like pronunciation and basic syntactic construction, while even advanced students experience anxiety when navigating complex linguistic structures. Despite their elevated competence, these advanced learners frequently hesitate during communication due to persistent apprehension regarding potential errors, ultimately impeding their progression toward comprehensive communicative proficiency.

1.4 Innovative Pedagogical Paradigms for Reducing Speaking Anxiety in EFL Contexts: From Theory to Practice

1.4.1 Affective Filter Theory and Its Modern Applications

Krashen's (1982) Affective Filter Hypothesis suggests that when learners are anxious, they develop a psychological barrier that prevents input from being processed effectively. This filter can be lowered by creating emotionally supportive classroom environments. Modern classroom

strategies grounded in this theory include storytelling, humor, student-centered activities, and warm teacher-student rapport (Horwitz, 2001; Oxford, 2016).

To support learners in high-stakes speaking situations, teachers often implement low-anxiety practices such as games, friendly competition, and simple oral tasks that gradually increase in complexity. Moreover, digital tools like Kahoot and Duolingo have brought gamification into the classroom, encouraging participation and reducing pressure (Oxford, 2016). These techniques, aligned with affective filter theory, help students engage more fully in oral language use without the debilitating effects of anxiety.

1.4.2 Social Interaction as Therapy: Task-Based and Collaborative Approaches

Vygotsky's (1978) Sociocultural Theory emphasizes that social interaction is key to language development, particularly through the Zone of Proximal Development (ZPD). In EFL settings, this theoretical foundation is realized through collaborative speaking tasks such as peer discussions, debates, interviews, and role plays, which allow students to practice speaking in a low-pressure and supportive social setting.

Task-Based Language Teaching (TBLT) serves as a practical extension of this theory. It focuses on meaningful communication over form, encouraging fluency and reducing self-consciousness during speech production (Willis, 1996). These tasks promote spontaneous speaking, enabling learners to overcome anxiety through repetition, peer modeling, and gradual exposure to public speaking (Swain, 2000).

1.4.3 Cognitive-Behavioral and Mindfulness-Based Pedagogy

Another innovative paradigm for reducing speaking anxiety derives from the application of cognitive-behavioral principles in language education. Gregersen and MacIntyre (2014)

highlight that anxious learners often engage in negative self-talk, which can be counteracted through positive cognitive reframing. By helping students become aware of irrational beliefs about speaking failure, educators can empower them to adopt more productive mindsets.

In parallel, mindfulness techniques such as deep breathing, guided visualization, and present-moment awareness have proven effective in managing performance anxiety (Oxford, 2016). Many teachers now incorporate short mindfulness sessions before oral tasks to lower student stress. Technology also supports these efforts; meditation and mindfulness apps like Calm and Headspace are increasingly used in language classrooms as pre-speaking warm-up tools.

1.4.4 Pedagogical Principles for Designing Low-Anxiety Speaking Activities

Dörnyei (2005) emphasizes that learners' motivation and anxiety levels are deeply influenced by how speaking activities are designed. Tasks that begin with low-stakes, familiar topics, or incorporate student choice are more likely to succeed in reducing speaking fear. Additionally, scaffolding and formative feedback help students develop without feeling overwhelmed.

Teachers are encouraged to integrate student-led discussions, interest-based presentations, and peer support systems into their curriculum. Feedback should focus on fluency, effort, and improvement rather than perfection (Young, 1991). This approach nurtures a growth mindset and encourages learners to view speaking as a skill they can develop rather than a performance they must perfect.

1.4.5 Digital Empowerment and Learner Agency

Reinders and White (2016) argue that technological tools empower learners by allowing them to control the pace, timing, and setting of their speaking practice. Such autonomy plays a

critical role in reducing speaking anxiety, as students can rehearse, receive feedback, and improve without the pressure of immediate judgment.

Modern tools include AI-based speaking coaches like ELSA Speak, asynchronous platforms like Vocaroo for recording voice messages, and VR environments that simulate real-life speaking contexts (Makransky & Mayer, 2022). These technologies allow for repeated, low-pressure practice, enabling learners to build confidence over time while receiving targeted feedback on their performance.

Part Two: High-Immersion Virtual Reality and English as a Foreign Language Speaking Anxiety

Virtual Reality: An Overview

As Virtual Reality (VR) continues to revolutionize various fields, including education, its potential in English as a Foreign Language (EFL) classrooms is gaining significant attention. By offering an immersive and interactive platform, VR has the capacity to transform traditional approaches to language learning, making the process more dynamic, engaging, and effective.

This section explores the multifaceted role of VR in EFL education, including its definition, core functionalities, and broader implications for teaching and learning. VR provides learners with experiential opportunities to practice language skills in authentic, real-world-like scenarios, which not only enhances linguistic competence and cultural awareness but also significantly reduces speaking anxiety. By creating a safe and controlled environment, VR allows students to practice speaking without fear of judgment, thus boosting their confidence and fluency.

Furthermore, this discussion will highlight various VR tools and their applications in fostering motivation, improving communication skills, and addressing common barriers to language acquisition. Understanding the capabilities of VR empowers educators to integrate this technology effectively, bridging linguistic and cultural gaps while creating a more inclusive and supportive learning experience.

2.1 Definition of Virtual Reality

Since Jaron Lanier introduced the term "Virtual Reality" (VR) in 1989, its definition has continuously evolved, often appearing complex in earlier descriptions (Kaplan-Rakowski &

Gruber, 2019). Coates (1992) defined VR as electronic simulations of environments that users experience through head-mounted goggles and wired clothing, enabling interaction within realistic three-dimensional settings. Similarly, Greenbaum (1992) emphasized the use of goggles and data gloves in his definition:

> "Virtual Reality is an alternate world filled with computer-generated images that respond to human movements. These simulated environments are usually visited with the aid of an expensive data suite which features stereophonic video goggles and fibre-optic data gloves" (p.58)

And gaining a clear understanding of the broad concept of Virtual Reality (VR) is essential for effectively integrating it into EFL classrooms. Recent studies and literature offer various definitions of VR, providing a foundation for exploring this technology in depth and developing a comprehensive understanding of its potential.

Virtual Reality (VR) is a computer-generated simulation of a three-dimensional environment that allows users to interact in a way that feels realistic and physical, typically through specialized electronic equipment like a headset with an integrated screen or sensor-equipped gloves (Burdea & Coiffet, 2003). Virtual Reality is characterized by the "3 I's": Immersion, Interaction, and Imagination.

Virtual Reality (VR) is defined as a computer-based technology that generates a synthetic reality using three-dimensional graphics (Serrano et al., 2013). Similarly, VR can be described as a technical system that enables one or more users to experience a simulated environment (Girvan, 2018).

Per contra, VR is seen as a therapeutic and training tool. According to Rizzo et al. (2014), it serves as a platform for exposure therapy, pain management, rehabilitation, and surgical training, offering controlled environments for both practitioners and patients.

From an Educational Perspective, educators view VR as an experiential learning platform that enables students to interact with abstract concepts in tangible ways. Merchant et al. (2014) suggests that VR can significantly enhance learning outcomes through immersive experiences.

2.2 The Technological Evolution of Virtual Reality: A Historical Perspective

Summarized by Barnard (2024) as Follow:

Virtual Reality (VR), though widely regarded as a modern technological breakthrough, has its conceptual roots in the early 19th century. One of the earliest foundations of immersive visual experiences was established by Sir Charles Wheatstone in 1838, when he introduced the principle of stereopsis, the brain's ability to merge two slightly different images into a single three-dimensional perception. His invention of the stereoscope, using angled mirrors to reflect side-by-side images to each eye, laid the groundwork for modern immersive visuals.

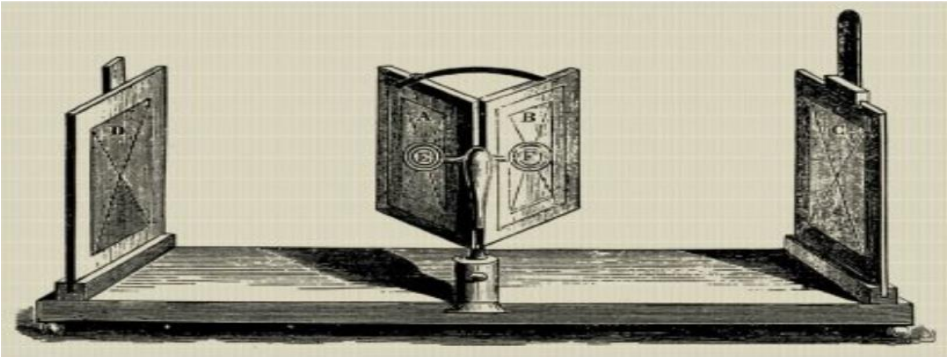


Figure 2: *The Wheatstone Mirror Stereoscope (Barnard, 2024).*

Although the term "virtual reality" emerged in the late 20th century, the idea of immersive environments appeared much earlier in literature. In 1935, Stanley Weinbaum's short story *Pygmalion's Spectacles* depicted goggles that provided multi-sensory cinematic experiences, including sight, sound, taste, and touch. This visionary portrayal is often cited as the earliest conceptualization of virtual immersion, anticipating many of the ambitions and mechanics of contemporary VR.

PYGMALION'S SPECTACLES

By STANLEY G. WEINBAUM

Author of "The Black Flame," "A Martian Odyssey," etc.

Figure 3: *Pygmalion's Spectacles Short Story (Barnard, 2024).*

Significant progress resumed in the 1950s with Morton Heilig, who in 1956 developed the Sensorama—a multimedia booth capable of simulating a multi-sensory environment through synchronized film, sound, scent, vibration, and wind effects. Heilig's Telesphere Mask (1960) was also one of the first head-mounted displays (HMDs), offering stereoscopic 3D visuals and sound, albeit without motion tracking.

Figure 4: *The Sensorama VR Machine (Barnard, 2024).*

The 1960s and 70s witnessed critical developments in both the military and academic spheres. In 1961, engineers Comeau and Bryan invented Headsight, the first motion-tracked head-mounted display HMD, designed for remote observation in hazardous environments. A few years later, Ivan Sutherland's influential "Ultimate Display" (1965) proposed the concept of a fully interactive, computer-generated environment indistinguishable from reality—a foundational philosophy for VR. He and Bob Sproull later realized this vision with the Sword of Damocles (1968), the first computer-driven HMD capable of tracking head movement and displaying basic wireframe graphics. Though rudimentary and heavy, this prototype marked the dawn of modern VR.

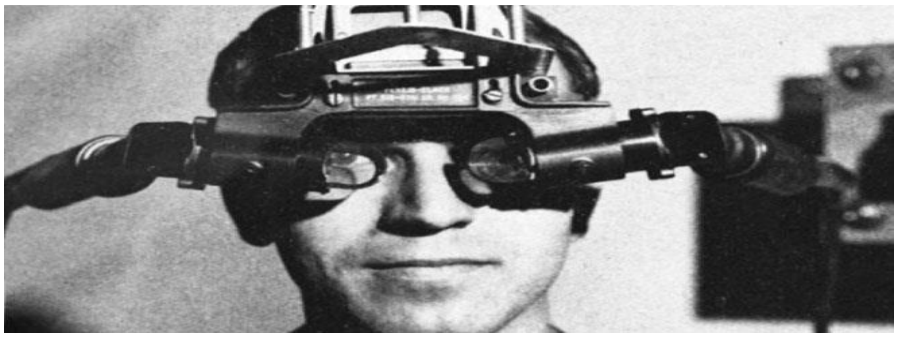


Figure 5: *The Sword of Damocles (Barnard, 2024).*

Parallel to these advances, Myron Krueger explored "artificial reality" with his development of VIDEOPLACE (1975), a system using cameras and projectors to create interactive silhouettes that responded to user movement. Unlike HMD-based VR, VIDEOPLACE used full-room projection, pioneering the concept of bodily interaction in shared virtual spaces.

