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الملخص:

هدفت الدراسة إلى فحص أثر الواقع الافتراضي في خفض قلق التحدث باللغة الإنجليزية كلغة أجنبية لدى المتعلمين الفلسطينيين، بالاستناد إلى إطار قلق الصف الدراسي للغة الأجنبية. عالجت الدراسة مشكلة ارتفاع مستويات القلق لدى الطلبة أثناء التحدث الإنجليزي نتيجة الخوف من التقييم السلبي، وضعف فرص الممارسة الشفوية، وسيادة الأساليب التقليدية المتمركزة حول المعلم. استخدمت الدراسة التصميم شبه التجريبي وشاركت فيها 183 طالبة من الصفين السابع والثامن في مدرسة حكومية برام الله، وقُسمت إلى مجموعتين: تجريبية تلقت تعلمًا قائمًا على الواقع الافتراضي باستخدام تطبيق PAL-VR ببيئات افتراضية بزوايا 360 درجة، وضابطة درست المحتوى نفسه باستخدام عروض تقديمية تقليدية. جُمعت البيانات عبر استبانة مختصرة مقننة لقياس قلق الصف الدراسي، وطُبقت قبلًا وبعديًا. أظهرت نتائج تحليل التباين المصاحب عدم وجود فروق دالة إحصائية بين المجموعتين بعد ضبط القلق القبلي، رغم ظهور اتجاه يشير إلى انخفاض طفيف في بعض مؤشرات القلق لدى مجموعة الواقع الافتراضي، مقابل ارتفاع نسبي في القلق لدى المجموعة الضابطة. تشير النتائج إلى أن التدخل قصير المدى بالواقع الافتراضي قد لا يكون كافيًا لخفض القلق المتجذر لدى الطلبة، لكنه يحمل إمكانات واعدة لهيئة بيئات تعلم آمنة ومنخفضة الضغوط تعزز الثقة والاستعداد للتواصل. وأوصت الدراسة بإطالة مدة التدخل، وتصميم مهام واقعية ثقافيًا، وتدريب المعلمين تربويًا لتعظيم أثر الواقع الافتراضي في خفض قلق التحدث.

كلمات مفتاحية: (الواقع الافتراضي، اللغة الإنجليزية كلغة أجنبية، القلق من تعلم اللغة الإنجليزية داخل الفصول الدراسية)

Abstract:

This study aimed to examine the effect of virtual reality (VR) on reducing English as a Foreign Language (EFL) speaking anxiety among Palestinian learners, drawing on the Foreign Language Classroom Anxiety (FLCA) framework. It addressed the persistent problem of high anxiety levels among students due to fear of negative evaluation, limited opportunities to speak English, and traditional teacher-centered practices. A quasi-experimental design was used with 183 seventh- and eighth-grade female students from a public school in Ramallah, divided into an experimental group that received VR-based instruction using the PAL-VR application with 360-degree contextual environments, and a control group that received the same content through PowerPoint presentations. Data were collected using a validated short form of an FLCA questionnaire administered pre- and post-intervention. ANCOVA results indicated no statistically significant differences between the groups after controlling for pre-anxiety levels; however, quantitative trends showed slight decreases in key anxiety indicators for the VR group, particularly physiological responses and tension during speaking, while the control group showed increased anxiety. The findings suggest that short-term VR exposure alone may be insufficient to reduce deeply rooted speaking anxiety, yet VR shows promise in creating low-stress, supportive learning environments that foster comfort, confidence, and willingness to communicate.

Keywords: (Virtual Reality (VR), English as a Foreign Language(EFL), Foreign Language Classroom Anxiety(FLCA)

## Introduction

Rapid technological progress around the world enables educators to stay current with new teaching and learning tools, making it easier to integrate updated methods into their teaching. Many of these tools are accessible online and can be adapted to meet specific educational goals, assuming they are built on learner-friendly systems that ensure equal learning opportunities for all (Lukoil, 2022).

In Palestine, where political conditions directly impact education, unstable conditions prompt educators to adopt new technological tools to transition from teacher-centered to student-centered teaching approaches (Bianchi & Hussein-Abdel Raze, 2017).

The Palestinian Ministry of Education and Higher Education (MoEHE) emphasizes the important role of teachers in supporting students throughout the learning process in Palestine and cope with new technological advancements (MoEHE, 2025).

They advocate switching from teacher-centered to student-centered learning to encourage students to take ownership of their learning and adapt their learning pace outside of EFL classes (Barham & Clarke, 2022).

Teachers should enhance student engagement and provide opportunities for independent exploration of new ideas under their guidance. This involves moving away from traditional teaching methods, which many Palestinian teachers still use without engaging students in the learning process. Consequently, large numbers of students are unable to communicate effectively orally while using EFL (Bianchi & Hussein-Abdel Razeq, 2017).

According to Dajani (2016), Palestinian EFL learners struggle with limited practice time, fear of making errors, shyness, anxiety, and low confidence when speaking EFL in the classroom. Many reach the end of secondary school still facing difficulties producing the language and articulating their ideas in English (Dajani, 2016).

These challenges are compounded by poor instructional quality, restricted access to technology, large classes, and a tendency for teachers to rely on whole-class instruction rather than group work (Scott et al., 2024).

Such conditions hinder the development of a supportive environment for improving EFL speaking skills, underscoring the teacher's role in fostering motivation and creating opportunities for meaningful communication, or "providing the environment which may help the students in English speaking" (Al Nakhalah, 2016, p. 105).

