INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN PROGRESSIVE EDUCATION & DEVELOPMENT

OPEN ACCESS JOURNAL

Vol 14, Issue 01, (2025) E-ISSN: 2226-6348

Leveraging Virtual Reality to Address Listening Challenges in ESL Learning: A Malaysian Secondary School Perspective

Madihah Mohamad Idris, Melor Md Yunus, Hanita Hanim Ismail

Faculty of Education, Universiti Kebangsaan Malaysia, 43600, Bangi, Malaysia

Email: madihahmidris@gmail.com, melor@ukm.edu.my, hanitaismail@ukm.edu.my

To Link this Article: http://dx.doi.org/10.6007/IJARPED/v14-i1/24910 DOI:10.6007/IJARPED/v14-i1/24910

Published Online: 25 March 2025

Abstract

This study investigates the impact of Virtual Reality (VR) on the listening comprehension of secondary school students learning English as a Second Language (ESL) in Malaysia. The virtual reality tech in teaching and learning listening skills can overcome these limitations since students has many obstacles on their way to master limited vocabulary, and lack of exposure to the inauthentic language environment. This study involved 30 Form Two students and compared traditional methods of teaching English as a second language (ESL) with virtual reality (VR) methods. Results show the VR group improved on listening comprehension scores, supporting the idea that immersive, interactive VR environments can help ESL learning. The study further investigates student attitudes towards VR in ESL learning, highlighting their positive perceptions and high engagement levels.

Keywords: ESL, Virtual Reality, Immersive Learning, Educational Technology, Malaysia

Introduction

Being proficient in English has becoming a vital aspect and need for Malaysians as it is a skill that is required for academic success and for future prospective careers. As proficiency in English is classified in four aspects, which are reading, writing, speaking and listening. Whilst all aspects are crucial in learning English as a Second Language (ESL), listening is an underrated skill that is critical for an effective communication. However, despite its crucial importance, secondary school students in Malaysia often meet considerable difficulties in mastering this skill effectively. These difficulties was primarily due to the traditional educational approaches that have often fail to provide adequate practical language experience and engaging learning contexts (Aziz & Kashinathan, 2021). This is because the way ESL has been taught in Malaysia has always been to typically involve classroom-based learning and textbook exercises, which may not effectively simulate the dynamic nature of real-life language use. The current curriculum and fast pace world and the new generation of students who are internet and technology-savvy is not moving in a parallel way together but instead diverging altogether. This gap in the current education sector suggests that there is an immediate action needed to innovate on innovative teaching methods that integrate more realistic and interactive elements to improve language learning.

The current hot topic trend that has surged to become the solution to these challenges is Virtual Reality (VR) technology. It is a technology that offers an extensive, promising and ever expanding potential in offering immersive learning environments that could transform the way language skills are taught and learned in ESL. VR has much to offer as it has a unique platform wherein students can engage with language in its natural context, which could lead to better comprehension and retention (Huang et al., 2020). Thus, the purpose of this study is to evaluate VR's effectiveness in ESL education, with special attention to enhancing listening comprehension skills of Malaysian secondary school students. Two primary research questions guide the investigation: 1) How does the VR-based listening comprehension compare to traditional listening comprehension? Second, what attitudes do students hold towards VR as a medium for ESL learning? Using a quasi-experimental design, this study presents a comparison between students who participate in VR-based learning environments and those who receive lessons via traditional means. “Doing this will help us determine if VR can offer a more powerful and engaging learning experience.” These findings from this study are anticipated to provide valuable insights on the role of VR technology in overcoming the persistent challenges and enhance the educational landscape in Malaysia related to ESL education. The knowledge from these dimensions will benefit the ESL teachers or practitioners, thus it has the potential of directly or indirectly (through developing the teacher education programs) impacting the ESL field of practice in Malaysia and globally.

Research Questions

a) Does VR-based learning significantly improve listening comprehension in ESL students compared to traditional methods?
b) What are students' attitudes towards VR learning for ESL?

ESL Learning and Listening Challenges

ESL learners often struggle with listening comprehension due to limited vocabulary, unfamiliarity with accents, and lack of exposure to authentic language (Jiang et al., 2022). Aziz and Kashinathan (2021) investigated the difficulties that ESL learners encounter in Malaysian classrooms and urged that those issues be resolved through new and unique strategies. The study was qualitative in that interviews were conducted with ESL teachers and students to understand the various challenges faced in the learning process. The studies pointed out that difficulties were observed in Listening comprehension, Ability to comprehend idioms, and Rate of spoken language. Similarly, Ying et al. (2021) performed a literature study on how ESL learners examined how social media and video conferencing tools helped address ESL listening difficulties during the COVID-19 pandemic.

The review integrated findings of different studies mainstreamed the idea regarding how digital learning resources can support learners by offering authentic language inputs and interactive learning practices. Based on their findings, the authors argued that the possibility of integrating technology in the classroom, the existing chasm between the classroom and actual language use, could be useful in improving listening skills. These studies stress the need to find practical ways to enhance the listening comprehension of ESL learners and the call for a conceptually innovative way of teaching centered on the effective use of emergent technologies to enhance learning.