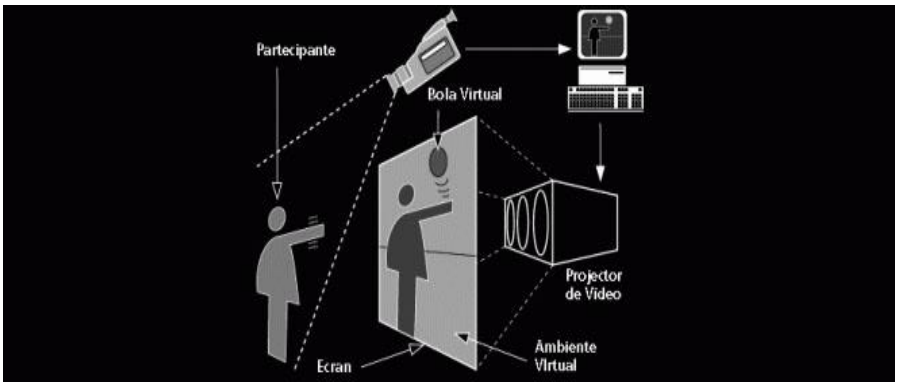


Figure 6: *VIDEOPLACE (Barnard, 2024).*

In the late 1970s and early 1980s, VR's application in training and simulation gained traction. Notably, Thomas Furness developed the Super Cockpit for the U.S. Air Force—an immersive simulator that integrated 3D maps, radar imaging, and gesture or voice controls to train pilots in real-time scenarios. Around the same time, MIT's Aspen Movie Map (1977) allowed users to navigate a virtual tour of Aspen, Colorado, using first-person images—an early forerunner of modern platforms like Google Street View. However, McDonnell-Douglas Corporation incorporated VR technology into its VITAL helmet, an HMD designed for military applications. The helmet featured a head tracker that monitored the pilot's eye movements to synchronize with computer-generated visuals.

Figure 7: *The VITAL Helmet (Barnard, 2024).*

Commercial interest intensified in the 1980s. Jaron Lanier and Thomas Zimmerman established VPL Research (1985), the first company to sell VR equipment including the DataGlove and EyePhone HMD. Lanier later popularized the term "virtual reality," helping move the technology into the public imagination. In the following years, VR began to merge with consumer technology, notably with Mattel's Power Glove (1989) and early software for building 3D environments.

Figure 8: *VPL Research (Barnard, 2024).*

In the 1990s, VR became more prominent in entertainment. NASA experimented with Virtual Environment Workstation Projects and Computer Simulated Teleoperation for space exploration, while Virtuality Group released arcade machines enabling multiplayer gaming in immersive 3D environments. SEGA and Nintendo attempted to commercialize VR headsets, though these efforts often fell short due to technical limitations and poor user experience. Notably, Nintendo's Virtual Boy (1995), although pioneering in offering 3D visuals, was commercially unsuccessful due to lack of color, software, and comfort.

Figure 9: *NASA Project (Barnard, 2024).*

Figure 10: *SEGA VR Headsets (Barnard, 2024).*

Despite early setbacks, VR began to diversify into healthcare and therapy. In 1997, researchers from Georgia Tech and Emory University introduced Virtual Vietnam, a VR-based PTSD treatment system for veterans, marking one of the first uses of VR for psychological therapy—an important precedent for today's educational and anxiety-related VR applications.

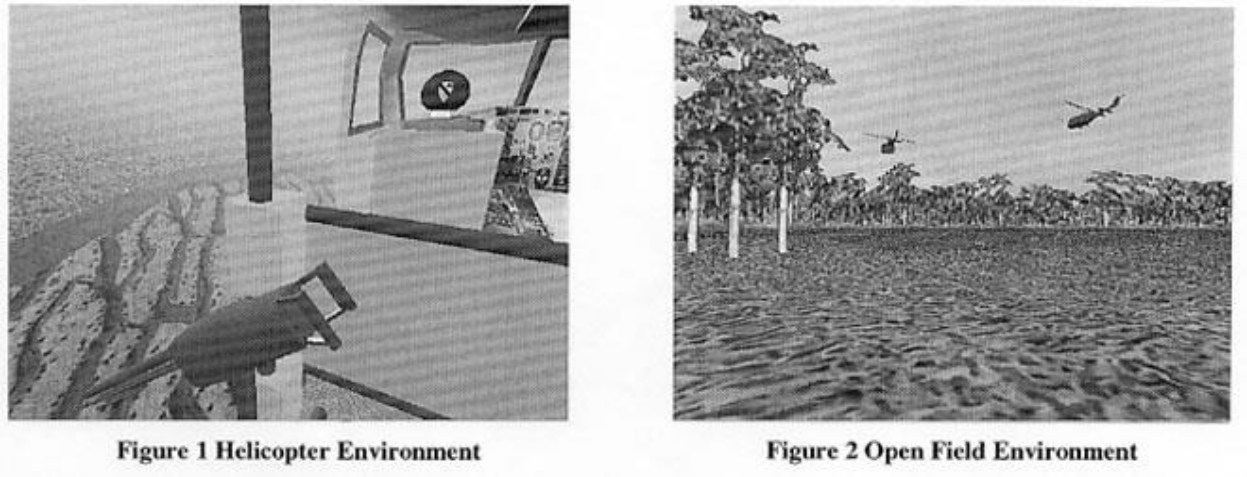


Figure 1 Helicopter Environment

Figure 2 Open Field Environment

Figure 11: *Virtual Vietnam (Barnard, 2024).*

From the mid-2000s onward, technological acceleration revolutionized the VR landscape. Google's Street View (2007) introduced immersive visual navigation to the public. In 2010, Palmer Luckey built the first prototype of the Oculus Rift, boasting a wide field of view and laying the foundation for modern consumer headsets. Following a successful Kickstarter campaign in 2012, the device gained massive popularity, ultimately leading to Facebook's acquisition of Oculus VR in 2014—a turning point that solidified VR's mainstream future.

Figure 12: *Oculus Rift (Barnard, 2024).*

This momentum led to a proliferation of devices, including HTC Vive, Sony PlayStation VR, and Samsung Gear VR, each contributing to immersive entertainment, gaming, and even educational applications. By 2016, most major tech companies had entered the VR race, and haptic feedback, gesture recognition, and spatial tracking had become industry standards.

Figure 13: *HTC VIVE SteamVR Headset (Barnard, 2024).*

Recent developments highlight VR's increasing integration into education and learning environments, particularly through standalone devices such as the Oculus Quest (2019) and Meta Quest 2 (2020). These untethered systems offer affordable, accessible, and highly immersive

experiences suitable for language learning, anxiety therapy, and professional training. The advent of mixed reality (MR) platforms, such as Meta Quest 3 and Apple Vision Pro (2023–2024), further expands the educational potential of immersive technologies, combining virtual and augmented environments to create context-rich simulations.

Figure 14: *Oculus Quest, Meta Quest 2, Meta Quest 3.(Barnard, 2024; JB Hi-Fi, n.d.; Vrent, n.d.).*

As the VR industry enters its next phase with powerful, lightweight, and AI-integrated headsets, its implications for language learning—especially in reducing speaking anxiety—are profound. With continued growth, Virtual Reality is no longer a speculative technology of the future, but a transformative tool for reshaping communicative, cognitive, and emotional engagement in education today.

2.3 The Technical Magic Behind VR

2.3.1 Existing High-Immersion Virtual Reality Devices

Hamilton (2021) categorizes VR headsets into three main types: tethered (such as Oculus Rift and HTC Vive), stand-alone (like Oculus Quest and HTC Vive Focus), and mobile (including Google Cardboard and Samsung Gear). Stand-alone headsets combine features of both mobile and

tethered devices by integrating a built-in screen, battery, and one or two motion controllers within the headset itself (Carruth, 2017).

Each type of high-immersion VR (HiVR) device offers distinct advantages and disadvantages. Tethered HiVR typically delivers the most immersive experience and comes with specialized controllers for gaming, but these systems are often heavy and impractical to use (Newbutt, Bradley, & Conley, 2019). While mobile HiVR is more affordable, generally offers lower levels of immersion and limited environmental interaction (Newbutt, Bradley, & Conley, 2019). In contrast, stand-alone HiVR devices provide an improved immersive experience compared to mobile VR through their head-mounted displays, while also being more user-friendly and portable than tethered headsets due to their simpler design and lighter weight.

Figure 15: *Example of Pc VR, Standalone and Mobile VR (Simulator Hardware, n.d.).*

2.3.2 How Does VR Create Its Illusion?

The captivating nature of VR stems from the seamless integration of advanced hardware and software. Immersive experiences are achieved through the coordinated use of specialized devices, including head-mounted displays (HMDs), motion-tracking sensors, and haptic controllers.

These systems track the user's movements with incredible precision, enabling them to look around, interact with objects, and move within virtual spaces with the same level of naturalness and fluidity as they would in real life (Sherman & Craig, 2018).

2.3.3 VR Technology Types

VR technology is an interdisciplinary innovation that combines various fields, including computer graphics, human-machine interaction technology, sensing, simulation, and artificial intelligence (Yang et al., 2010). It facilitates human-computer interaction by providing multimodal information through devices that immerse users in a three-dimensional virtual environment, fostering both physical and cognitive engagement while delivering a realistic sensory experience. Based on the level of immersion and the extent to which it replaces physical reality, VR technology is typically categorized into three types: non-immersive, semi-immersive, and fully immersive VR (Carrier, Damerow, & Bailey, 2017) (***Figure 16***).

Non-immersive VR technology, commonly referred to as desktop virtual reality, allows users to interact with a virtual environment using input devices such as a mouse, keyboard, game controller, or touchscreen. While it may not provide the deepest level of immersion, its accessibility and lower cost make it widely available. Common applications include traditional video games and architectural visualization software, where users can explore 3D environments from their desktop computers without requiring specialized equipment. (Cabero Almenara & Fernández Robles, 2018).

Semi-Immersive VR, or Projected VR, takes a step further in the immersion spectrum by utilizing large projected displays or curved screens to create a more encompassing visual

experience. These systems often incorporate 3D glasses to enhance depth perception plus the realism of the virtual environment. Flight and driving simulators serve as outstanding examples of advanced simulation technology. These systems provide pilots-in-training with the opportunity to experience highly realistic cockpit conditions, replicating the challenges and scenarios of actual flight without the inherent risks. Similarly, beginner drivers benefit from these simulators by practicing real-world driving techniques in a controlled, safe, and immersive environment. This technology not only enhances skill development but also reduces the potential for accidents during the training phase, making it an invaluable tool in education and safety. One significant application of Semi-Immersive VR is the CAVE (Cave Automatic Virtual Environment) system, which utilizes projectors to display visuals on three to six walls of a cube-shaped room, allowing for the detection and tracking of users' physical movements within the environment. It is widely used in training and education settings where groups can collectively experience and interact with virtual environments (Di Natale et al., 2020).

Fully Immersive VR represents the most advanced and complete virtual reality experience available today. Users can engage completely with the virtual environment, experiencing it in a highly realistic and lifelike manner through head-mounted displays HMDs (Makransky & Lilleholt, 2018) like the Oculus Quest, HTC Vive, or Valve Index to achieve complete visual immersion in the virtual world by utilizing features an integrated liquid crystal display that delivers 360-degree video images, presenting slightly different perspectives to each eye (Hamilton et al., 2021). These systems utilize advanced motion tracking and haptic feedback technologies, enabling users to engage with the virtual environment through natural movements and gestures. By combining visual isolation from the physical world with precise motion tracking and haptic

feedback, they generate an unparalleled sense of presence and immersion, resulting in more realistic, genuine and authentic interactions within the virtual space (Peixoto et al., 2021).