This study aimed to investigate the impact of Virtual Reality (VR) tool as a new technological tool in Palestinian public schools on reducing EFL speaking anxiety and it is significant because it pioneered the use of virtual reality to teach EFL speaking skills in Palestinian public schools. It offers students immersive and authentic opportunities to practice English and reduce speaking anxiety." In line with the Palestinian MoEHE focus on quality, student-centered learning, the findings demonstrate that VR enhances engagement, fosters learner autonomy, and promotes more confident oral communication (MoEHE, 2025).

Additionally, the study contributes to global discussions on sustainable education by highlighting VR's potential to bridge linguistic gaps, strengthen communication skills, reduce anxiety, and prepare learners for real-world challenges in the Palestinian education context. Grounded in validated assessment tools and the study addressed local barriers to technology adoption and provides practical recommendations for integrating innovative digital tools into EFL instruction. The study assumed that VR could facilitate language acquisition by creating realistic practice environments and that reducing anxiety through VR simulations can improve students' speaking performance (Monteiro et al., 2024). The study main question was:

- Does participation in the VR intervention significantly reduce post-test Foreign Language Classroom Anxiety (FLCA) compared to the control group, after controlling for pre-test anxiety levels?

## Literature Review

Anxiety involves learner's discomfort in receiving information in a foreign language; processing anxiety involves the apprehension experienced in learning and output anxiety refers to the apprehension experienced in speaking the foreign language (Onwuegbuzie et al., 1999).

According to Hung et al. (2023), many EFL learners find speaking English challenging. Despite its importance, there are few opportunities to practice speaking English. Hung et al. (2023) incorporated VR into English speaking classes using VR-simulated scenarios to investigate its impact on speaking proficiency and anxiety. Their study included 40 university students, one group of whom used the VR tool to practice speaking, while the other group used PowerPoint. Data analysis showed conflicting results: ANCOVA revealed no significant difference in oral proficiency or speaking anxiety after the intervention, but qualitative analysis of semi-structured interviews suggested that the VR environment could reduce speaking anxiety and that VR could be an effective tool for practicing speaking in real-life situations. However, the study focused on university students rather than school-aged participants. Additionally, the lack of subjectivity during the interviews may have influenced the study's results. As the author mentioned, further research on the impact of VR tools on students is essential, as is giving learners the opportunity to speak in front of not only their peers but also a public audience.

Practising public speaking in EFL boosts students' confidence, particularly among female students, including both high and low achievers (Bensalem & Alenazi, 2023). Kaplan-Rakowski and Gruber (2023) investigated the impact of VR on foreign language anxiety (FLA) during public speaking exercises among intermediate English learners. Participants completed eight public speaking sessions over three months, resulting in 160 observations for the research. The experimental group used a VR headset to speak to a virtual audience in a high-immersion VR environment, while the control group used a video conferencing platform (Zoom) to speak to a real audience. Data were collected using two questionnaires: a demographic questionnaire and an operationalised FLA questionnaire. The results of their study showed that VR technology positively impacted the practice of public speaking in a foreign language. Analysis also revealed that practicing speaking with VR was statistically significantly associated with lower FLA scores. The study also provided evidence that VR-based public speaking could be more effective in reducing FLA, as participants were able to perform in front of programmed virtual humans. Furthermore, repeated public speaking practice led to decreased anxiety levels. These findings have implications for curriculum designers in various fields where public speaking skills are important, and VR-based speaking simulations may be particularly beneficial for students experiencing anxiety during presentations, or individuals preparing for inherently stressful situations. The study recommended that future research should explore the additional factors influencing FLA, including contextual elements such as the complexity of speaking tasks, time constraints and cultural influences shaping learners' experiences. It also noted that using a self-reported FLA questionnaire could introduce bias.

Park et al. (2025) explored how VR can serve as a tool to reduce FLA and enhance confidence in public speaking. Thirteen participants completed two blocks, each of which comprised three VR-based public speaking presentations. Participants could customize their VR experience by selecting the size of the audience and the environment (classroom vs. conference room), and their avatar. Data collection included pre- and post-test FLA questionnaires, Big Five personality trait assessments, eye tracking, performance evaluations, and semi-structured interviews. The results emphasized the potential of VR as a flexible tool for language learning and professional

skill development. It allows users to manage anxiety and practise public speaking in a controlled environment. The research also linked FLA improvement to personality traits, emphasizing the role of VR in providing a personalized learning experience. Yan and Lowell (2025) examined the use of AI-enhanced, head-mounted display (HMD)-based VR technology in foreign language education. They focused on its ability to create immersive, interactive, and personalized learning experiences. The study tracked learners' speaking pace, clarity, confidence, engagement, eye contact, and posture within the VR system. AI-generated feedback and system logs supplemented this tracking, enabling analysis of interactions. The results showed that AI-enhanced VR reduced public speaking anxiety (PSA) and improved speaking performance. This highlights the effectiveness of personalized AI feedback in fostering more authentic and engaging language learning experiences which encourage learners to speak in front of public and reduce EFL speaking anxiety.