The credibility of these articles can be regarded as high because they were published in peer-reviewed journals, and the cause is limited to ESL learning in Malaysia only. This paper is useful for understanding the difficulties faced by Malaysian ESL learners, as Aziz and Kashinathan based their research on accounts of teachers and learners. Due to the flexibility of the qualitative approach, the researchers can go deeper into the listening comprehension process, revealing many important details and aspects that support the findings.

In contrast, Wulyani et al. (2023) review makes a systematic attempt to identify possible solutions through the use of digital technology and gathers data from several studies to give a cross-sectional view of the topic. The systematic undertaking of the literature review makes the conclusions more reliable because evidence from the existing literature is adequately reviewed. Collectively, these articles set up the rationale for new directions regarding listening difficulties in ESL instruction and the groundwork needed to consider the application of VR technology in this context.

Virtual Reality in Language Learning

Virtual reality has emerged as a promising tool for enhancing language learning experiences (Karuppannan & Mohammed, 2020). Huang et al. (2020) reviewed the use of Augmented Reality and Virtual Reality to improve language learning and its strengths and difficulties. The review included 58 articles from 2010-2019 justifying the extent of AR and VR applications in language learning environments. The results showed that AR and VR in teaching allowed the programmer to create a more engaging and interactive learning environment that increases learner motivation and language proficiencies. However, the authors also emphasized the lack of high methodological research and the necessity to study learners' characteristics and instruction technologies when using these technologies. Likewise, Chen et al. (2021) conducted a meta-synthesis of the effects of using VR for language learning and identified the impact of VR on different language learning aspects, including liking comprehension. Their meta-analysis examined 24 studies conducted between 2010 and 2020 with a sample of 1,321 participants. The findings indicated that integrating VR into language learning improved comprehensible language learning, specifically listening and speaking. The authors attributed these positive results to the worth of the VR affine environment, which enables the learners to use the language naturally and be exposed to natural language input. These papers provide a positive beginning for addressing technology applications in VR to improve ESL and identify directions for further research to consider factors in which VR might improve learning and teaching.

These articles are reliable because the writers followed a systematic approach and effectively executed the scientific procedures appropriately. The research article by Huang et al. (2020) explains the methods employed to search, select, and compare relevant literature systematically and consistently. This approach helps to minimize the subjectivity of the results and brings more effectiveness to the possibility of repetition of these results (Lo, 2023). Similarly, the meta-analysis by Annamalai et al. (2021) employs statistical procedures to integrate multiple studies' findings into one and provide a more general overview of the effectiveness of the VR-assisted language learning intervention.

VR Integration in Malaysian ESL Education

The integration of VR technology in Malaysian ESL education has gained attention in recent years (Marrahi-Gomez & Belda-Medina, 2024). In the Malaysian high school context, Raman et al. (2024) investigate whether the integration of VR would benefit ESL learners' English Verbal Communication Skills. The researchers evaluated the effectiveness of VR-based learning activities using a mixed methods approach, including self-administered questionnaires, interviews, and observation. The study established that students who learned through VR could gain much more fluency, pronunciation, and overall confidence than those taught in the normal class environment. The authors attributed such improving results to the exposure of learners to VR environments where they can practice the language in real contexts and minimize stress arising from f2f communication. Similarly, Hashim, Osman, and Ismail (2024) examined the effect of using VR in English subjects on the learners' motivation in a Malaysian secondary school. It was a quasi-experimental research comparing the results of virtual reality applications for students and traditional classroom approaches. The findings indicated that the students who utilized the VR learning paradigm demonstrated increased motivation, learning participation, and inter-lexical comprehension than those in the conventional learning paradigm. VR technology shows considerable promise as a supportive tool for improving ESL education in Malaysia and, more so, in learner autonomy and realistic language practice (Tang, 2024). These studies highlight the significant potential of integrating VR technology into Malaysian ESL education. The information presented in these studies would be useful in identifying the synergy of integrating VR in Malaysian secondary schools and the strengths and weaknesses of adopting this technology.

The reliability of these articles can be viewed in the special focus of the articles on the Malaysian ESL context and the use of sound research methods. Conducting both quantitative and qualitative research helps to provide a rounded picture of how the integration of virtual reality into learning affects the spoken language abilities of learners (Yaccob et al., 2022). Employing various data collection tools increases the credibility of the results and offers a richer view of learning. Likewise, the quasi-experimental design provides optimal comparison results between learning outcomes of the VR-assisted learning environments and actual class learning environments while accounting for factors that may affect the results. The results are similar because the same concepts are employed, and statistical techniques are utilized, which increases the external validity of multiple settings. In addition, both articles are published in various peer-reviewed and international journals and may be considered reliable. The factors enhance the reliability of the findings and provide the groundwork for future research about VR in Malaysian ESL (Yu & Xu, 2022).