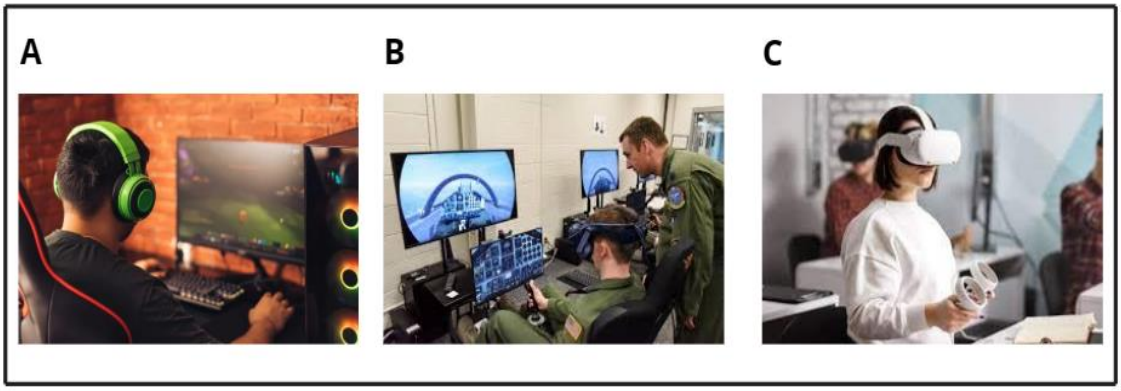


Figure 16: (A) Non-immersive VR, (B) Semi-immersive VR, and (C) Fully Immersive VR. *(PCMag, n.d.; Shutterstock, n.d.; U.S. National Archives, n.d.)*

2.4 Main Affordances of HiVR in Learning

High-Immersive Virtual Reality (HiVR) offers unique capabilities that can enhance foreign language acquisition and help in alleviating Foreign Language Speaking Anxiety. The concept of technological affordance refers to the inherent properties of a technology that facilitate particular practices or applications—in this case, language learning and practice (Bobsin, Petrini, & Pozzebon, 2019). This section examines two primary affordances of HiVR in educational settings: presence and agency.

2.4.1 Presence

In the context of High-Immersive Virtual Reality (HiVR), presence commonly refers to telepresence, which is the sensation of being in a location despite not being physically present (Riva, Davide, & IJsselsteijn, 2003). Slater (2018) defines presence as "the illusion of being there, notwithstanding that you know for sure that you are not" (p. 432). Essentially, presence represents

a psychological state or a subjective experience where users, to some extent, overlook the technological medium while interacting with it (Schuemie et al., 2001). A critical factor influencing presence is how realistically the virtual environment is portrayed and how seamlessly the view transitions within that environment (Dalgarno & Lee, 2010). In HiVR, the head-tracking functionality integrated into head-mounted displays (HMDs) enables users to naturally explore their digital surroundings by moving their heads, much like they would in the physical world (Dhimolea, Kaplan-Rakowski, & Lin, 2022). Presence is regarded as a defining feature that sets VR apart from other digital learning tools, occurring when the brain and nervous system respond to the virtual environment as though it were a genuine real-world situation (Slater, 2003).

The immersive nature of HiVR significantly contributes to establishing a robust sense of presence. From a technological standpoint, immersion is described as "the extent to which the computer displays are capable of delivering an inclusive, extensive, surrounding, and vivid illusion of reality" (Slater & Wilbur, 1997, pp. 604). Unlike presence, which is a subjective experience, immersion is an objective attribute of the VR system itself (Slater & Wilbur, 1997).

HiVR achieves high levels of immersion through advanced hardware such as head-mounted displays (HMDs), enabling users to fully engage with the virtual environment. These displays provide a first-person perspective, offering vivid visuals, realistic sounds, and other sensory feedback that minimize external distractions (Freina & Ott, 2015). Additional technologies, such as spatial audio and haptic feedback, further intensify immersion by enabling multisensory interaction within the virtual space.

The sense of presence created by HiVR can potentially reduce English-speaking anxiety, as the immersive environment allows learners to practice the target language in a supportive

setting. As learners engage more frequently in authentic communication, their anxiety related to speaking a foreign language may decrease (Dewaele, 2008; Mede & Karaırmak, 2017).

Moreover, the design of HiVR environments often includes realistic textures, dynamic lighting, and interactive elements, which contribute to the sense of "being there." These features are particularly effective in educational contexts, where learners can explore, manipulate, and interact with complex scenarios or environments that would be inaccessible or impractical in real life (Dalgarno & Lee, 2010). By integrating both technological and experiential elements, HiVR provides an engaging platform that fosters experiential learning, critical thinking, and skill development.

2.4.2 Agency

Agency is a fundamental learning affordance of High-Immersion Virtual Reality (HiVR), referring to an individual's ability to initiate and control their own actions (Moore & Fletcher, 2012). Within the context of HiVR, agency specifically pertains to the user's capacity to freely navigate and interact within the virtual environment, thereby enhancing their sense of control and active participation (Johnson-Glenberg, 2019).

The experience of agency occurs when the expected sensory outcomes of a user's actions correspond with the actual sensory feedback received. This consistency triggers a neural response in the central nervous system, reinforcing the feeling of control and ownership over one's movements (Farrer et al., 2008).

In educational settings, agency in HiVR allows learners to actively shape their experiences by exploring virtual spaces, manipulating objects, and making decisions that influence outcomes.

This active participation fosters critical thinking, creativity, and problem-solving skills, while also promoting a deeper connection to the learning material. By providing an environment where users can experiment freely without real-world consequences, HiVR supports self-directed learning and boosts learner confidence in applying knowledge.

2.5 Applications of VR in Education

2.5.1 Brief Historical Overview of the Integration of VR in Educational Contexts

The conceptual and technological foundations of Virtual Reality (VR) in education trace back to the early 1960s, marking the beginning of immersive technology in learning contexts. Morton Heilig's groundbreaking invention, the Sensorama (1962), represented the first attempt to create a multi-sensory immersive experience, though it was not strictly virtual reality as understood today. This mechanical device engaged multiple senses through a combination of 3D video, audio, vibration, and even scents, establishing the fundamental principle that learning could be enhanced through immersive experiences (Heilig, 1962). Ivan Sutherland's development of the "Sword of Damocles" in 1968, widely considered the first head-mounted display (HMD), marked another crucial milestone. Despite its primitive graphics and cumbersome nature, this invention laid the groundwork for future VR applications in educational settings (Sutherland, 1968). During this period, the potential for using immersive technologies in training and education began to emerge, particularly in military and aerospace applications.

The 1970s and early 1980s saw the first systematic attempts to integrate VR concepts into educational and training environments. The military sector, particularly the U.S. Air Force, pioneered the use of flight simulators incorporating VR principles for pilot training (Ellis, 1991). These early applications demonstrated key advantages such as risk-free training environments for

high-stakes scenarios, reproducible learning conditions, cost-effective alternatives to real-world training, and standardized assessment opportunities. Thomas Furness's work at Wright-Patterson Air Force Base led to the development of the Super Cockpit program in 1986, which represented a significant advancement in VR-based training systems (Furness, 1988). This period established the foundation for what would become Computer-Based Training (CBT) and Simulation-Based Learning.

The 1990s marked a crucial period for VR in education, characterized by increased academic interest and research into its pedagogical applications. Pantelidis's seminal work (1993) provided one of the first comprehensive frameworks for implementing VR in educational settings, identifying key areas where virtual environments could enhance learning, such as abstract concept visualization, manipulation of virtual objects, interaction with environments otherwise impossible to access, and the creation of new forms of collaborative learning spaces. During this period, researchers began exploring VR's potential in various educational disciplines. Medical education saw the implementation of VR for anatomy education and surgical training simulations, allowing students to practice procedures without risk to patients, visualize complex anatomical structures, experience rare medical conditions, and receive immediate feedback on performance (Satava, 1995). Science education utilized VR applications for molecular visualization in chemistry, physical phenomena simulation in physics, and ecological system modeling in biology (Dede et al., 1996).

The 2000s brought significant technological improvements that made VR more accessible to educational institutions. Dalgarno and Lee's (2010) comprehensive review identified several key affordances of 3D virtual learning environments, including enhanced spatial knowledge

representation, experiential learning opportunities, increased motivation and engagement, improved contextual learning, and rich and effective collaborative learning opportunities. This period also saw the development of more sophisticated learning theories specifically adapted to VR environments, including situated learning in virtual contexts, constructivist approaches to virtual world-building, and social presence theory in virtual environments (Mikropoulos & Natsis, 2011).

The introduction of affordable consumer VR hardware in the 2010s, particularly the Oculus Rift (2012) and subsequent devices, revolutionized educational VR applications. This period, characterized by High-Immersion Virtual Reality (HiVR), brought several significant developments such as improved display resolution and tracking capabilities, reduced motion sickness issues, and more intuitive user interfaces (Freina & Ott, 2015). Recent research has focused on specific educational applications, particularly in language learning, where studies have shown significant benefits in reducing speaking anxiety, enhancing cultural immersion, improving pronunciation through real-time feedback, and increasing student engagement and motivation (Lin, Lan, & Chang, 2022). In STEM education, VR has been increasingly used for complex mathematical visualization, engineering design and prototyping, scientific simulation and experimentation, and coding education (Jensen & Konradsen, 2018).

Contemporary research focuses on several key areas, including the integration of VR with augmented reality (AR) and mixed reality (MR) technologies to create new possibilities for blended learning environments (Wu et al., 2020). AI-enhanced VR educational experiences are emerging, offering personalized learning paths, adaptive difficulty adjustment, intelligent tutoring systems, and real-time performance analysis (Radianti et al., 2020). Social VR platforms are

enabling virtual classrooms and campuses, cross-cultural collaborative learning, global educational networking, and both synchronous and asynchronous learning opportunities (Bailenson, 2021).

The evolution of VR in educational contexts represents a significant transformation in how learning experiences are conceived and delivered. From Heilig's Sensorama to modern HiVR systems, each technological advancement has expanded the possibilities for immersive learning. Current trends suggest continued integration of VR with other emerging technologies, potentially leading to more personalized, effective, and accessible educational experiences.

2.5.2 VR as a Tool for Experiential Learning, Skill Acquisition, and Engagement

Virtual Reality (VR) has emerged as a transformative educational tool, especially in facilitating experiential learning and skill acquisition. According to Kolb's (1984) Experiential Learning Theory, effective learning occurs through a cycle comprising concrete experience, reflective observation, abstract conceptualization, and active experimentation. VR environments naturally support this cycle by providing immersive, first-hand experiences, enabling reflective analysis through built-in recording and playback features, fostering abstract thinking via visualization tools, and facilitating active experimentation through trial-and-error learning in safe, controlled virtual spaces.

Moreover, VR's alignment with Situated Learning Theory (Brown, Collins, & Duguid, 1989) underscores its potential for embedding learners within authentic social and physical contexts. This theory posits that knowledge is best acquired through legitimate peripheral participation within a community of practice. VR makes this possible by simulating real-world scenarios, allowing learners to practice skills in environments that closely resemble authentic

settings. For instance, virtual laboratories and language immersion environments enable students to develop practical skills through contextualized, hands-on practice, reinforcing the social construction of knowledge.