Practicing public speaking in front of a virtual audience can help reduce learners' anxiety in native English speakers. Gironcini et al. (2023) investigated the effect of graphic and acoustic features of a virtual audience on anxiety levels in a public speaking task performed in the students' native language. Forty-two young students between the ages of 20 and 63 (29 females and 13 males) participated in four public speaking sessions with different levels of audience realism (high vs. low graphic and acoustic complexity). Data were collected using questionnaires and implicit psychological measures. Results showed that the sensory-multi features (graphic and acoustic) of the virtual environment create realistic public speaking experiences, which can be effectively used within gamification strategies to improve soft skills and effectively reduce public speaking anxiety. This suggests that VR provides a safe and controlled environment in which learners can practise repeatedly, which plays a key role in reducing anxiety levels.

Using familiar objects, faces or animations, and creating suitable virtual reality environments in the classroom, appears to alleviate speaking anxiety. Ding (2024) investigated the effectiveness of highly immersive virtual reality in alleviating anxiety when speaking a foreign language. The study involved using a facial and body animation to enable the avatar to move its body, head, hands, eyes and mouth according to a predetermined set of movements. The study involved 140 Chinese English as a Foreign Language learners, who were randomly assigned to one of four groups of 35 students. These groups experienced different combinations of learning environments, including high-immersion VR and traditional classrooms. Pre- and post-tests were used to measure anxiety levels, and an ANOVA statistical test was employed for statistical analysis. Qualitative data was also collected to capture participants' descriptions of changes in anxiety when speaking a foreign language and their perceptions of the effects of highly immersive VR. The results indicated that high-immersion VR did not significantly influence students' real-life foreign language speaking anxiety. However, most students reported that high-immersion VR offered an authentic environment. This highlights the importance of designing VR tasks that are relevant to the classroom, as these factors may enhance learners' comfort and gradually reduce anxiety.

Monteiro et al. (2024) examined the use of familiar virtual faces compared to unfamiliar faces. Ten university students participated in the study. The study developed a virtual reality environment and used 3D scans and of real people to create realistic and familiar audience. The findings revealed that individuals with moderate fear of speaking in public benefited the most, as they felt more relaxed in front of a virtual audience with familiar faces. In contrast, there were no noticeable effects for others. In other words, while the study did not find a correlation between anxiety scores and other measures, it

did reveal some potential underlying patterns. It highlighted how facial expressions may play a stronger role in shaping learners' anxiety than broader physical behaviors.

Distraction is a concept that involves shifting attention from one task to another and is considered a useful strategy for mood regulation in daily life (Oikawa, 2003). Tatli and Karadag (2023) investigated whether VR distraction is effective in reducing anxiety caused by fear of public speaking. Fifty-six university students participated in the study. Students were given the Public Speaking Anxiety Scale (PSAS) and the Covid-19 Fear Scale (CFS) to complete. Pre- and post-test measures were administered using the State Trait Anxiety Inventory (STAI-I). The results of the pre-post comparisons showed statistically significant reductions on the STAI-I for all groups. The comparison of pre- and post-test results in this pilot study indicated that VR significantly reduced students' public speaking anxiety more than other methods and it recommended implementing more VR intervention programs.

Another important issue that affects student anxiety is the size of the audience, whether it is large or small. Park et al. (2023) developed an immersive VR experience to investigate the relationship between FLA, virtual audience characteristics, and learners' perceptions of the virtual audience. Seven students learning English as a second language selected their avatars and practiced presenting to a virtual audience in a realistic classroom setting. Results indicated that participants in the study exhibited elevated levels of FLA when faced with larger virtual audiences, suggesting that the size of the audience exacerbated their anxiety, presumably due to increased performance pressure. This result suggests that larger audience sizes lead to increased anxiety, probably due to greater performance pressure.

Scaffolding, which is the instructional support provided by learning tools or teachers to help learners achieve educational goals, plays a vital role in learning language. H. L. Huang (2024) investigated the use of virtual reality VR scaffolding in English as a foreign language EFL classrooms and its impact on speaking anxiety from the students' perspective. The study involved 34 Taiwanese university students and used both qualitative and quantitative methods to collect data. Qualitative results indicated a significant reduction in speaking anxiety and positive perceptions of VR-assisted learning. Qualitative findings revealed that students experienced two types of anxiety during VR learning: one related to language and the other related to technology. They also felt nervous during performance evaluations in a VR setting. Furthermore, it also highlighted the importance of adopting assessment strategies that are tailored to the unique, immersive nature of VR environments in language instruction.

In their 2024 study, Yu and Duan conducted a literature review and meta-analysis focusing on anxiety in VR and its application in language learning. They systematically analysed 41 randomised controlled trials conducted between 2008 and 2021 that examined the impact of VR technologies on language learning outcomes. Their findings revealed that VR reduces anxiety levels while enhancing motivation, performance, self-efficacy and satisfaction in language learning compared to traditional methods. The study also emphasised the importance of investigating the impact of VR on intercultural communicative competence.

## **Theoretical Framework**

### **The concept of foreign language classroom anxiety**

The construct of Foreign Language Classroom Anxiety (FLCA) proposed by Horwitz et al. (1986) described anxiety as "the subjective feeling of tension, apprehension, nervousness, and worry associated with an arousal of the autonomic nervous system." (Horwitz et al., 1986, p. 125). This concept specifically addresses the anxiety and fear that learners experience when speaking in a foreign language in classroom situations.

Key elements of the concept include communication apprehension and self-perception of language ability.