Emerging Trends and Future Directions

The use of VR technology in language learning has been a topic of extensive discussion, and new trends and directions have been identified in recent years (Mozaffari & Hamidi, 2023). Hasumi and Chiu (2024) conducted a performance analysis of LE towards technology-aided language learning, focusing on basic research and prospects in English language education. The information emphasized a growing number of studies concerning integrating VR and AR into language learning by emphasizing learners' interest and realism. Learner characteristics such as learning style and preference were other aspects that the authors identified when designing and facilitating VL2 learning with VR (Pham et al., 2022).

Similarly, Luo et al. (2023) systematically synthesized the literature on xReality (XR) in the English classroom to describe its advantages, limitations, and further development. The review synthesized 42 articles published between 2010 and 2022, emphasizing the extent of XR in teaching and learning various facets of English, such as listening, speaking, reading, and writing. Learners trained using XR technologies would be motivated to learn and interact more, consequently improving language acquisition (Sharifuddin & Hashim, 2024). Nevertheless, the authors pointed out the limited methodological rigor of the studies, the relevance of approaching the use of instructional designs and learners, and the possible difficulties in using XR technologies in learning environments. These studies present the future developments and potential research directions for using VR in language learning and present useful information about the factors that must be considered when using VR in ESL interventions.

Challenges and Opportunities in Implementing VR for ESL Education

Implementing VR technology in ESL education presents challenges and opportunities (Qazi et al., 2024). Esteves et al. (2023) review studies that show design recommendations for using immersive VR for teaching ELLs in English as a second language. The paper reviewed 25 articles published between 2015 and 2022 to identify the contributing design principles and guidelines for the design of effective language learning in VR environments. The research emphasized several crucial aspects, including the independent learner initiative, the interaction design, feedback systems, and cultural sensitivity when it comes to developing applications with virtual reality in the context of ESL learning and teaching. The authors also highlighted the role of social interactions between teachers, instructional designers, and VR designers to guarantee that the applications fit the needs and demands of language learners and marry other principles of good practices in language education. In addition, it has been reported that “students had a low level of self-efficacy and lacked the effort to do well” (Yunus & Abdullah, 2011, p.2636)

In a related study, Adnan (2020) investigated the move from integrated teaching to engaging learning in Malaysian universities through 360 videos and VR. The research also used interviews to understand students' and educators' experiences and perceptions about incorporating these technologies. Although VR and 360-degree videos are effective tools for increasing student motivation and creating natural conditions for learning, there are some issues with technological implementation, teachers’ professionalism, and lesson planning (Ramalingam et al., 2022). The author asserted that all stakeholders must be engaged when implementing VR in Malaysian education, suggesting that it is the easiest way of addressing the challenges outlined. These studies raise the discussion of both the theoretical framework and the practical considerations involved in the lessons learned from incorporating VR technology in teaching ESL and call for a coherent and integrated approach to implementing the idea for it to be effective.

Methods

Research Design & Sampling

A quasi-experimental design incorporated the pre-test and post-test to then assess the influence of VR -learning when compared to traditional ESL learning. The research sample consisted of 30 Form Two students aged fourteen, enrolled in a secondary school located in

Perak, Malaysia. The students were separated into: the experimental group, which used VR tools for learning, and the control group, which used the textbook-based approach.

Materials and Instruments

Virtual Reality instruments was utilized, which is the Meta Quest 3 headset alongside its developed software. This software included interactive VR scenarios—like virtual places of various kinds and guided tours—crafted to mirror authentic linguistic environments. Meanwhile, the control group used resources which are ESL textbooks, audio recordings, and direct instruction, all aligned with the Malaysian ESL curriculum.

The researcher used 3 applications available on the Meta Quest 3 Application Database to conduct the learning. The name of the applications are as follows: VR CHAT, FIRST HAND APPLICATION, FIRST ENCOUNTERS APPLICATION. (Refer to Appendix for In-Game Screenshots). All 3 application require students to focus their listening skill with VR Chat being the only open-world application of all of them, hence allowing students to approach listening skills in real time with real participants who were also using the VR Chat application.

Data Collection Procedures

The study spanned six weeks and unfolded in several phases: Initially, all participants completed a standardized listening comprehension test to establish a baseline for their abilities. Afterwards, the experimental group with 15 students altogether was given a 30 minute slot individually each week to use the VR headsets with the software for interactive VR scenarios over the course of 6 weeks. Their learning is purely based on interactions from virtual places of various kinds and guided tours—crafted to mirror authentic linguistic environments.

Week	Application Used - META QUEST 3 APP DATABASE
1	FIRST ENCOUNTERS
2	FIRST HAND APP 1
3	FIRST HAND APP 2
4	FIRST HAND APP 3 & VR CHAT (WORLD)
5	VR CHAT (WORLD)
6	VR CHAT (WORLD)

Meanwhile, the control group was taught with the usual, standard traditional resources in class using their ESL textbook and audio recordings. This group was also only given 30 minutes slot each week for their learning. At the end of the six-week period, both groups retook the same listening comprehension test to assess any improvements. To gather insights into the participants' experiences, questionnaires were administered to explore their subjective perceptions of the learning methods used.