VR’s effectiveness in education is largely due to its ability to generate a strong sense of presence and immersion within the learning environment. Slater and Sanchez-Vives (2016), identify critical components such as multi-modal sensory input, spatial audio, haptic feedback, and natural interaction methods, which collectively enhance sensory engagement. VR's ability to track physical movements and allow dynamic manipulation of objects further solidifies its role in fostering environmental presence, and maintaining learner engagement.

In terms of skill acquisition, VR facilitates both procedural and cognitive skill development. Procedural learning is enhanced through features like step-by-step guidance, immediate feedback, and adaptive difficulty levels. Cognitive skills, including pattern recognition, spatial reasoning, decision-making under pressure, and problem-solving, are developed through interactive and context-rich scenarios. For example, VR-based medical training allows students to perform complex procedures in a risk-free environment, improving both competence and confidence.

Furthermore, the Flow Theory proposed by Csikszentmihalyi (1990) suggests that VR environments effectively foster engagement by maintaining a balance between challenge and skill level, offering clear goals, immediate feedback, and immersive experiences that minimize external distractions. This balance keeps learners in a state of flow, where they are fully absorbed and motivated to complete tasks. Additionally, Self-Determination Theory (Ryan & Deci, 2000) supports VR's motivational potential by promoting autonomy through user-directed exploration

and choice, competence through scaffolded learning activities, and relatedness through social interactions in virtual collaborative settings.

Empirical studies further validate VR's educational impact. For instance, Jensen and Konradsen (2018) found that VR-based learning results in a 20% higher knowledge retention rate compared to traditional teaching methods. Moreover, VR's ability to enhance long-term recall, especially in spatial reasoning and complex problem-solving, supports its integration into STEM education.

Learner engagement is another critical factor, as VR environments encourage active participation, voluntary involvement, and sustained focus. Studies report higher completion rates in VR training programs and increased satisfaction among learners who appreciate the interactive, immersive, and feedback-rich nature of VR learning platforms.

2.5.3 VR's Application in Language Learning

Virtual Reality (VR) has emerged as a powerful tool in language learning, offering immersive experiences through simulated environments and real-world practice scenarios. By engaging learners in interactive and context-rich settings, VR can enhance comprehension, pronunciation, and overall language proficiency (Kaplan-Rakowski, R., & Gruber, A.).

Numerous studies have investigated the application of VR in relation to specific language skills. Research has addressed areas such as vocabulary acquisition (Alfadil, 2020; Papin & Kaplan-Rakowski, 2022; Vázquez et al., 2018), listening comprehension (Tai et al., 2020; Ye & Kaplan-Rakowski, 2023), reading development (Kaplan-Rakowski & Gruber, 2022, 2023), writing proficiency (Barrett et al., 2021; Dolgunsöz et al., 2018), and cultural understanding

(Cheng et al., 2017). Increasing focus has also been placed on the use of VR to enhance speaking skills (Dooly et al., 2023; Gruber & Kaplan-Rakowski, 2020; Kaplan-Rakowski & Gruber, 2021; Nobrega & Rozenfeld, 2019; Thrasher, 2022; Xie et al., 2019). More recently, research has begun to explore VR's potential to develop communicative competence (Dooly et al., 2023; Yang et al., 2020) and to alleviate foreign language speaking anxiety (Gruber & Kaplan-Rakowski, 2020; Thrasher, 2022; York et al., 2021).

2.6 Potential of Using HiVR in Foreign Language Learning

2.6.1 Potential to Increase Experience

The integration of High-Immersion Virtual Reality (HiVR) in language learning environments offers increased opportunities for learners to actively practice the target language in realistic settings. This increased frequency of meaningful interaction may help alleviate Foreign Language Speaking Anxiety (FLSA), as prior research links greater exposure to reduced anxiety levels (Dewaele, 2008). Onwuegbuzie, Bailey, and Daley (1999) emphasize that immersion in authentic language environments significantly boosts learners' speaking confidence. However, due to financial, geographic, or time-related constraints, many learners cannot access such immersive experiences. HiVR presents a practical alternative by simulating these environments, allowing users to engage in realistic conversational scenarios without leaving their homes (Peixoto et al., 2021). Typical virtual settings used for language practice include everyday locations such as cafés, airports, museums, restaurants, hotels, and educational institutions (Alfadil, 2020; Yang et al., 2020; Wang, Lian, et al., 2021). These environments, enhanced by the sense of presence HiVR provides, mimic real-life experiences and remove many logistical barriers. Nevertheless, it remains an open question whether increased speaking practice in virtual settings through HiVR can impact FLSA levels to the same extent as real-life immersion.

2.6.2 Potential to Improve Learning Engagement

HiVR has the capacity to boost learning engagement, which refers to students' willingness to speak and to actively participate in educational activities (Hu & Hui, 2012). Research findings indicate that 91% of students in Kaplan-Rakowski and Wojdynski (2018) research and 70% in a study by Sally Wu and Alan Hung (2022) reported heightened engagement when learning with HiVR. Further investigations into specific language learning components have demonstrated HiVR's positive impact on engagement, including vocabulary acquisition and development (Alfadil, 2020; Tai, Chen, & Todd, 2022), communication and interaction (Tseng & Geng, 2021; Yang et al., 2020), and oral practice (Enkin, 2022). Increasing engagement through HiVR may also contribute to reducing foreign language speaking anxiety by shifting learners' attention away from concerns about their speaking ability and toward the learning tasks. It is likely that when learners are fully immersed in HiVR activities, they feel more at ease, which enhances their overall enjoyment of the learning process.

2.6.3 Potential to Improve Oral Proficiency

The impact of High-Immersion Virtual Reality (HiVR) on oral language proficiency has produced mixed findings. While some research indicates that HiVR contributes positively to vocabulary acquisition (Ebadi & Ebadijalal, 2020; Sally Wu & Alan Hung, 2022; Xie, Chen, & Ryder, 2021), its direct influence on speaking abilities remains inconclusive. For instance, Chen, Hung, and Yeh (2021) found that integrating HiVR into a problem-based learning framework led to greater vocabulary gains compared to a traditional problem-based approach without virtual reality. It is important to clarify that the focus here is on studies employing HiVR specifically for oral communication tasks, rather than those centered solely on vocabulary instruction (e.g., Alfadil, 2020; Legault et al., 2019; Tai, Chen, & Todd, 2022; Wilang & Soermphongsuwat, 2018).

Notably, a case study by Xie, Ryder, and Chen (2019) revealed that students delivering presentations in a HiVR environment tended to use more advanced vocabulary than they typically would, suggesting a possible enhancement of expressive language skills under immersive conditions.

2.6.4 Potential to Create a Low Anxiety Environment

Evidence from both quantitative and qualitative research indicates that High-Immersion Virtual Reality (HiVR) can contribute to reducing anxiety in language learning contexts. Engaging with HiVR has been shown to promote learners' willingness to communicate and boost their motivation to acquire a foreign language. For example, Ebadi and Ebadijalal (2020) found that after delivering four presentations, English as a Foreign Language (EFL) students spanning proficiency levels from A1 to C2 exhibited a significantly higher willingness to communicate when using HiVR compared to those who did not use it.

These observations are further supported by qualitative studies, which consistently show increased learner interest and enthusiasm for English when engaging with HiVR (Awada & Diab, 2018; Chen et al., 2020; Sally Wu & Alan Hung, 2022). The immersive and psychologically safe environment provided by HiVR appears to enhance learners' confidence (Ebadi & Ebadijalal, 2020) and fosters a willingness to take linguistic risks (Enkin, 2022). Notably, in a study by Xie, Ryder, and Chen (2019), 12 students—including both native English speakers and Chinese heritage learners—reported feeling more comfortable when practicing oral presentations in Chinese using HiVR. This sense of ease was largely attributed to the way attention was spread across the virtual setting, offering learners additional time and space to manage presentation-related anxiety.

2.7 Limitations and Considerations in VR Implementation

Despite its advantages, VR implementation in education faces several technical and pedagogical challenges. Hardware limitations include motion sickness, physical discomfort during extended use, high equipment costs, and the need for technical support. Software-related challenges involve the complexity of development, high content creation costs, integration with existing educational systems, and issues related to standardization.

One notable challenge associated with the use of High-Immersion Virtual Reality (HiVR) is cybersickness, a condition often marked by symptoms such as dizziness and headaches. In a study conducted by Xie, Ryder, and Chen (2019), several participants reported experiencing physical discomfort, especially dizziness, while using HiVR equipment. Similar symptoms were observed by Wu and Hung (2022), who found that extended exposure to HiVR headsets often resulted in headaches and vertigo. Additionally, Kaplan-Rakowski and Wojdynski (2018) highlighted that highly dynamic virtual content such as simulations involving cycling tended to intensify discomfort. This may be attributed to the delay in visual processing or perceptual lag when rendering fast-moving or complex environments (Ryan et al., 2019). These adverse physical effects linked to head-mounted displays are important considerations when implementing HiVR in educational contexts, particularly in foreign language instruction, where sustained user comfort is crucial for maintaining engagement and learning efficacy.

Incorporating High-Immersion Virtual Reality (HiVR) into educational settings also brings several technical challenges. The use of head-mounted displays can be distracting and may hinder students' ability to concentrate during instructional activities (Urueta & Ogi, 2019). For instance, Xie, Ryder, and Chen (2019) observed that learners often found it difficult to determine where to

direct their attention, particularly when encountering unclear pronunciation or unfamiliar vocabulary. In addition, technical issues such as dependence on stable internet connectivity posed further complications (Urueta & Ogi, 2019; Xie, Ryder, & Chen, 2019). Adoption of HiVR is also influenced by students' receptiveness to new technologies, with some learners demonstrating resistance due to their preference for more conventional educational approaches (Soto et al., 2020).

Pedagogical challenges include selecting appropriate VR content, balancing guidance and exploration, developing effective assessment methodologies, and integrating VR into existing curricula. Accessibility concerns, such as physical limitations, technical literacy requirements, economic barriers, and infrastructure needs, must be addressed to maximize the reach and effectiveness of VR in education.

Ultimately, the challenges of using HiVR in education extend beyond discomfort and technical difficulties. A deeper understanding of learners' experiences is essential to optimizing VR's role in education. A qualitative approach can provide valuable insights into how VR can best support language learning and alleviate foreign language speaking anxiety (FLSA).

Literature Review

Foreign Language Speaking Anxiety (FLSA) is one of the most significant barriers in second-language acquisition (Horwitz et al., 1986). Many learners experience nervousness, fear of negative evaluation, and lack of confidence**,** leading to avoidance of speaking activities (Dewaele & MacIntyre, 2014). High-Immersion Virtual Reality (HiVR) has gained attention as an effective tool to reduce FLSA by creating safe, judgment-free environments where learners can practice oral communication with realistic, immersive simulations (Peixoto et al., 2021). The use of VR to alleviate speaking anxiety has been explored in numerous studies over the past two decades as follow:

Pertaub, Slater, and Barker (2002) examined anxiety responses during presentations to virtual audiences with neutral, positive, or negative behaviors. Forty participants gave five-minute talks, with half using a head-mounted display and the rest a desktop system. Anxiety was measured using the Personal Report of Confidence as a Public Speaker (PRCS) before and after each talk. Results showed that post-talk PRCS correlated with pre-talk PRCS for neutral and positive audiences, but not for the negative audience, which consistently provoked higher anxiety regardless of prior confidence levels. The negative audience also elicited greater somatic anxiety responses compared to the other groups.

Harris, Kemmerling, and North (2002) explored the effectiveness of virtual reality therapy (VRT) in reducing public speaking anxiety among university students. Eight participants completed four weekly 15-minute VRT sessions, while six served as a Wait-List control. Methods included self-report inventories, Subjective Units of Discomfort (SUD), and heart rate measurements. Results showed VRT significantly reduced anxiety, supported by self-report and

physiological data, aligning with prior research. The study highlights VRT's potential and calls for further research on younger populations.