### **Communication apprehension**

Communication apprehension refers to the fear or anxiety associated with either actual or anticipated communication with others. In the context of language learning, it refers to the discomfort or nervousness of speaking a foreign language, especially in front of others. According to Horwitz et al. (1986), communication apprehension appears to “play a large role in foreign language anxiety. People who typically have trouble speaking in groups are likely to experience even greater difficulty speaking in a foreign language class where they have little control of communicative situation and their performance is constantly monitored.” (Horwitz et al., 1986, p. 127). In addition, “communication apprehension is a type of shyness characterized by fear of or anxiety about communicating with people.” (Horwitz et al., 1986, p.127). This highlights the importance of creating a supportive, low-stress environment to help learners overcome anxiety and build confidence in communicating in a foreign language. Students who struggle to speak in front of others often find it difficult to speak in foreign language classes, and anxiety can be a major obstacle to learning another language (Horwitz et al., 1986). Some students feel shy about speaking in front of others and have difficulty expressing themselves comfortably in a group. According to the FLCA construct, key concepts related to communication apprehension include: Fear of speaking; reluctance to participate; impact of fluency; impact of social interaction; and self-perception of language ability.

Students may be anxious about speaking in front of others because they fear making mistakes or being judged negatively. Horwitz et al (1986) stated that “Fear of negative evaluation, defined as apprehension about others ‘evaluations, avoidance of evaluative situations, and the expectation that others would evaluate oneself negatively.” (p.130). This suggests that students' fear of negative evaluation can hinder their participation and willingness to take risks, both of which are essential for meaningful language learning.

Additionally, anxiety can cause learners to avoid speaking opportunities or engaging in classroom activities, which negatively affects their overall language practice and development. Zhong (2013) emphasised that teachers are often puzzled by certain learners “were observed reluctant to get involved in pair/group work in class.” (p. 749). Horwitz et al. (1986) asserted that anxiety in EFL speaking makes learners avoid participating in speaking classes. Furthermore, communication anxiety can impede fluency by causing learners to hesitate or become overly cautious, which affects their ability to express themselves clearly and confidently. Feedback mechanisms significantly impact overall speaking accuracy and fluency, regardless of the training and correction circumstances. This means that peer correction is more effective than teacher correction at improving speaking accuracy, fluency and academic engagement (Li & Hu, 2024). Feedback from either teachers or peers influences EFL learners’ skills, reduces language learners’ anxiety, and contributes to language learners’ performance to improve their fluency. In addition, advanced EFL learners who have higher levels of internal anxiety tend to use filled pauses more frequently when speaking (Szyzka et al. 2024). Overall, anxiety is seen as an obstacle to fluency. Constructive feedback alleviates anxiety and supports smoother speech production, reducing reliance on filler words and enhancing fluency.

Anxiety can also affect social interactions and make it difficult for learners to interact effectively with peers and teachers in the target language. Students often feel anxious about speaking in front of others because they are afraid of making mistakes. This anxiety can cause them to avoid speaking opportunities or participating in classroom activities, which negatively affects their language development (Horwitz et al 1986). In

addition, this anxiety can interfere with social interactions, making it difficult for learners to engage effectively with peers and teachers in EFL, where social interaction plays an important role in students' speaking development. Li et al. (2023) emphasized that social interaction increases a "sense of social presence." (p. 3) This concept asserts the importance of creating a social interaction to help learners feel comfortable during speaking classes.

In conclusion, communication apprehension is a significant obstacle to learning a foreign language, as it causes a fear of speaking, a reluctance to participate and reduced fluency. This is often exacerbated by learners' fear of negative evaluation (Horwitz et al., 1986). This anxiety limits opportunities for practice and interferes with effective social interaction, which is an essential component of language acquisition. Research shows that constructive feedback from teachers or peers can reduce learners' anxiety, boost their confidence, and encourage smoother, more fluent speech (Li & Hu, 2024; Szyszka et al., 2024). Furthermore, fostering supportive and interactive classroom environments enhances learners' sense of presence, reducing apprehension and encouraging participation, thereby improving language proficiency (Li et al., 2023). Therefore, it is crucial to address communication apprehension through feedback, encouragement and meaningful social interaction in order to overcome anxiety and support the development of communicative competence in EFL contexts.

### **Perceptions of language ability**

Horwitz et al. (1986) described foreign language anxiety as "a distinct complex of self-perceptions, beliefs, feelings, and behaviors related to classroom language learning arising from the uniqueness of the language learning process." (p. 128) Self-perception of language ability refers to how learners view their own abilities in the foreign language. Low self-perceptions of language competence can increase feelings of anxiety (Horwitz et al., 1986). According to these researchers, key concepts related to self-perceptions of language proficiency include self-efficacy, confidence levels, learning motivation, and feedback reception.

### **Self-efficacy**

Learners' beliefs about their ability to perform language tasks effectively can affect their anxiety levels. Those with low self-efficacy beliefs may feel more anxious about speaking and avoid participating. Hong and Tai (2024) supported this view by demonstrating that self-efficacy when using a virtual video game was positively related to English learning and perceived enjoyment, but negatively related to learning anxiety. This suggests that strengthening learners' efficacy can play a pivotal role in reducing communication apprehension. Confident learners are more likely to participate actively, experience less anxiety and engage more fully in meaningful language tasks.