Data Analysis Method

In this study, quantitative data were analysed to assess the effectiveness of VR in improving ESL listening comprehension among Malaysian secondary students. A statistical methods was used to evaluate the data collected from the pre- and post-intervention tests.

Findings

To achieve the objectives of this study, the pre-test and post-test scores were put to a statistical lens as seen in Table 1. Both groups showcased an increase in their scores overall.

Table 1

Pre-Test and Post Test Scores of The Two Groups

Student ID	Group	Pre-Test Score	Post-Test Score
1.	Experimental VR Lab	65	75
2.	Experimental VR Lab	61	73
3.	Experimental VR Lab	65	79
4.	Experimental VR Lab	70	74
5.	Experimental VR Lab	61	72
6.	Experimental VR Lab	61	85
7.	Experimental VR Lab	71	77
8.	Experimental VR Lab	66	78
9.	Experimental VR Lab	59	71
10.	Experimental VR Lab	65	75
11.	Experimental VR Lab	59	79
12.	Experimental VR Lab	59	73
13.	Experimental VR Lab	63	80
14.	Experimental VR Lab	52	75
15.	Experimental VR Lab	53	77
16.	Control Normal No VR	57	64
17.	Control Normal No VR	72	66
18.	Control Normal No VR	61	73
19.	Control Normal No VR	55	70
20.	Control Normal No VR	66	59
21.	Control Normal No VR	54	70
22.	Control Normal No VR	62	66
23.	Control Normal No VR	49	64
24.	Control Normal No VR	53	71
25.	Control Normal No VR	62	73
26.	Control Normal No VR	65	73
27.	Control Normal No VR	62	64
28.	Control Normal No VR	60	66
29.	Control Normal No VR	59	70
30.	Control Normal No VR	52	73

In Table 2, the analysis of pre-test and post-test scores showed certain differences in listening comprehension improvements between the experimental group (VR-based learning) and the control group (traditional ESL instruction). The pre-test scores showed not much difference between the groups, with an average score of 62% (SD = 5.4) for the experimental group and 61% (SD = 5.9) for the control group, confirming baseline equivalence.

Table 2
Descriptive statistics comparing the mean scores of the two groups for the pre- and post- test

Group	Pre-Test Mean (SD)	Post-Test Mean (SD)	Mean Difference	t-value	p-value
Experimental	62% (5.4)	78% (4.6)	+16%	5.32	<0.001
Group	61(%) (5.9)	68 (5.2)	+7%		

After completing the six-week instructional period, the experimental group exhibited a statistically significant enhancement in their listening comprehension scores, attaining an average post-test score of 78% (SD = 4.6), whereas the control group averaged 68% (SD = 5.2). The improvement in scores, determined through a paired t-test, was significant ($t(28) = 5.32$, $p < 0.001$). This indicates that VR-based instruction had an impactful effect on advancing listening skills as opposed to traditional teaching methods.

In regard to the Questionnaire Response (Appendix 1), the result the analysis involved responses from students regarding their experiences with Virtual Reality (VR) in enhancing English as a Second Language (ESL) learning. Students rated 20 statements related to the impact of VR on listening comprehension and their attitudes towards VR learning, using a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

The analysis yielded insights into students' perceptions of VR's applicability in ESL contexts. Descriptive statistics, including means, medians, and standard deviations, were calculated for each question to understand the central tendency and variability of responses. Additionally, frequency distributions were examined to gauge the spread and concentration of responses across different Likert categories.

Table 3
Questionnaire Questions

Impact of VR on Listening Based Learning	
1.	The use of VR technology helped me understand spoken English better.
2.	Listening tasks in VR environments felt more authentic than traditional methods.
3.	VR-based learning made me feel more confident in my listening skills.
4.	I was able to focus better during VR-based listening activities compared to traditional methods.
5.	The VR scenarios enhanced my ability to comprehend English in real-life situations.
6.	The feedback provided in VR activities was useful for improving my listening comprehension.
7.	I experienced noticeable improvement in my listening skills after participating in VR sessions.
8.	The pace of the VR-based activities was suitable for my learning needs.
9.	The audio quality in the VR activities supported my understanding of spoken English.
10.	I think VR-based learning can be a valuable tool for students struggling with listening comprehension.
Attitudes Towards VR Learning for ESL	
11.	I enjoyed using VR as part of my ESL learning experience.
12.	VR-based learning made the sessions more engaging compared to traditional methods.
13.	I would like to use VR for learning other aspects of English besides listening.

14.	The immersive nature of VR enhanced my overall learning experience.
15.	I felt motivated to participate in the VR-based lessons.
16.	Using VR made me feel like I was in a real English-speaking environment.
17.	I would recommend VR-based learning to other students learning English.
18.	I found VR-based learning to be more effective than traditional methods for learning ESL.
19.	The use of VR technology increased my interest in improving my English skills.
20.	I felt that the VR system was easy to use and navigate during the learning sessions.