Anderson et al. (2005) tested a cognitive-behavioral treatment for public-speaking anxiety using virtual reality (VR) for exposure therapy. Ten participants with social phobia or panic disorder underwent eight sessions, combining anxiety management training and VR exposure to a virtual audience. Self-report measures at pre-treatment, post-treatment, and 3-month follow-up showed significant anxiety reductions, maintained over time. However, participants were no more likely to complete a speech post-treatment than at baseline. The findings suggest VR-based exposure therapy can reduce public-speaking anxiety, though further controlled studies are needed.

Wallach, Safir, and Bar-Zvi (2009) compared virtual reality cognitive behavior therapy (VRCBT) to traditional CBT and a wait-list control (WLC) for treating public speaking anxiety (PSA). Participants were randomly assigned to VRCBT (28), CBT (30), or WLC (30). Both VRCBT and CBT significantly reduced anxiety on four of five measures and self-rated anxiety during a behavioral task, outperforming WLC. Observer ratings showed no significant differences, but CBT had twice the dropout rate of VRCBT. Results indicate VRCBT is as effective as CBT, offering a brief and viable alternative for PSA treatment.

Robillard et al. (2010) compared the effectiveness of virtual reality (VR) exposure to in vivo exposure within cognitive-behavioral therapy (CBT) for social anxiety disorder (SAD). Participants were randomized to VR exposure (n = 17), in vivo exposure (n = 22), or a waitlist (n = 20). Both active treatments showed significant improvements on the Liebowitz Social Anxiety Scale and secondary measures compared to the waitlist, with VR exposure outperforming in vivo on the primary measure and one secondary measure at post-treatment. Gains were maintained at

6-month follow-up, and VR was rated as more practical for therapists. The findings suggest VR exposure is an effective, cost-efficient, and practical alternative to traditional CBT for SAD.

Safir et al. (2011) evaluated the durability of virtual reality cognitive-behavior therapy (VRCBT) and traditional CBT for public speaking anxiety (PSA). In a prior study, both VRCBT (n = 28) and CBT (n = 30) significantly reduced anxiety compared to a wait-list control (n = 30), with no differences between the two active treatments. However, CBT had twice the dropout rate of VRCBT. At a 1-year follow-up, both VRCBT (n = 25) and CBT (n = 24) maintained treatment gains on all measures, with the CBT group showing further improvement on the Liebowitz Social Anxiety Scale (LSAS) fear subscale. These findings confirm the long-term efficacy of VRCBT as a brief and effective treatment for PSA.

Ling et al. (2014) examined the relationship between sense of presence and anxiety in virtual reality exposure therapy (VRET) for anxiety disorders. Analyzing 33 studies (1,196 participants), a medium overall correlation (r = 28) was found between self-reported presence and anxiety. Moderation analyses revealed stronger correlations for specific disorders, such as fear of animals (r = 50), but negligible effects for social anxiety disorder (r = 001). Clinical populations showed higher correlations than non-clinical groups, and advanced VR technology (e.g., six degrees of freedom trackers, larger field of view) enhanced this relationship. The findings confirm that presence is positively linked to anxiety in VRET, with variability influenced by disorder type, participant characteristics, and technological features.

Owens and Beidel (2015) investigated whether a virtual reality (VR) environment could elicit physiological and subjective arousal similar to real-world public speaking. Participants included 21 adults with Social Anxiety Disorder (SAD) and 24 controls, who delivered speeches in both VR and live settings. Results showed that the VR task significantly increased heart rate,

electrodermal activity, respiratory sinus arrhythmia, and self-reported distress compared to baseline, though it was less anxiety-inducing than the live task. Participants reported moderate presence in VR, but significantly lower than in the live setting. No group differences were found in physiological responses. The findings support VR's potential for simulating anxiety-provoking scenarios in SAD treatment.

Morina et al. (2015) explored the effectiveness of virtual reality exposure therapy (VRET) in eliciting sense of presence and anxiety during social interactions with virtual humans. Thirty-eight non-clinical participants were randomly assigned to either a head-mounted display (HMD) or a one-screen projection-based display. Both conditions elicited moderate levels of presence and anxiety, with the HMD group reporting significantly higher presence ($p = 001$). However, anxiety levels did not differ between groups ($p = 97$). The findings suggest that virtual social interactions can effectively enhance presence and anxiety in VRET, and low-cost projection-based displays may be a viable option for treating social phobia.

Kampmann, Emmelkamp, and Morina (2016) evaluated the efficacy of technology-assisted interventions for social anxiety disorder (SAD), analyzing 37 randomized controlled trials (2,991 participants). Interventions included internet-delivered cognitive behavior therapy (ICBT), virtual reality exposure therapy (VRET), and cognitive bias modification (CBM). ICBT and VRET significantly reduced SAD symptoms compared to passive controls ($g = 0.84$ and 0.82, respectively), with ICBT showing a small advantage over active controls ($g = 0.38$). CBM was ineffective except in laboratory settings ($g = 0.35$). The findings highlight ICBT and VRET as effective interventions for SAD, demonstrating the potential of technology-assisted treatments.

Poeschl-Guenther (2017) explored factors influencing the effectiveness of virtual reality (VR) public speaking training using a framework evaluating system features, user factors, and moderating variables. Thirty-six undergraduate students participated in a VR training scenario with stereoscopic visualization, where task difficulty was the independent variable, and concentration ability, fear of public speaking, and social presence were covariates. Results showed that covariates moderated the effect of task difficulty on speech performance, rendering it non-significant. The presenter's reaction to virtual audience agents overlapped with task difficulty, highlighting the complexity of factors influencing VR training quality. The findings emphasize the need for further research on interactions between variables to optimize VR public speaking applications.

Emmelkamp et al. (2020) examines the use of virtual reality exposure therapy (VRET) for social anxiety disorder (SAD), focusing on technological aspects like avatar interactions, virtual audiences, and emotional expressions. While studies show promising results, few randomized controlled trials (RCTs) have compared VRET to in vivo exposure, often combining VRET with cognitive interventions. No significant differences were found between these combined treatments, but the standalone efficacy of VRET remains understudied, with only one RCT showing VRET was not superior to in vivo exposure. Further research is needed to establish VRET's standalone effectiveness and therapeutic processes before its widespread clinical adoption.

Tian (2024) examined the use of virtual reality therapy (VRT) for psychological disorders, including PTSD, social anxiety disorder (SAD), and public speaking anxiety (PSA). VRT enhances exposure therapy through realistic simulations, improves accessibility, and allows

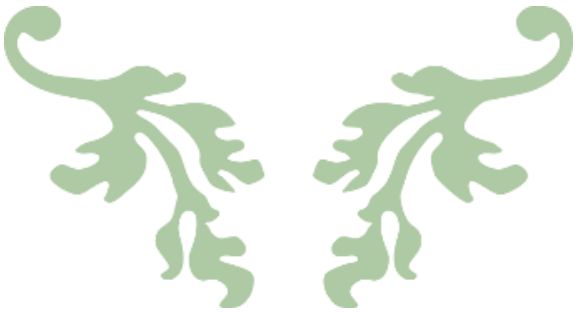
precise control over stimulus intensity. Studies show VRT effectively reduces anxiety and physiological stress in patients. However, challenges like access to VR equipment and data privacy concerns remain. Future research should explore expanding VRT to other mental disorders and integrating advanced technologies like artificial intelligence to maximize its therapeutic potential.

The utilization of high-immersion virtual reality (VR) for alleviating speaking anxiety among English as Foreign Language (EFL) learners represents an unexplored frontier in the Algerian educational context, where students face unique challenges stemming from their complex linguistic and cultural background. While numerous studies have demonstrated VR's effectiveness in reducing speaking anxiety in various international settings, the Algerian context presents distinctive considerations due to its multilingual landscape encompassing Arabic, French, and Tamazight, with English often being learned as a third or fourth language. This linguistic complexity, combined with cultural differences between Algerian and Anglophone societies, creates additional barriers to confident English expression that have yet to be systematically addressed through technological interventions. Traditional teaching methods in Algeria, which typically emphasize grammar over practical communication skills, coupled with large class sizes and limited opportunities for authentic English conversation practice, further compound these challenges. The potential implementation of VR technology in this context offers promising solutions through its ability to create immersive, low-stakes environments for practice, simulate various cultural contexts, and provide opportunities for repeated practice and gradual confidence building. However, the absence of research specifically examining VR's effectiveness in the North African educational setting leaves crucial questions unanswered regarding cultural adaptation requirements, technology acceptance among Algerian educators and students, and the interaction between traditional teaching methods and VR implementation. The successful integration of VR

technology in Algerian EFL classrooms must consider various factors including infrastructure requirements, teacher training needs, cultural sensitivity in scenario design, and cost-effectiveness within the local educational context. This research gap presents an opportunity to contribute significantly to our understanding of technology-enhanced language learning in Algeria, with potential implications for educational policy, curriculum development, and teaching methodologies throughout North Africa. The findings could inform the development of culturally specific VR content, the integration of artificial intelligence for personalized learning, and the establishment of virtual exchange programs with English-speaking countries, ultimately working toward reducing speaking anxiety and improving English language proficiency among Algerian EFL learners while respecting and incorporating local cultural and educational contexts.

Chapter Two:

Research Methodology



Introduction

The practical section of this research plays a crucial role in exploring the core aspects of the study. This study focuses on third-year Bachelor's Degree students in English Language at Abbes Laghrour Khenchela University, investigating their experiences with VR-based speaking tasks. The present work studied the impact of high-immersion virtual reality (HiVR) on alleviating speaking anxiety among EFL learners. Given its nature and objectives, a mixed-method approach was employed, whose elements and procedures are explained in detail in this chapter. Along with semi-structured interviews, this research part delves into participants' reactions, offering a comprehensive understanding that directly addresses the study's research questions and objectives.

Through the combination of quantitative data from anxiety measurement scales and qualitative insights from interviews, this practical section enhances the comprehension of HiVR's effectiveness in reducing speaking anxiety. The findings from this part serve as a foundation for developing informed recommendations for integrating VR technology into EFL learning environments, thereby contributing to the ongoing discussion on language anxiety reduction and innovative pedagogical strategies in language education.

3.1 Research Design

To ensure a comprehensive analysis, a mixed-methods approach was employed in the form of a quasi-experiment and an interview. By quantitatively examining the cause-effect relationship between exposure to High-Immersion Virtual Reality (HiVR) and changes in anxiety levels, this study sought to provide empirical evidence on the effectiveness of VR-based language learning interventions. Participants' speaking anxiety was measured before and after the HiVR intervention to assess potential improvements in their confidence and communication skills. The quantitative

component involved anxiety measurement scale to objectively evaluate changes in speaking anxiety levels.

Meanwhile, the qualitative component, gathered through semi-structured interview, provided deeper insights into participants' perceptions, experiences, and challenges with HiVR. This combination enhanced the validity of findings by mixing statistical data with personal reflections.

3.2 Population

The target population for this study consists of EFL learners who experience speaking anxiety. Specifically, the study focuses on Third-year English Language students at Abbes Laghrour Khenchela University, as they are actively engaged in oral communication in academic settings and face challenges related to speaking anxiety.

3.2.1 Sample Size & Selection

A purposive sampling technique was employed to ensure that participants meet the specific criteria relevant to the study's objectives. A total of 30 participants divided equally between the control and experiment groups (15 students in each group), ensuring a diverse representation of EFL learners with varying levels of speaking anxiety. The selection criteria included:

Language Proficiency: Participants must have a sufficient command of English to engage in meaningful speaking tasks.