### **Confidence**

Learners' confidence in their language skills has a strong influence on their willingness to engage in speaking activities. Low confidence can lead to anxiety and discourage participation, whereas higher confidence enables learners to interact more freely and without fear. Almusharraf (2022) found that learners had above-average confidence in their pronunciation and held highly positive attitudes towards achieving a native-like English accent. The study also emphasized the importance of instructors paying close attention to learners' pronunciation needs, particularly with regard to fostering greater self-confidence. Similarly, Uchida and Sugimoto (2020) asserted that "confidence led to positive attitudes towards pronunciation instruction." (p. 1). These findings emphasize that confidence not only shapes learners' perceptions of pronunciation, but also acts as a catalyst for sustained effort and persistence. When learners feel confident in their abilities, they are more likely to take risks, practise consistently and accept feedback on their pronunciation, all of which are essential for improvement.

### **Impact on performance**

Learners who have a negative perception of their language ability may perform poorly in language-related activities due to self-doubt and heightened anxiety. This can create a cycle where poor performance further reinforces their negative self-image. Providing a stress-free environment can improve students' performance and reduce anxiety. Yasmin et al. (2024) suggested that enjoyable activities can help reduce learners' anxiety and improve their speaking performance by creating a stress-free environment. This highlights the importance of effective support in language classrooms. By fostering enjoyment and reducing stress through engaging activities, teachers can lower the affective filter. This enables learners to participate more confidently and develop their speaking skills more effectively.

### **Motivation to learn**

Self-perception can affect motivation to learn. Learners who doubt their abilities may be less motivated to practise and improve, which can perpetuate anxiety and hinder their progress. Chen (2024) found that motivation and anxiety are important individual factors that affect learning outcomes, with motivation playing a key part in alleviating anxiety. The study advised “teachers should guide students to aim high and provide more opportunities for spoken English practice.” (Chen, 2024, p. 1). According to Jiang and Fryer (2024), students' motivation increased following a VR intervention, with higher levels observed than with other pedagogical approaches. This suggests that fostering learners' self-perception and motivation could play a vital part in alleviating language anxiety. By providing supportive and engaging opportunities, such as VR-based activities, teachers can help learners to build confidence, reduce anxiety and participate more actively in speaking tasks, thus enhancing their language development.

### **Feedback reception**

Feedback is a powerful classroom tool. It helps students recognize their strengths and weaknesses, providing clear guidance on how they can improve. Effective feedback enhances performance, boosts confidence and alleviates language anxiety, which is often a major barrier in EFL contexts. When students engage in creating dialogues under the guidance of their teachers, they learn by both giving and receiving comments. This process normalizes mistakes as part of the learning process and reduces the fear of being judged. Motallebzadeh, Kondori and Kazemi (2020) explored the effect of peer feedback on learners' classroom anxiety, with a specific focus on speaking ability. They reported that peer feedback was an effective technique for alleviating students' anxiety. Further analysis of interview data revealed that students benefited from and enjoyed the peer feedback process. This suggests that feedback plays a crucial role in reducing effective barriers such as anxiety, as well as supporting academic progress. By fostering a supportive environment, feedback empowers learners to participate more confidently in classroom activities.

## **Study design**

### **Research methodology**

The study employed a quantitative data to collect information from students before and after the VR implementation

### **The school**

The study was conducted at Ziad Abu-Ein, a public girls' primary upper school in Ramallah under the Ramallah and Al-Bireh Directorate of Education. The school serves around 465 students in Grades 5–9 across 15 sections, with up to 35 students per class, and provides a spacious, well-resourced learning environment for students from varied socio-economic backgrounds. Recognized as one of Palestine's Smart Teaching schools, it participates in the national Smart Learning Project, which aims to modernize

instruction through technology, although implementation is hindered by financial, technical and strategic limitations (Khlaif & Farid, 2018). The school follows the *English for Palestine* curriculum and benefits from strong community and municipal support. It is the only public school in the West Bank with a VR lab, previously used for subjects such as Arabic and history but not for EFL instruction prior to this study. Additional facilities include smart boards, smart screens, courtyards, a theatre, and programming and robotics labs.

### Study Sample

Participants in this study were selected through convenience sampling based on accessibility and willingness to participate. The sample included 183 female EFL students in grades seven and eight (ages 12–14) from Ziad Abu-Ein Primary Upper School under Ramallah and Al-Bireh Directorate of Education. The experimental group (EG) 119 and the control group (CG) 64 female students. Students received 4.15 hours of English instruction per week in seventh grade and 5.15 hours in eighth grade. The experimental group comprised 119 students from grades 7 and 8 (sections A and C), and the control group included 64 students from grades 7 and 8 (section B). The control group was selected in consultation with the school principal and EFL teachers. Overall, 48.09% of the participants were in seventh grade, and 51.91% were in eighth grade, with an equal grade distribution in the control group. Most students (97.81%) lived in urban areas, and only 4.92% received extra English instruction outside of school. Thirty-six-point seven percent of students reported speaking an additional language, and multilingual students were more prevalent in the experimental group. Regarding their guardians' education level, 55.19% had a university degree, 37.70% had a high school diploma, and 7.10% were illiterate. University-educated guardians were more prevalent in the experimental group. The mean age of the students was 13.43 years ( $SD = 0.63$ ), indicating a relatively homogeneous sample of early adolescents. (Table 1)

**Table 1**

#### *Demographic Information of the Sample*

	Overall Sample		Experimental Group		Control Group	
	N	%	N	%	N	%
Grade						
7 <sup>th</sup>	88	48.09	56	30.60	32	17.49
8 <sup>th</sup>	95	51.91	63	34.43	32	17.49
Place of residence						
city	179	97.81	11	63.39	63	34.43
Village	4	2.19	3	1.64	1	0.55
English tuition after school						
Yes	9	4.92	4	2.19	5	2.73
No	174	95.08	11	62.84	59	32.24
Additional language(s)						

Yes	66	36.07	50	27.32	16	8.74
No	117	63.93	69	37.70	48	26.23
Students' legal guardians level of education						
University degree	101	55.19	72	39.34	29	15.85
School level	69	37.70	44	24.04	25	13.66
Uneducated	13	7.10	10	5.46	3	1.64

Mean (SD)

13.43

(0.63)

Age

*Note.* School level for student's guardians refers to legal guardians who have completed secondary school.