Table 4

Questionnaire Responses

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Median	Standard Deviation
Q1	2	6	7	9	6	3.34	3.0	1.23
Q2	2	7	10	7	4	3.14	3.0	1.16
Q3	1	4	9	10	6	3.52	4.0	1.09
Q4	1	5	8	7	9	3.62	4.0	1.21
Q5	2	4	8	7	9	3.55	4.0	1.27
Q6	1	6	13	7	3	3.17	3.0	1.00
Q7	1	5	8	9	7	3.52	4.0	1.15
Q8	3	4	10	6	7	3.34	3.0	1.29
Q9	1	5	8	7	9	3.59	4.0	1.21
Q10	2	5	8	10	5	3.38	4.0	1.18
Q11	1	5	8	9	7	3.52	4.0	1.15
Q12	1	5	8	5	11	3.69	4.0	1.26
Q13	2	4	8	10	6	3.45	4.0	1.18
Q14	1	5	9	5	10	3.62	4.0	1.24
Q15	1	4	9	9	7	3.55	4.0	1.12
Q16	2	5	10	6	7	3.38	3.0	1.24
Q17	1	5	7	11	6	3.52	4.0	1.12
Q18	2	6	8	6	8	3.41	3.0	1.30
Q19	1	5	7	9	8	3.59	4.0	1.18
Q20	1	5	8	9	9	3.62	4.0	1.21

Question 1 until 20 assess the students' attitudes and responses towards virtual reality learning for ESL and the impact of VR on listening comprehensions. The overall responses indicated a positive reception of VR in ESL learning, with mean scores predominantly above the neutral midpoint of 3.0 across all items. This reflects a general consensus on the effectiveness of VR in enhancing learning experiences. The observed variability in responses underscores the subjective nature of technology adoption in educational contexts. It suggests that while VR is generally perceived as beneficial, the degree of its impact varies among individual learners. Such variations could be attributed to differences in prior exposure to technology, personal learning preferences, or the specific VR content encountered.

The independent t-test comparing the average Likert scale responses between the two constructs—Impact of VR on Listening Comprehension (Questions 1-10) and Attitudes Towards VR Learning (Questions 11-20)—resulted in the t-statistic of -0.40094 indicates a minor difference in the means of the two groups, with the direction being such that the 'Impact of VR on Listening Comprehension' group might have slightly lower mean scores than the 'Attitudes Towards VR Learning' group. However, the p-value of approximately 0.69 suggests that this difference is not statistically significant.

This means that there is not much emphasis on a statistical evidence to support the claim that the perceptions of the impact of VR on listening comprehension and attitudes towards VR learning differ significantly among the students. The high p-value indicates that any differences could likely be ascribed to random variation rather than a systematic difference between the groups.

Given the lack of a significant difference, it can be inferred that the students' insights of the efficacy of VR technology in enhancing their ESL learning, both in terms of listening comprehension and overall attitudes towards VR learning, are broadly consistent. This suggests that interventions or studies focusing on either of these aspects of VR in ESL can expect similar levels of reception or effectiveness in terms of student perceptions.

The results indicate that virtual reality has a great potential for improving listening comprehension of ESL students by providing them with immersive and interactive learning experiences that other conventional ways may not offer. Nonetheless, utilizing this type of information technology in educational environments must be properly weighed up against tech difficulties and instructor schooling to optimize its efficiency and also to produce a positive prior experience for students.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Impact of VR on Listening Based Learning	30	1.00	5.00	3.4200	1.07780	-.378	.427	-.664	.833
Attitudes Towards VR Learning for ESL	30	1.00	5.00	3.5333	1.11149	-.456	.427	-.773	.833
Valid N (listwise)	30								

Figure 1. Descriptive Statistics for Impact of VR on Listening Based Learning and Attitudes Towards VR Learning for ESL

The students rated their experiences on a scale from 1 to 5, where the mean score was 3.5333, indicating a moderately positive perception of VR's role in enhancing listening skills. The standard deviation stood at 1.11149, reflecting a moderate spread around the mean. The distribution of these scores was slightly negatively skewed (-0.456), suggesting a trend towards higher ratings. The kurtosis was -0.664, indicating a flatter spread of responses, deviating from a normal distribution. In terms of the Attitudes Towards VR Learning for ESL, this measure ranged from 1 to 5, with a mean score of 4.2, reflecting a generally favourable attitude towards VR in ESL learning. The standard deviation was slightly narrower at 1.07780. The skewness of -0.378 and a kurtosis of -0.773 both pointed to a flatter and modestly skewed distribution favoring higher scores.

The study findings indicate a positive reception of VR technology among the participants, with the majority viewing VR as a beneficial tool for ESL learning. This aligns with the hypothesis that immersive learning environments could significantly bolster language comprehension and learner engagement. The variability in scores, as indicated by the standard deviations, suggests diverse experiences with VR, which may be influenced by individual differences in technology interaction, learning preferences, and prior exposure to VR.