Speaking Anxiety: Participants' levels of speaking anxiety will be assessed and confirmed via validated self-report measures.

3.2.1.1 Control Group vs Experimental Group

Participants are divided into two groups:

Experimental Group: Engages in VR-based speaking tasks as described in the intervention phase.

Control Group: Receives no treatment—they continue studying in normal classroom settings with no VR exposure or additional speaking interventions. Their anxiety levels are measured only before and after the study to compare with the experimental group's progress.

3.2.2 Ethical Considerations

Ethical guidelines were strictly followed to ensure the protection and well-being of participants:

Informed Consent: Each participant is provided with a detailed explanation of the study's purpose, procedures, and potential risks before voluntarily agreeing to participate.

Anonymity and Confidentiality: Participants' identities remain anonymous, and all data collected are kept confidential. Responses are used solely for research purposes, and findings are presented in a way that does not reveal individual identities.

By adhering to these ethical principles, the study ensures that participants feel comfortable and secure while contributing to research on the effectiveness of HiVR in reducing speaking anxiety.

3.3 Data Gathering Tools

This study employed a mixed-method approach to assess the impact of Virtual Reality (VR) on foreign language speaking anxiety. Participants had to undergo a VR-based speaking practice as part of the experiment. A pre-test and post-test using the Public Speaking Class Anxiety Scale (PSCAS) was used to measure anxiety levels before and after the intervention. Additionally, semi-structured interview were conducted to explore the participants' experiences, confidence levels, and perceptions of HiVR as a learning tool. By combining statistical data with qualitative insights, this study provides a comprehensive evaluation of VR's effectiveness in reducing EFL speaking anxiety.

3.4 The Pilot Study Report: Exploring the Feasibility of High-Immersion Virtual Reality to Alleviate Speaking Anxiety Among Third Year EFL Students

3.4.1 Purpose of the Pilot Study

The purpose of this pilot study was to evaluate the feasibility of using high-immersion virtual reality (VR) as a tool to alleviate speaking anxiety among English as a Foreign Language (EFL) students at the University of Abbess Laghrour Khenchela. Specifically, the study sought to examine how first-time experiences with VR influenced learners' comfort levels and confidence in speaking English in realistic, AI-driven virtual scenarios. Insights from this pilot were used to refine the methodology for a larger-scale study.

3.4.2 Participants and Sampling

The study initially aimed to work with First Year EFL students, but their limited vocabulary hindered meaningful interactions with AI-driven virtual personalities. To address this, the sample was adjusted to Second Year EFL students, yet they also struggled with fluency. Recognizing these challenges, the selection shifted to Third Year EFL students, who had both sufficient vocabulary and speaking anxiety, making them the most suitable participants.

A purposive sample of four Third Year students with no prior VR experience was chosen to ensure authentic first-time user reactions.

3.4.3 VR Equipment and Setup

3.4.3.1 Equipment

A high-immersion VR headset with hand controllers.

The VirtualSpeech application, which provided AI-driven virtual personalities for participants to interact with in various real-life speaking scenarios, such as: job interviews, oral presentations, and discussions on social and academic topics.

3.4.3.2 Setup

The VR environment was designed to replicate realistic, judgment-free conversational settings. Participants practiced speaking English with AI-driven characters in a virtual space, allowing them to focus on language use without external pressures. The goal was to create a safe and immersive experience conducive to reduce speaking anxiety.

3.4.4 Challenges and Potential Adjustments

3.4.4.1 Challenges

Sampling Adjustments: The initial selection of First Year and Second Year students proved ineffective due to their limited vocabulary, necessitating a shift to Third Year students.

Initial Anxiety: Participants exhibited nervousness about using the VR device for the first time. This was primarily due to unfamiliarity with the technology rather than the speaking tasks.

Learning Curve: Participants required a brief orientation to understand how to operate the device and navigate the virtual environment.

3.4.4.2 Potential Adjustments

Extend the familiarization period to allow participants more time to adjust to the VR technology before engaging in speaking tasks.

Provide step-by-step guidance during the initial setup to build participants' confidence with the VR device.

Refin the VR scenarios to align more closely with students' academic and real-life communication needs.

3.4.5 Preliminary Results and Observations

3.4.5.1 General Observations

Participants initially reported feelings of apprehension toward using the VR device. However, these feelings dissipated after a brief familiarization period.

The immersive nature of the VR environment allowed participants to engage with AI-driven virtual personalities without the fear of judgment or external evaluation.

Participant 1: The participant started with some anxiety but quickly adapted to the VR environment. She asked the virtual personality, "How can I succeed in a job interview?" and received a helpful response. She expressed that the interaction felt very realistic, stating: "I felt

like she is in front of me. It was very comfortable." This indicates that the immersive nature of VR helped her feel at ease during the interaction.

Participant 2: The participant initially needed to learn how to use the device but became comfortable using it after a short period. She asked the virtual personality, "How should I do well in my oral presentation next week?" and received advice. Her feedback was: "It was really good. I could not feel that you were here in the room with me. It was like I'm alone." This highlights the ability of VR to create a private, judgment-free environment, which might reduce anxiety.

Participant 3: The participant followed a similar process, becoming comfortable with the device after some initial learning. She asked the virtual personality about social media, specifically: "Do you think social media has a positive or negative impact these days?" She felt comfortable and expressed: "I felt comfortable and it was easy to talk. I felt like I'm alone." Her reaction suggests that the VR experience provided a safe space for practicing English without external pressure.

Participant 4: The participant became familiar with the device quickly and asked the virtual personality for advice on overcoming social anxiety: "How can I get rid of social anxiety?" After completing the interaction, she stated: "I felt integrated into the virtual world."

3.4.5.2 Key Observations

Comfort and Realism: Participants expressed that the VR interactions felt realistic and private, creating a low-pressure environment that encouraged spontaneous language use.

Engagement: The high level of immersion helped participants focus on the conversational tasks, reducing distractions and external stressors.

Feedback: Participants noted that VR provided a unique experience, helping them feel "integrated" into the virtual world and more at ease during English-speaking tasks.

3.4.6 Setting

The pilot study was conducted in a controlled environment at the University of Abbess Laghrour Khenchela. A dedicated room was selected to ensure minimal external distractions and a conducive atmosphere for immersive VR experiences.

3.4.6.1 Room Features

- A quiet, well-lit space equipped with comfortable seating for participants.
- Ample space for safe movement while using the VR headset.
- Temperature-controlled and sound-insulated to provide a relaxed setting.

3.4.6.2 Session Details

Each participant engaged with the VR system individually for 5–6 minutes.

The session included:

- A brief familiarization period to learn how to operate the VR device.
- Interaction with AI-driven virtual personalities in conversational scenarios.
- A post-interaction debriefs where participants reflected on their experience.

This controlled setting was critical in minimizing environmental factors that could influence speaking anxiety, allowing the focus to remain on the participants' engagement with the VR system.

3.4.7 Summary

The pilot study demonstrated the feasibility of incorporating high-immersion VR into a study aimed at reducing speaking anxiety among EFL students. While initial challenges related to technological unfamiliarity were observed, participants adapted quickly and expressed positive feedback about the immersive and supportive nature of the VR environment.

Key adjustments for the main study include:

- Allocating additional time for familiarization with the VR equipment.
- Providing enhanced guidance during the setup phase to ensure participant confidence.
- Refining the VR scenarios to align more closely with students' academic and real-life communication needs.

This pilot study highlighted the importance of selecting participants with both speaking anxiety and adequate vocabulary skills to fully engage with AI-driven VR interactions. The adjustments in sampling led to the successful identification of Third Year EFL students as the ideal participants for the study. Preliminary results indicate that VR immersion can help reduce speaking anxiety by providing a realistic, private, and judgment-free environment for language practice. Future research will build upon these findings to explore long-term effects and potential curriculum integrations for VR-assisted language learning.

3.5 Measuring Anxiety

3.5.1 EFL Public Speaking Class Anxiety Scale

To quantitatively assess the impact of HiVR on foreign language speaking anxiety, this study utilizes the EFL Public Speaking Class Anxiety Scale, developed and validated by Kriangkrai Yaikhong and Siriluck Usaha (2012). Published in *English Language Teaching* (Vol. 5, No. 12), this scale is a structured self-report instrument designed to measure anxiety levels in EFL public speaking contexts.

The scale consists of Likert-scale items assessing key dimensions of speaking anxiety, including communication apprehension, fear of negative evaluation, and overall speaking-related anxiety. A pre-test will be conducted before the VR-based intervention to establish baseline anxiety levels, followed by a post-test after the experiment to evaluate changes. The comparison of these scores will provide statistical insights into the effectiveness of HiVR in reducing speaking anxiety among EFL learners, see (**Table *5***) for further details.

3.6 Experimental Setup

3.6.1 Technology Used

The study utilizes ***Oculus Quest***, the High-Immersion Virtual Reality (HiVR) headsets, which provide realistic, interactive simulations for language practice. This device enables 360-degree immersion, allowing participants to engage in authentic conversational scenarios without external distractions.

For the software platform, a VR-based language learning application is employed called VirtualSpeech, offering virtual speaking environments such as classrooms, social gatherings, and

public speaking venues. The platform includes AI-driven conversational agents and speech recognition features to simulate real-life communication. These settings provide controlled exposure to speaking situations that typically induce anxiety in EFL learners.

3.6.2 Procedure

The experiment follows a three-phase process to assess the impact of HiVR on speaking anxiety:

3.6.2.1 Pre-Test (Baseline Anxiety Measurement)

Participants completed a Public Speaking Anxiety Scale (PSCAS) to determine their initial level of speaking anxiety.

A short speaking task (e.g., introducing themselves, responding to questions) was recorded to observe initial performance indicators.

3.6.2.2 Intervention (VR-Based Speaking Practice)

Participants engaged in VR-speaking tasks, gradually increasing in difficulty:

- Basic conversations (e.g., ordering food, introducing themselves).
- Public speaking practice (e.g., giving a short speech in front of a virtual audience).
- Interactive role-play (e.g., debates, job interviews).

Each session lasted 15–30 minutes, and participants went through multiple VR sessions over a set period *(eight sessions/ four weeks*).

The VR learning application (VirtualSpeech) provides real-time feedback on speech clarity, eye contact, confidence, and audience engagement, helping learners refine their public speaking skills.

3.6.2.3 Post-Test (Measuring Changes in Anxiety Levels)

Participants retook the anxiety assessment (PSCAS) to compare pre- and post-intervention anxiety levels.

3.6.3 Results and discussion

In this section the results obtained from the study are presented and analyzed. The first part is devoted to the experiment results and the second is for the interview findings.

7.6.3.1 The Experiment Results

The pre and post results of the focus group and control group are shown in tables 1 and 2 below.

Table 1. *Focus Group Scores*

Participants	**Pre test Scores**	**Post test scores**
Participant 01	3.88	2.41
Participant 02	3.52	2.70
Participant 03	4.00	2.17
Participant 04	4.05	2.52
Participant 05	3.64	2.41
Participant 06	3.29	2.58
Participant 07	3.41	2.52
Participant 08	3.94	2.70
Participant 09	3.29	2.82
Participant 10	3.35	2.58
Participant 11	3.88	3.00
Participant 12	3.77	2.17
Participant 13	3.58	2.17
Participant 14	3.41	2.00
Participant 15	3.23	2.52

The participants' scores before the VR intervention ranged from 3.23 to 4.05, with most participants scoring between 3.3 and 3.9. This indicates that at the beginning, the participants had a moderate to high level of speaking anxiety.