### Data collection tools

The questionnaire focused on foreign language anxiety in the context of EFL speaking in the classroom. It used MacIntyre's (1992) abbreviated version of the Foreign Language Classroom Anxiety Scale, originally developed by Horwitz et al. (1986). This short-form of the foreign language classroom anxiety scale consisting of 8 items was validated by Botes et al. (2022). In this section, students were asked about their level of anxiety in relation to some communication situations during EFL speaking lessons. These situations included feeling anxious even when well-prepared because they believe their peers are more proficient, experiencing physical reactions such as a pounding heart when anticipating being called on, worrying about making mistakes, feeling nervous or confused when speaking, feeling confident and unbothered by mistakes, experiencing panic when speaking without preparation, and feeling embarrassed when volunteering answers in class. Students answered on a 5-point Likert-type scale: Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree, enhanced with emojis to increase engagement (Kilic et al., 2021).

Two items (items 4 and 5) were phrased to reflect a lack of anxiety, in contrast to the rest of the scale, which reflected anxiety-provoking experiences. These items were reverse-coded for consistency during analysis. However, reliability analysis revealed that including them substantially lowered the internal consistency of the scale. To maintain both statistical robustness and conceptual clarity, items 4 and 5 were excluded from the calculation of reliability and from all subsequent analyses, in line with common practices in scale adaptation and refinement (Field, 2018; Tavakol & Dennick, 2011). Once items 4 and 5 of the anxiety questionnaire section were eliminated from the analysis, Cronbach's alpha revealed a high degree of internal consistency ( $\alpha = .911$  for the pre-questionnaire and  $\alpha = .905$  for the post-questionnaire).

### Design and development of the PAL-Virtual Reality App

The researcher collaborated with engineers from InterTech Software Company, a firm specializing in the development of VR applications (<https://tinyurl.com/3zxwkm6x>), in coordination with Palestinian EFL supervisors, the EFL team at Ziad Abu Ein Primary Upper School provided the company's Director General with selected materials from the seventh and eighth grade English text books. These materials were carefully selected

from the students' official English language curriculum. The company refined the PAL-VR application based on feedback from teachers, the school principal, and the supervisors. The final version of PAL-VR was a contextualized application that incorporated a variety of real-life scenarios and different subjects from students' lives. The VR videos the company developed were in a 360-degree immersive format, capturing a full field of view and allowing viewers to explore scenes in all directions - up, down, left, right, and behind - as if they were standing in the center of the environment. The study designed six VR scenarios based on real-life situations in Palestine. The first session, "The Animal Kingdom," took place on December 22, 2024, and the last session, "More than Just Food," took place on May 8, 2025. The participating teachers developed session plans and set goals to improve students' interactive communication skills.

### **The VR intervention**

The experimental and control groups received the same instructional content but used different technological tools. The experimental group used a virtual VR tool, while the control group used PowerPoint slides. The pedagogical differences between VR and PowerPoint stem from their different methods of engaging learners, presenting content, and supporting comprehension. VR-based learning in the experimental group provided a fully immersive experience, allowing learners to interact with virtual objects, characters, VR goggles, and explore simulated environments, such as stepping into real-world scenarios. In terms of interactivity, the VR tool promoted hands-on learning by immersing learners in tasks and simulations, allowing them to manipulate objects and directly observe results (Srdanovic et al., 2025), it allowed learners to engage in contextualized activities, such as hearing animal sounds, exploring Ramallah, and interacting with traditional objects, all while observing the outcomes of their language use in real time. In addition, the VR tool supported contextual learning by placing learners in real or simulated environments, fostering deeper understanding (He et al., 2025), whereas, the PowerPoint group's learning experience involved a traditional presentation of information, typically consisting of text, audio, videos and images, which lacks the immersive quality of VR. PowerPoint primarily promotes passive learning, where students absorb visually and verbally presented information with limited interaction. It provides abstract representations of knowledge that require learners to mentally connect theoretical concepts to their real-world applications (Nam et al., 2024).

From a pedagogical perspective, VR emphasizes experiential, immersive, and active learning, thereby fostering deeper engagement and contextual understanding. Conversely, PowerPoint prioritizes information delivery through structured presentations, ensuring accessibility but with diminished interactivity and dynamism. The selection of a particular tool is contingent upon the learning objectives, the availability of resources, and the desired level of learner interaction. For the experimental group, an application (PAL VR) utilizing 360-degree technology was developed to enhance the learning experience.

## **Results**

### **Impact of the VR intervention on experimental students' Foreign Language Classroom Anxiety**

An analysis of covariance (ANCOVA) was conducted to examine whether there was a significant difference in post-test speaking anxiety levels between the control and experimental groups, while statistically controlling for pre-test anxiety levels, as measured by the short FLCA scale. To determine whether pre-test anxiety was an appropriate covariate, Pearson correlation coefficients were calculated between pre- and

post-test Foreign Language Classroom Anxiety (FLCA) scores. The results indicated that pre-test anxiety was significantly correlated with post-test anxiety in all groups, justifying its inclusion as a covariate (see Table 2).