The distributions characterized by negative skewness and flatter kurtosis imply that while the general reception of VR is positive, there exists a subset of participants who did not rate the impact and effectiveness of VR as highly. This could highlight the nuanced nature of technology-based learning where not all learners uniformly benefit from such interventions. These results bolster the argument for incorporating VR into ESL curriculum frameworks, suggesting that VR can enhance learning experiences and outcomes effectively. This endorsement of VR is particularly pertinent in the context of catering to digital-native learners, who are often more receptive to technology-enhanced learning environments. Moreover, the noted variability and distribution characteristics suggest that while VR is generally well-received, educational technologists and curriculum designers should consider the inclusivity and accessibility of VR-based learning to ensure equitable educational benefits.

Discussion

Virtual Reality Capability to Enhance ESL Skill

Listening comprehension is a key and difficult-to-master aspect of language acquisition that poses read more significant challenges for ESL learners stemming from their restricted vocabulary, accents that lead to unintelligibility, and the pace of delivered speech (Jiang et al., 2022). Due to VR's ability to simulate immersive, real-life linguistic environments, it has the potential to revolutionise this process. The findings from our study are thus consistent the evidence emerging from prior studies demonstrating that immersive VR environments can create a highly immersive and context-sensitive language learning environment, which significantly improves the learners' listening-comprehension ability through experiential language exposure (Chen et al., 2021; Huang et al., 2020). VR can be particularly beneficial in Malaysian ESL education, as students here face systemic challenges in listening skills resulting from limited exposure to naturalistic language situations (Aziz & Kashinathan, 2021), where the immersive experience of VR can help connect the dots between their in-class instruction and the real world. This was in accordance with the previously characterized pedagogical needs from studies, calling for technology integration in innovative ways to meet educational challenges (Ying et al., 2021).

Student Attitudes Towards VR Learning

The positive attitudes toward VR learning revealed in this study are vital because they indicate a willingness of students to adopt new technologies for learning. This is important since motivation and engagement are fundamental determinants of successful language acquisition (Annamalai et al., 2021). VR can thus contribute towards driving these factors and this has transformative implications, especially for ESL education in Malaysian, where these traditional pedagogy of education may not be sufficient to drive students engagement. Interestingly enough, both of these positive perceptions also embody the prevailing trends in education where there is a growing awareness to develop digital literacies and embrace

technology in educational planning (Karuppannan & Mohammed, 2020). The enthusiasm shown towards VR during this research shows a clear signs of students wanting to adapt and begin using new technologies as they become available, showing that student attitudes may be shifting away from traditional learning models and opening students up to more interactive learning environments as echoed in Rajendran and Yunus (2021) that stated learning took place actively inside as well as outside the classroom contexts which translates to an interactive learning environment for students. In addition, the ease and use and fun factor has been established to be important in determining students' attitude towards the use of e-learning (Nordin et al., 2016) and therefore, use of VR can be associated to have the same impact as well.

Pedagogical Implications and Educational Strategies

Overall, the consistency and positivity of VR reception across these varying aspects of learning indicate that VR should not only be used as a supplementary tool but rather integrated as a more intrinsic aspect of ESL curriculum. This means designing holistic VR-powered language programs that cover all communicative skills from listening/speaking to reading/writing (Ironsi, 2023). But this is just one among many challenges faced with the use of VR in education. Major barriers include the cost of VR devices, the need for extensive teacher training, and the creation of appropriate and effective content (Esteves et al., 2023). Overcoming these hurdles must involve more than just the influx of funds. These are several aspects that should be taken into account by educators and policymakers to enable VR technologies by sense of engagement in education. This has also been echoed in that the variety of multiple learning strategies do encourage students to be more active and also increase the chance of them improving thei capability to explore new creativity in learning (Wil et al., 2019).

Although this research offers important insights into the application of VR within the ESL learning environment, valuable directions for future research include investigating the long-term effects of VR and how its different components may impact student engagement on a demographic basis. Essentially teachers must decide the best approach and teaching materials that is sufficient for their students and them "adapting ICT in the teaching and learning could boost learners' LLSs" (Bayuong et al., (2019). This has also been echoed by Lubis et al. (2011) as the usage of media is important so that materials taught become more easily understandable for the students so they can use the information easily later on. Further research must also explore possible integration of VR with other technological innovations, including Artificial Intelligence (AI) and Augmented Reality (AR), to increase the adaptability and effectiveness potential of ESL teaching tools. Such studies are likely to provide a deeper understanding of how technology is best used in language education to lead to the development of more sophisticated, learner-adaptive educational technologies.

Conclusion

This study has meaningful theoretical and contextual relevance in the realm of ESL education, especially within the Malaysian secondary school setting. In theory, it supports the theory of multimedia learning wherein immersive and interactive environments enhance comprehension of the student's learning. As this study explored Virtual Reality (VR) technology, it was shown that it creates an experimental learning space that nurture active engagement of the students thus making learning linguistic elements in a language more

accessible. In terms of contextually, the study addresses the consistent difficult challenges faced by Malaysian ESL learners. For example, the limited accessibility to authentic spoken English and the over reliance on the traditional instruction. As the study compared the VR assisted learning and the traditional ESL learning, the results revealed that VR has the potential to bridge the gap between classroom learning and also in terms of applying real world communication among the students. Therefore this research contributes and aim to improve listening comprehension and the English language proficiency of students in secondary school setting.