After the VR intervention, the scores dropped significantly, ranging from 2.00 to 3.00.

The most noticeable decreases were: Participant 03 (-1.83), Participant 12 (-1.60), Participant 04 (-1.53) Since lower scores indicate reduced anxiety, this means that the high-immersion VR was effective in helping participants feel less anxious during speaking tasks.

Table 2. *Control Group Scores*

Participants	**Pre Score**	**Post Score**
Participant 01	3.47	3.64
Participant 02	3.88	4.05
Participant 03	2.94	3.58
Participant 04	3.70	4.05
Participant 05	4.00	3.88
Participant 06	3.41	4.23
Participant 07	3.29	4.35
Participant 08	2.88	3.11
Participant 09	2.82	4.35
Participant 10	3.88	3.88
Participant 11	3.76	4.11
Participant 12	2.29	2.29
Participant 13	3.76	3.59
Participant 14	3.41	3.35
Participant 15	3.64	4.05

The control group's initial scores ranged from 2.29 to 4.00, with a similar distribution to the focus group. This suggests that both groups started with comparable levels of speaking anxiety. Unlike the focus group, the control group's scores increased or remained stable, ranging from 2.29 to 4.35.

The largest increases were seen in: Participant 09 (+1.53), Participant 07 (+1.06), Participant 06 (+0.82). The slight decreases in Participant 05 (-0.12), Participant 13 (-0.17), and Participant 14 (-0.06) were minor compared to the overall improvement in confidence for most participants.

7.6.3.1.1 Inferential Statistical Analysis

Table 3. *t-Test: Paired Two Sample for Means for the Experimental Group*

	Variable 1	***Variable 2***
Mean	3.616	2.484666667
Variance	0.080868571	0.07398381
Observations	15	15
Pearson Correlation	-0.060781528	
Hypothesized Mean Difference	0	
Df	14	
t Stat	10.81126714	
P(T<=t) one-tail	1.76265E-08	
t Critical one-tail	1.761310136	
P(T<=t) two-tail	3.52529E-08	
t Critical two-tail	2.144786688	

The t-test table shows:

$\mathbf{M_{pre} = 3.6 > M_{post} = 2.48}$

P-value = $1.76265^{-08} < \alpha = 0.05$,

And therefore, the difference that occurred in the means is significant

Accordingly:

The null hypothesis **H_0** is **rejected** and, our hypothesis **H_1** is **accepted**: *the use of VR is effective in reducing speaking anxiety among the students of English in our case study.*

Table 4: *t-Test: Paired Two Sample for Means for the Control Group*

	Variable 1	***Variable 2***
Mean	3.408666667	3.767333333
Variance	0.235298095	0.296220952
Observations	15	15
Pearson Correlation	0.575428082	
Hypothesized Mean Difference	0	
Df	14	
t-Stat	2.911190139	
P(T<=t) one-tail	0.005693695	
t Critical one-tail	1.761310136	
P(T<=t) two-tail	0.01138739	
t Critical two-tail	2.144786688	

The control groups' means showed an increase in anxiety among the participants.

7.6.3.1.2 VR's Effectiveness in Reducing Speaking Anxiety:

The experimental group's consistent decrease in scores confirms that high-immersion VR helped participants feel less anxious while speaking. This shows that VR provided a safe and controlled environment where students could practice speaking with reduced fear of judgment.

7.6.3.1.3 Comparison Between Both Groups:

Experimental Group (VR Exposure) → Scores decreased = reduced anxiety.

Control Group (No VR) → Scores increased or remained stable = more confidence over time, but not necessarily less anxiety.

This supports the hypothesis that high-immersion VR is an effective tool for alleviating speaking anxiety in EFL learners.

7.6.3.2 Interview Findings

Participants shared qualitative feedback through semi-structured interview, offering reflections on their experiences with HiVR. These interviews provided valuable insights into their language learning journey, confidence levels, and the role of VR in managing speaking anxiety.

Synthesis:

1. Can you tell me about your experience with learning English as a foreign language?

Most participants expressed a strong interest in English from an early age. While some enjoyed learning about English culture, history, and literature, others faced challenges, particularly with speaking fluently due to anxiety and limited practice opportunities.

Participant 1: *"I've always loved English, especially watching movies and reading books, but speaking was my weak point because I didn't get much practice."*

Participant 3: *"I always wanted to sound like a native speaker, but I struggled with pronunciation and confidence."*

2. Before using HiVR, how would you describe your confidence in speaking English?

All participants admitted to experiencing varying degrees of anxiety when speaking English, particularly in academic or formal settings. They often hesitated, forgot words, or avoided speaking altogether due to fear of making mistakes.

Participant 2: *"Even when I knew the right words, I would freeze when speaking in front of people."*

Participant 4: *"I preferred writing over speaking because I felt like my accent would expose my mistakes."*

3. How did you feel when you first used HiVR for speaking practice?

Most participants described their first HiVR experience as engaging and immersive. They found the virtual setting unique compared to traditional classroom learning, which made speaking practice less intimidating.

Participant 5: *"It was like stepping into a different world, something I had only seen in movies or social media!"*

Participant 3: *"At first, I felt a bit awkward, but then I got used to it and realized how helpful it was."*

4. Did you notice any changes in your confidence when speaking English after using HiVR? If so, what kind of changes?

All participants reported noticeable improvements in their speaking confidence after using HiVR. They mentioned reduced hesitation, better pronunciation, and increased fluency. Some even felt more comfortable initiating conversations.

Participant 1: *"After several sessions, I found myself speaking with fewer pauses. I wasn't as afraid to make mistakes."*

Participant 4: *"I can now start conversations without overthinking every word, which was a big problem before."*

5. How did practicing in a virtual environment affect your anxiety levels compared to speaking in a real classroom or public setting?

Participants generally agreed that speaking in a virtual environment felt safer and less pressuring than in real-life settings. The absence of direct judgment helped them overcome their fear of negative evaluation. Some even reported a transfer of confidence from VR to real-life interactions.

Participant 2: *"I felt more relaxed speaking in VR because I wasn't worried about being judged."*

Participant 5: *"Surprisingly, after practicing in HiVR, I found myself speaking more confidently in real-life situations, too."*

6. Would you recommend HiVR to other EFL learners? What advice would you give them?

Every participant recommended HiVR as an effective tool for reducing speaking anxiety and improving fluency. They advised consistent use and emphasized that making mistakes is part of the learning process.

Participant 3: *"Use HiVR not just for fun but as a serious learning tool. The more you practice, the better you get."*

Participant 1: *"Don't be afraid to make mistakes. The more comfortable you become in VR, the easier real conversations will be."*

7.7 Discussion

This study set out to examine the effectiveness of High-Immersion Virtual Reality (HiVR) in alleviating speaking anxiety among EFL learners. The results of both the quantitative and qualitative analyses converge to support the conclusion that HiVR is a powerful tool for reducing speaking anxiety and enhancing learners' confidence in oral communication.

The quantitative data, derived from pre- and post-tests using the Public Speaking Class Anxiety Scale (PSCAS), revealed a statistically significant reduction in speaking anxiety among participants in the experimental group who practiced with HiVR. In contrast, the control group, which received no intervention, showed either stable or slightly increased anxiety levels. These findings confirm the hypothesis that immersive virtual environments create safer, less judgmental spaces for EFL learners to develop their speaking skills.

The qualitative data from semi-structured interview further corroborate these findings. Participants described their HiVR experiences as immersive, realistic, and emotionally supportive. They reported feeling less judged and more willing to take speaking risks. Several participants also noted improvements in fluency, pronunciation, and willingness to initiate conversations after VR practice, suggesting a transfer of confidence from virtual settings to real-world communication.

These results strongly align with earlier studies in the literature review. For instance, Pertaub et al. (2002) and Anderson et al. (2005) found that virtual audiences can effectively simulate real speaking situations, producing anxiety responses while allowing for controlled exposure. Similarly, Wallach et al. (2009) and Robillard et al. (2010) confirmed that VR-based

exposure therapy is equally effective as traditional cognitive-behavioral methods in alleviating public speaking anxiety. Like in these studies, this research reinforces the therapeutic potential of immersive environments but extends their application to educational settings involving language learners.

Moreover, this study contributes a novel perspective by focusing on Algerian EFL learners, a population often overlooked in technology-based language research. As noted in the literature review, the Algerian educational context is shaped by a complex multilingual environment and traditional grammar-focused instruction, with limited opportunities for authentic speaking practice. By demonstrating the effectiveness of HiVR in this unique context, this study fills a critical gap in the existing body of research. It also answers the call for more culturally sensitive and technologically innovative approaches to language learning in under-researched regions like North Africa.

The findings not only validate international studies on VR and anxiety reduction but also reveal new insights into learners' emotional engagement and the cultural relevance of VR scenarios. Participants' reflections suggest that HiVR allowed them to overcome deeply rooted anxieties tied to fear of negative evaluation, rigid academic norms, and unfamiliarity with real-time English conversations.

Ultimately, this study affirms that HiVR is a viable, scalable, and culturally adaptable solution for reducing speaking anxiety in EFL settings. It provides both empirical evidence and pedagogical implications, supporting a shift toward immersive technologies in foreign language instruction, particularly in contexts where traditional methods fail to engage or emotionally support learners.

7.8 Pedagogical Implications

This research study aims to contribute to the field of language education, particularly by supporting innovation in EFL teaching through the integration of immersive technologies such as High-Immersion Virtual Reality (HiVR). The findings provided practical insights into how VR-based tools can be used to improve oral communication skills and reduce the anxiety often associated with speaking in a foreign language. As immersive technologies become increasingly accessible and pedagogically relevant, this section outlines a set of pedagogical recommendations that may be applied by EFL educators and institutions to promote more engaging and psychologically safe learning environments. These suggestions focus on helping teachers harness the affordances of HiVR to improve language performance, address affective factors in learning, and enhance students' overall classroom experiences.

7.8.3 Guidelines and Procedures

The effective integration of HiVR into EFL instruction requires the establishment of clear, well-defined procedures that ensure both pedagogical value and ethical implementation. Teachers must introduce HiVR as a supportive tool rather than a complete replacement for traditional instructional methods. Educators should provide students with orientation sessions on how to use VR responsibly, highlighting both its advantages; such as real-time interaction and anxiety-reducing environments, and its limitations, such as technical constraints and physical discomfort.

Assignments involving VR should be designed intentionally, ensuring alignment with course objectives while encouraging authentic communication. For example, virtual role-play scenarios or public speaking simulations can be used to facilitate fluency development in low-

stress contexts. Moreover, educators should create tasks that require reflective components like post-VR journals or class discussions to reinforce learning and help students internalize their experiences.

To maximize the benefits of HiVR while minimizing drawbacks, institutions should also develop usage policies to address issues such as screen fatigue, session duration, and equitable access to VR tools. Clear standards must be set to ensure that the use of technology enhances, rather than overwhelms, the learning process.

7.8.4 Professional Development

For HiVR to be successfully implemented, teacher training and professional development are essential. Many educators may be unfamiliar with the technical and pedagogical aspects of virtual reality; therefore, training workshops should be organized to equip teachers with the necessary skills. These sessions should cover the operational use of VR equipment, strategies for designing immersive language tasks, methods for assessing student performance in VR settings, and guidelines for troubleshooting common technical issues.

Additionally, professional development programs must explore the psychological dimensions of language learning in VR environments. Educators should be trained to recognize signs of cybersickness, discomfort, or anxiety among students and adapt their teaching accordingly. These programs should also encourage collaboration among educators, allowing them to share experiences and best practices. Continued training ensures that teachers remain up-to-date with advancements in immersive learning technologies and can effectively integrate them into their curricula.