**Table 2**

*Correlations Between Pre- and Post-VR Intervention FLCA by Group*

Group	<i>r</i> (Pearson)	<i>p</i> -value	N	Interpretation
Control	0.550	< .001	64	Strong, significant correlation
Experimental	0.286	.002	119	Moderate, significant correlation
Combined	0.369	< .001	183	Moderate, significant correlation

Note. FLCA = Foreign Language Classroom Anxiety.

To assess the assumption of homogeneity of regression slopes, an initial ANCOVA was conducted including the interaction term between group and pre-test anxiety. The interaction term was not statistically significant:  $F(1, 179) = 3.362, p = .068, \eta^2_p = .018$ , indicating that the assumption was met. Therefore, a final ANCOVA excluding the interaction term was performed (Table 3).

**Table 3**

*Two-Way ANOVA Results for VR Intervention Effects on FLCA Scores*

Source	F	<i>p</i> -value	Partial $\eta^2$	Interpretation
Group	2.074	.152	.011	Not significant
Pre-test FLCA	28.269	< .001	.136	Significant

Note. FLCA = Foreign Language Classroom Anxiety.

The results suggest that pre-test speaking anxiety significantly predicts post-test speaking anxiety. However, after controlling for pre-test FLCA, the difference between the control and experimental groups was not statistically significant, indicating that the VR intervention did not have a significant effect on anxiety reduction.

The descriptive analysis of pre- and post-intervention anxiety levels (Table 4) revealed distinct patterns between the CG and EG. The CG exhibited increased anxiety across multiple items, most notably in the statement “*I can feel my heart pounding when I'm going to be called on in FL class,*” which showed a rise of +0.41 points, the largest increase observed. Smaller but consistent increases were also noted for items such as “*I feel anxious even when well prepared*” (+0.18) and “*I get nervous and confused when speaking*” (+0.18). In contrast, the EG demonstrated slight reductions in anxiety for key items, particularly “*heart pounding when called on*” (−0.27) and “*nervousness when speaking*” (−0.04). However, minimal change was observed for feeling “*panic when speaking unprepared*” (+0.03), suggesting this aspect of anxiety is practically unaffected by the VR intervention.

The most striking between-group difference appeared in physiological anxiety responses. While the CG reported heightened anxiety when anticipating being called on (+0.41), the EG showed a notable decrease (−0.27), indicating that the VR intervention may have helped students manage situational stress more effectively. However, anxiety related to peer comparison (“*I always feel that the other students speak the FL better than I do*”) remained stable in both groups (CG: 0.00, EG: −0.03), implying that self-evaluative anxieties were less impacted by the intervention. Total anxiety scores further reinforced these observed patterns, with the control group demonstrating an aggregate increase (+0.18) while the experimental group showed a slight decrease (−0.04). However, as noted above, this between-group difference failed to reach statistical

significance ( $p > .05$ ) while statistically controlling for pre-test anxiety levels, suggesting that while the VR intervention may have helped prevent anxiety increases seen in the control condition, its overall impact on reducing anxiety levels was minimal. This non-significant finding aligns with the small differences in mean scores observed across most individual anxiety items.

**Table 4**

*Descriptive Statistics for Foreign Language Classroom Anxiety*

Item	Control Group (CG)		Experimental Group (EG)		Difference (CG)	Difference (EG)
	Pre (M ± SD)	Post (M ± SD)	Pre (M ± SD)	Post (M ± SD)	Post – Pre	Post – Pre
Even if I am well prepared for FL class, I feel anxious about it	2.88 ± 1.34	3.06 ± 1.33	2.86 ± 1.33	2.82 ± 1.41	+0.18	-0.04
I always feel that the other students speak the FL better than I do.	3.16 ± 1.30	3.16 ± 1.35	2.82 ± 1.45	2.79 ± 1.40	0.00	-0.03
I can feel my heart pounding when I'm going to be called on in FL class.	2.73 ± 1.35	3.14 ± 1.48	3.02 ± 1.40	2.75 ± 1.45	+0.41	-0.27
I get nervous and confused when I am speaking in my FL class.	2.80 ± 1.35	2.98 ± 1.35	2.73 ± 1.37	2.69 ± 1.37	+0.18	-0.04
I start to panic when I have to speak without preparation in FL class.	2.86 ± 1.39	2.98 ± 1.35	2.86 ± 1.35	2.89 ± 1.38	+0.12	+0.03
It embarrasses me to volunteer answers in my FL class	2.88 ± 1.48	2.75 ± 1.36	2.56 ± 1.51	2.55 ± 1.45	-0.13	-0.01
<i>Total</i>	2.88 ± 1.34	3.06 ± 1.33	2.86 ± 1.33	2.82 ± 1.41	+0.18	-0.04

*Note.* Responses were measured on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree).

**Discussion:**

This study posited that anxiety is a significant obstacle to effective public speaking in EFL classes and that VR simulations can mitigate anxiety. However, the results showed no significant difference between the control and experimental groups and that the VR intervention was ineffective in reducing anxiety. These results differ from those of Park et al. (2023), who found a significant reduction in EFL scores after six VR scenarios, and from those of Kaplan-Rakowski and Gruber (2023), who found that practicing public speaking with VR tools was strongly associated with lower anxiety scores. It also differs from the findings of Hung et al. (2023), who found that VR could be an effective tool for practicing real-life speaking situations. The results of Tatli and Karadag (2023) also differed. They found that the pre-post comparisons showed statistically significant reductions on anxiety for all groups. And with those of H. L. Huang (2024) who found that qualitative results indicated a significant reduction in speaking anxiety and positive

perceptions of VR-assisted learning. These results suggest that VR alone may not necessarily reduce anxiety.