In conclusion, this study meaningfully adds to literature of innovative technologies' application in language education. The findings illuminate virtual reality's ability to notably enhance English as a second language learning through improved listening comprehension and fostered positive student attitudes towards the learning process. As educational technologies continue evolving rapidly, the insights from this research provide an invaluable framework for skillfully integrating virtual reality into ESL curriculums in Malaysia aiming to cultivate engaging, effectual, and learner-centered educational experiences. The uniformly enthusiastic reception of virtual reality technologies across diverse facets of English as a second language learning not only implies preparedness for educational innovation but also indicates the potential for significant transformations across the educational landscape. By skilfully harnessing this potential, educators can notably enhance language education in Malaysia and beyond, rendering it more involving, effectual, and aligned with the necessities of the digital age.

References

Adnan, A. H. M. (2020, September). From interactive teaching to immersive learning: Higher Education 4.0 via 360-degree videos and virtual reality in Malaysia. In *IOP Conference Series: Materials Science and Engineering* (Vol. 917, No. 1, p. 012023). IOP Publishing. https://iopscience.iop.org/article/10.1088/1757-899X/917/1/012023/pdf

Annamalai, N., Kabilan, M. K., Ab Rashid, R., Valūnaitė Oleškevičienė, G., & Vaičiūnienė, V. (2021). English language learning through non-technology games: A case study of international students at a Lithuanian university. *Qualitative report. Fort Lauderdale, Florida: Nova Southeastern University, 2021, vol. 26, no. 10. https://nsuworks.nova.edu/cgi/viewcontent.cgi?article=4986&context=tqr*

Aziz, A. A., & Kashinathan, S. (2021). ESL learners' challenges in speaking English in Malaysian classrooms. *Development*, *10*(2), 983-991. https://ijarped.com/index.php/journal/article/view/2201/2168

Bayuong, P. D., Hashim, H., & Yunus, M. M. (2019). Identifying language learning strategies used by ESL learners in a rural primary school. International Journal of Academic Research in Progressive Education and Development, 8(3), 151-165.

Chen, B., Wang, Y., & Wang, L. (2021). The Effects of Virtual Reality-Assisted Language Learning: A Meta-Analysis. *Sustainability*, *14*(6), 3147. https://doi.org/10.3390/su14063147

Esteves, J. R., Cardoso, J. C., & Gonçalves, B. S. (2023). Design Recommendations for Immersive Virtual Reality Application for English Learning: A Systematic Review. *Computers*, *12*(11), 236. https://doi.org/10.3390/computers12110236

Hashim, H., Ismail, H., & Raman, K. (2024). Exploring the Impact of VR Integration on ESL Leaners' English Verbal Communication Skills: A Case Study in a Malaysian High School. https://awej.org/wp-content/uploads/2024/07/10.pdf

Hasumi, T., & Chiu, M. S. (2024). Technology-enhanced language learning in English language education: Performance analysis, core publications, and emerging trends. *Cogent Education*, *11*(1), 2346044. https://doi.org/10.1080/2331186X.2024.2346044

Hoter, E., & Azulay, H. (2024). Enhancing Language Learning and Intergroup Empathy through Multi-user Interactions and Simulations in a Virtual World. *Virtual Worlds*, *3*(3), 333-353. https://doi.org/10.3390/virtualworlds3030018

Huang, X., Zou, D., Cheng, G., & Xie, H. (2020). A Systematic Review of AR and VR Enhanced Language Learning. *Sustainability*, *13*(9), 4639. https://doi.org/10.3390/su13094639

Ironsi, C. S. (2023). Investigating the use of virtual reality to improve speaking skills: Insights from students and teachers. *Smart Learning Environments*, *10*(1), 1-21. https://doi.org/10.1186/s40561-023-00272-8

Jiang, P., Namaziandost, E., Azizi, Z., & Razmi, M. H. (2022). Exploring the effects of online learning on EFL learners' motivation, anxiety, and attitudes during the COVID-19 pandemic: A focus on Iran. *Current Psychology (New Brunswick, N.j.)*, *42*(3), 2310. https://doi.org/10.1007/s12144-022-04013-x

Jerry, M., & Yunus, M. M. (2021). Blended learning in rural primary ESL classroom: Do or don't. International Journal of Learning, Teaching and Educational Research, 20(2), 152-173.

Karuppannan, S., & Mohammed, L. A. (2020). Predictive factors associated with online learning during the COVID-19 pandemic in Malaysia: A conceptual framework. *International Journal of Management and Human Science (IJMHS)*, *4*(4), 19-29.

Lo, N. P. (2023). Digital learning and the ESL online classroom in higher education: Teachers' perspectives. *Asian-Pacific Journal of Second and Foreign Language Education*, *8*(1), 1-22. https://doi.org/10.1186/s40862-023-00198-1

Lubis, M. A., Abdullah Awang Lampoh, M. M. Y., Shahar, S. N., Ishak, N. M., & Muhamad, T. A. (2011). The use of ICT in teaching Islamic subjects in Brunei Darussalam. International Journal of education and Information technologies, 1(5), 79-86.