7.8.5 Balancing Technology and Traditional Methods

While HiVR offers exciting possibilities for enhancing oral communication in EFL classes, it should be viewed as a complementary tool, not a replacement for human-centered instruction. The goal is to strike a balance between digital innovation and traditional pedagogical approaches. HiVR can be effectively used to simulate realistic speaking environments, provide individualized practice, and reduce performance-related anxiety. However, traditional methods such as face-to-face discussions, peer feedback, and teacher-led activities remain crucial for developing interpersonal communication, critical thinking, and classroom interaction skills.

For instance, teachers might use HiVR to simulate interview or presentation tasks, followed by in-class peer evaluations or oral feedback sessions. This hybrid model ensures that learners benefit from the engagement and immersion of VR while still developing social and collaborative competencies that are best fostered through direct human interaction. By thoughtfully combining both approaches, educators can create comprehensive and dynamic language learning environments.

7.8.6 Suggestions for Future Research

This study opens the door to several avenues of future research that can further advance the integration of HiVR in EFL instruction. The following recommendations aim to build upon the insights of this research and address current gaps:

Expand to different educational levels and demographics. Future research should investigate the use of HiVR with students from varying proficiency levels and age groups, including secondary

school learners or adult education programs, to determine whether the tool's anxiety-reducing effects are consistent across contexts.

Apply HiVR in diverse language learning environments. While this study focuses on EFL learners in an Algerian university, future research could examine HiVR's impact in multilingual or ESL (English as a Second Language) settings, offering broader insights into its pedagogical versatility.

Conduct comparative studies. Researchers are encouraged to carry out studies comparing HiVR-based learning with traditional speaking activities to assess differences in anxiety reduction, fluency, and learner engagement. These studies can help define the relative strengths and limitations of each approach.

Explore long-term outcomes. It is recommended that future research evaluate the sustained impact of HiVR on students' speaking proficiency, motivation, and classroom confidence. Longitudinal studies could provide a clearer understanding of how virtual practice influences learners' oral development over time.

Investigate teachers' experiences. While this study focused on students, future work could explore how regular integration of HiVR affects teachers' instructional strategies, classroom dynamics, and workload. This would help in identifying training needs and the practicality of HiVR in everyday teaching.

Develop tailored pedagogical frameworks. Further research should be devoted to designing and testing blended teaching models that incorporate HiVR effectively. These frameworks should offer

guidance on lesson planning, ethical considerations, assessment tools, and digital literacy training for both teachers and learners.

7.8.7 Limitations of the Study

While this study contributes valuable findings to the fields of language learning and educational technology, it is not without limitations, which should be acknowledged to place the results in proper context.

One notable limitation is the short duration of HiVR use and the relatively limited number of speaking sessions conducted. This means that participants' reactions were based on a brief exposure, which may not fully reflect the long-term benefits or challenges associated with regular HiVR integration in language classrooms. Longer studies would provide deeper insights into retention, fluency development, and sustained reduction in anxiety.

Another limitation concerns the small sample size and restricted scope. The study focused on 30 third-year EFL students from a single department at one Algerian university. As such, the findings may not be generalizable to other institutions, regions, or educational systems. Broader and more diverse sampling would be necessary to validate the results across different learning contexts.

Lastly, some technical constraints impacted the experience. A few students experienced mild cybersickness or found the equipment initially challenging to use, which may have affected their ability to fully benefit from the experience. The availability of HiVR equipment and technical support also posed limitations, which might not be easily resolved in under-resourced educational settings.

General Conclusion

The present research paper aimed to investigate the use of High-Immersion Virtual Reality (HiVR) as a pedagogical tool to alleviate speaking anxiety among EFL students. This study was motivated by the increasing integration of immersive technologies into education, and the growing need to address persistent psychological barriers such as speaking anxiety in language learning contexts. The primary objectives focused on evaluating the effectiveness of HiVR in reducing speaking anxiety, assessing changes in students' fluency and willingness to speak, and exploring students' attitudes toward the use of HiVR in EFL classrooms. By addressing these objectives, this research seeks to inform educators and institutions about the pedagogical potential of VR-based environments and to encourage the implementation of immersive learning experiences that support learners' emotional well-being and linguistic development.

In pursuit of these aims, the study was guided by the following research questions:

1. Does the use of High-Immersion Virtual Reality (HiVR) significantly reduce speaking anxiety among third-year EFL students?
2. Is there any significant difference in students' fluency and willingness to speak before and after using High-Immersion Virtual Reality (HiVR)?
3. What are the students' perceptions and attitudes toward using High-Immersion Virtual Reality (HiVR) as a tool for practicing oral communication in EFL classrooms?

To provide valid and relevant answers to these questions, the study began with a thorough theoretical investigation. The first chapter of the research explored foundational concepts such as speaking anxiety, its characteristics, causes, and effects on language performance. It also examined the historical development and educational potential of virtual reality, with a focus on the

affordances of HiVR for language learning. This chapter highlighted how immersive environments promote learner presence and agency, which are critical elements for reducing language anxiety and improving oral proficiency.

The second chapter represented the practical part of the research, which employed a quasi-experimental design. The sample consisted of 30 third-year EFL students at the University of Abbes Laghrour Khenchela, divided into experimental and control groups. A combination of pre-Test, an intervention and post-Test, along with interviews with some participants, was used to collect both quantitative and qualitative data. The findings revealed that the use of HiVR contributed to a measurable reduction in speaking anxiety among students in the experimental group. Furthermore, participants showed improvements in fluency, greater willingness to speak, and increased engagement during oral communication tasks.

Additionally, students' responses indicated generally positive attitudes toward HiVR as a learning tool. Many learners reported feeling more confident, less judged, and more motivated when speaking in the virtual environment compared to traditional classroom settings. However, the study also noted a few limitations, including technical challenges such as cybersickness and limited access to high-end equipment, which should be considered in future implementations.

Overall, this study supports the idea that immersive technologies like HiVR can serve as effective supplementary tools in EFL education, particularly for students who struggle with anxiety-related barriers to speaking. It also suggests that, when integrated thoughtfully, HiVR has the potential to enrich the language learning experience and create more inclusive, supportive environments. Future research may continue to explore the long-term effects of HiVR, its application in diverse cultural contexts, and its integration alongside traditional pedagogical methods to support a balanced and effective approach to language teaching and learning.

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Annexes

Annex A: The VR device pictures and some experiment pictures

Figure 17: *Oculus Quest Device.*

(Lang, 2019)

Figure 18: *Experiment Pictures.*

Photograph by the author (2025).

Annex B: EFL Public Speaking Class Anxiety Scale

This scale is designed to measure your level of anxiety when speaking English as a foreign language. Please read each statement carefully and indicate how much you agree or disagree with it by selecting a number between 1 and 5.

1= Strongly Disagree 2= Disagree 3= Undecided 4= Agree 5= Strongly Agree

There are no right or wrong answers. Your responses will remain confidential and will be used solely for academic research purposes.

Table 5: *The PSCAS*

Item No	Statements adopted with minor adaptation in wordings	Opinion				
		(5) Strongly Agree	(4) Agree	(3) Undecided	(2) Disagree	(1) Strongly Disagree
1	I never feel quite sure of myself while I am speaking English.					
2	I start to panic when I have to speak English without a preparation in advance.					
3	In a speaking class, I can get so nervous I forget things I know.					
4	I feel confident while I am speaking English.					
5	I get nervous and confused when I am speaking English.					
6	I am afraid that other students will laugh at me while I am speaking English.					
7	I get nervous when the English teacher asks me to speak English which I have prepared in advance.					
8	I have no fear of speaking English.					

9	I can feel my heart pounding when I am going to be called on.					
10	I feel relaxed while I am speaking English.					
11	It embarrasses me to volunteer to go out first to speak English.					
12	I face the prospect of speaking English with confidence.					
13	Certain parts of my body feel very tense and rigid while I am speaking English.					
14	I feel anxious while I am waiting to speak English.					
15	I dislike using my voice and body expressively while I am speaking English.					
16	I have trouble to coordinate my movements while I am speaking English.					
17	Even if I am very well prepared. I feel anxious about speaking English.					

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Résumé

Cette étude examine l'efficacité de la réalité virtuelle à immersion totale (HiVR) dans la réduction de l'anxiété orale chez les étudiants en anglais langue étrangère (EFL), tout en explorant leurs perceptions et attitudes face à l'intégration de cette technologie dans le processus d'apprentissage. Une méthode de recherche mixte a été adoptée, combinant une approche expérimentale et des entretiens semi-structurés avec des étudiants de troisième année à l'Université Abbès Laghrour de Khenchela, en Algérie. L'échantillon comprenait 30 participants, répartis équitablement entre un groupe témoin et un groupe expérimental. Pour évaluer les niveaux d'anxiété avant et après l'intervention, l'échelle PSCAS (Public Speaking Class Anxiety Scale) a été utilisée. L'analyse statistique à l'aide du test t pour échantillons appariés a révélé que la HiVR a significativement réduit l'anxiété de prise de parole chez les étudiants du groupe expérimental. De plus, les données qualitatives issues des entretiens ont montré que les étudiants considéraient la HiVR comme un environnement engageant, motivant et moins intimidant pour pratiquer l'expression orale, ce qui a contribué à renforcer leur confiance et à réduire leur peur d'être jugés. Ces résultats offrent des pistes prometteuses aux enseignants et praticiens du domaine de l'EFL pour traiter l'anxiété liée à l'expression orale en classe de langue.

Mots-clés : Anxiété de prise de parole, Réalité Virtuelle à Haute Immersion (HiVR), cours d'EFL, Échelle d'anxiété de prise de parole en public, Réalité virtuelle, Compétence orale.

الملخص

تسعى هذه الدراسة إلى استقصاء فعالية تقنية الواقع الافتراضي عالي الانغماس (HiVR) في التخفيف من قلق التحدث لدى طلبة اللغة الإنجليزية كلغة أجنبية، مع استكشاف تصوراتهم ومواقفهم تجاه دمج هذه التكنولوجيا في عملية التعلم. وقد تم اعتماد تصميم بحثي ذي منهجية مختلطة، تجمع بين المقاربة التجريبية والمقابلات شبه المهيكلة مع طلبة السنة الثالثة بقسم اللغة الإنجليزية في جامعة عباس لغرور، خنشلة، الجزائر. تألفت العينة من 30 مشاركاً، تم تقسيمهم بالتساوي إلى مجموعة ضابطة وأخرى تجريبية. ولقياس تغير مستويات القلق قبل وبعد التدخل، تم استخدام مقياس قلق التحدث في الصف (PSCAS) وقد أظهرت التحليلات الإحصائية باستخدام اختبار (t-Test) للعينات المرتبطة أن تقنية (HiVR) أسهمت بشكل ملحوظ في خفض قلق التحدث لدى أفراد المجموعة التجريبية. كما أشارت المعطيات النوعية المستخلصة من المقابلات إلى أن الطلبة اعتبروا تقنية (HiVR) بيئة محفزة وجذابة وأقل تهديداً لممارسة مهارات التحدث، مما ساعد على تعزيز الثقة بالنفس وتقليص الخوف من التقييم السلبي. وقد توفر هذه النتائج رؤى قيّمة للمعلمين والممارسين في ميدان تعليم اللغة الإنجليزية كلغة أجنبية الباحثين عن حلول مبتكرة لمعالجة قلق التحدث داخل القسم.

الكلمات المفتاحية: قلق التحدث، الواقع الافتراضي عالي الانغماس، دروس اللغة الإنجليزية كلغة أجنبية، مقياس قلق التحدث في الصف، الواقع الافتراضي، مهارة التحدث.