In this study, the experimental group (EG) showed slight reductions in anxiety for certain items after the VR intervention, notably “heart pounding when called on” and “nervousness when speaking.” However, minimal change was observed for the item “feeling panic when speaking unprepared,” indicating that this aspect of anxiety remained largely unaffected by the VR intervention. These results are consistent with those of Monteiro et al. (2024), who found that students feel more relaxed and less anxious when interacting with a familiar virtual audience. They are also consistent with the findings of Yan and Lowell (2025), who reported that AI-enhanced VR reduced public speaking anxiety and thereby improved speaking performance, and with Ding (2024), who indicated that high-immersion VR did not significantly influence students’ real-life foreign language speaking anxiety.

The lack of statistically significant difference between the control and the experimental groups suggest that a short-term VR intervention alone may not be sufficient to overcome deeply rooted source of anxiety experienced by Palestinian EFL learners. In addition, VR is completely new EFL learning environment at Ziad Abu Ein Primary Upper School, its unfamiliarity may initially add pressure, especially in the absence of extensive training or gradual integration of VR tool. Conversely, the CG exhibited increased anxiety across multiple items, most notably in response to the statement “I can feel my heart pounding when I know I’m going to be called on in FL class,” which saw the largest increase. Smaller but consistent increases were also noted for items such as “I feel anxious even when I’m well prepared.” and “I get nervous and confused when speaking.” This increase in anxiety among the CG likely reflects the pressure of traditional EFL classrooms in public Palestinian schools, where there is limited oral practice and a fear of making mistakes, which intensifies nervousness rather than reducing it.

Anxiety can cause learners to avoid speaking and participating in classroom activities, negatively affecting their overall language practice and development (Zhong, 2013). To address this issue, EFL teachers at Ziad Abu Ein Primary Upper School promoted pair and group work during the VR intervention. This provided students with supportive opportunities to practice speaking in a less threatening environment, which helped reduce anxiety. Additionally, EFL teachers at Ziad Abu Ein Primary Upper School offered constructive feedback to help students recognize their strengths and weaknesses. This approach has been shown to alleviate speaking anxiety and promote learner confidence (Motallebzadeh, Kondori, & Kazemi, 2020). Motivation also plays a crucial role in reducing anxiety. Research indicates that students’ motivation increases following VR-based interventions, often surpassing levels observed with traditional pedagogical approaches (Jiang & Fryer, 2024). Moreover, learners’ confidence in their language abilities impacts their willingness to participate in speaking activities. Low confidence tends to increase anxiety and discourage engagement, while higher confidence enables learners to communicate more freely and actively in EFL classrooms.

At Ziad Abu Ein Primary Upper School, learners interacted with greater confidence and less fear. This allowed them to be more motivated to attain a native-like English accent (Almusharraf, 2022), thereby addressing gaps in self-confidence. This increased confidence led to more positive attitudes toward anxiety and supported the development of learners’ self-assurance (Uchida & Sugimoto, 2020). Together, these findings suggest that targeted feedback and motivational support are essential in building learners’ confidence and reducing EFL speaking anxiety. Consequently, learners become more

willing to take risks, engage in regular practice, and accept corrective feedback. These behaviors help lower anxiety levels and enhance EFL speaking performance.

## **Conclusion**

The study assumed that VR has the ability to reduce EFL speaking anxiety through VR simulations. However, no statistically significant differences were observed between the control and experimental groups. Although the experimental group showed slight reductions in anxiety in certain areas, these results support the study's initial hypothesis that anxiety is a barrier to effective speaking in the classroom and that VR simulations can reduce EFL anxiety (Monteiro et al., 2024). The lack of an overall impact suggests that a short-term VR intervention alone may be insufficient to overcome deeply rooted sources of anxiety, particularly in the unfamiliar VR context of Palestinian EFL classrooms. In contrast, the CG's increased anxiety highlights the pressures of traditional classrooms in public schools, where limited oral practice and the fear of making mistakes exacerbate nervousness.

The findings suggest that VR may help reduce speaking anxiety in EFL learners in Palestine by providing immersive, low-stress environments where students feel less judged. Although the results were not statistically significant, there was clear evidence of a tendency toward lower anxiety and greater comfort speaking English. Allowing learners to practice in culturally familiar VR scenarios and choose comfortable peers further reduced anxiety. These results suggest that VR has the potential to foster confidence and the willingness to communicate, warranting further large-scale investigations focused specifically on reducing anxiety in EFL speaking classes. The study recommends using VR to create low-anxiety EFL environments that allow for gradual, supported speaking practice and reduce the fear of negative evaluation. To enhance learner comfort and emotional safety, create culturally familiar and well-structured VR scenarios. Teachers should receive training on how to use VR pedagogically to manage and reduce students' language anxiety. Future studies should examine the long-term effects of VR on foreign language anxiety, especially speaking anxiety. Furthermore, more research is needed to understand how learner characteristics, task types, and teacher training influence anxiety levels in VR-based EFL learning.

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