Luo, S., Zou, D., & Kohnke, L. (2023). A systematic review of research on xReality (XR) in the English classroom: Trends, research areas, benefits, and challenges. *Computers & Education: X Reality*, *4*, 100049. https://doi.org/10.1016/j.cexr.2023.100049

Marrahi-Gomez, V., & Belda-Medina, J. (2024, May). Assessing the effect of Augmented Reality on English language learning and student motivation in secondary education. In *Frontiers in Education* (Vol. 9, p. 1359692). Frontiers Media SA. https://doi.org/10.3389/feduc.2024.1359692

Mozaffari, S., & Hamidi, H. R. (2023). Impacts of augmented reality on foreign language teaching: a case study of Persian language. *Multimedia tools and applications*, *82*(3), 4735-4748. https://doi.org/10.1007/s11042-022-13370-5

Nordin, N. M., Hamzah, M. I., Yunus, M. M., & Embi, M. A. (2010). The mobile learning environment for the in-service school administrators. Procedia-Social and Behavioral Sciences, 7, 671-679.

Qazi, A., Qazi, J., Naseer, K., Hasan, N., Hardaker, G., & Bao, D. (2024). M-Learning in education during COVID-19: A systematic review of sentiment, challenges, and opportunities. *Heliyon*, *10*(12), e32638. https://doi.org/10.1016/j.heliyon.2024.e32638

Pham, M. T., Luu, T. T. U., Mai, T. H. U., Thai, T. T. T., & Ngo, T. C. T. (2022). EFL students' challenges of online courses at Van Lang University during the COVID-19 Pandemic. *International Journal of TESOL & Education*, *2*(2), 1-26. https://doi.org/10.54855/ijte.22221

Rajendran, T., & Yunus, M. M. (2021). A systematic literature review on the use of mobile-assisted language Learning (MALL) for enhancing speaking skills among ESL and EFL learners. *International Journal of Academic Research in Progressive Education and Development, 10*(1), 586-609.

Ramalingam, S., Yunus, M. M., & Hashim, H. (2022). Exploring English as a second language educators' challenges of teaching communication skills in blended learning environments: A Malaysian scenario. *Journal of Positive School Psychology*, *6*(2), 1388-1405.

Raman, K., Hashim, H., & Ismail, H. H. (2024). Exploring the Impact of VR Integration on ESL Leaners' English Verbal Communication Skills: A Case Study in a Malaysian High School. *Arab World English Journal*. http://dx.doi.org/10.24093/awej/call10.10

Sharifuddin, N. S., & Hashim, H. (2024). Benefits and Challenges in Implementing Artificial Intelligence in Education (AIED) in ESL Classroom: A Systematic Review (2019-2022). *International Journal of Academic Research in Business and Social Sciences*, *14*(1), 146-164. https://pdfs.semanticscholar.org/1dfe/2838192fc5a24ce98c86d9d86c04da9b70e0.pdf

Shi, J., Sitthiworachart, J., & Ratanaolarn, T. (2023). Tracking the New Trends in Immersive Virtual Reality-Assisted Foreign Language Education: A Systematic Review of Empirical Studies. *World Journal of English Language*, *13*(7), 154-154.

Tang, F. (2024). Understanding the role of digital immersive technology in educating the students of english language: does it promote critical thinking and self-directed learning for achieving sustainability in education with the help of teamwork?. *BMC psychology*, *12*(1), 144. https://doi.org/10.1186/s40359-024-01636-6

Wil, C. S. C., Yunus, M. M., & Suliman, A. (2019). The use of social media to assist writing skills among secondary pupils. *International Journal of Academic Research in Progressive Education and Development, 8*(3), 224-236

Wulyani, A. N., Sata, M. R. M., & Rusdin, D. (2023). Overcoming challenges: Indonesian EFL teachers' strategies for using Moodle in high schools. *Social Sciences & Humanities Open*, *10*, 101175. https://doi.org/10.1016/j.ssaho.2024.101175

Yaccob, N. S., Yunus, M. M., & Hashim, H. (2022). The Integration of Global Competence Into Malaysian English as a Second Language Lessons for Quality Education (Fourth United Nations Sustainable Development Goal). *Frontiers in Psychology*, *13*, 848417. https://doi.org/10.3389/fpsyg.2022.848417

Ying, Y. H., Siang, W. E. W., & Mohamad, M. (2021). The challenges of learning English skills and integrating social media and video conferencing tools to help ESL learners cope with the challenges during the COVID-19 pandemic: A literature review. *Creative Education*, *12*(7), 1503-1516. https://doi.org/10.4236/ce.2021.127115

Yu, Z., & Xu, W. (2022). A meta-analysis and systematic review of the effect of virtual reality technology on users' learning outcomes. *Computer Applications in Engineering Education*, *30*(5), 1470-1484. https://doi.org/10.1002/cae.22532

Yunus, M. M., & Abdullah, N. R. K. R. B. (2011). Motivation and attitudes for learning English among year six students in primary rural school. *Procedia-Social and Behavioral Sciences, 15*, 2631-2636.

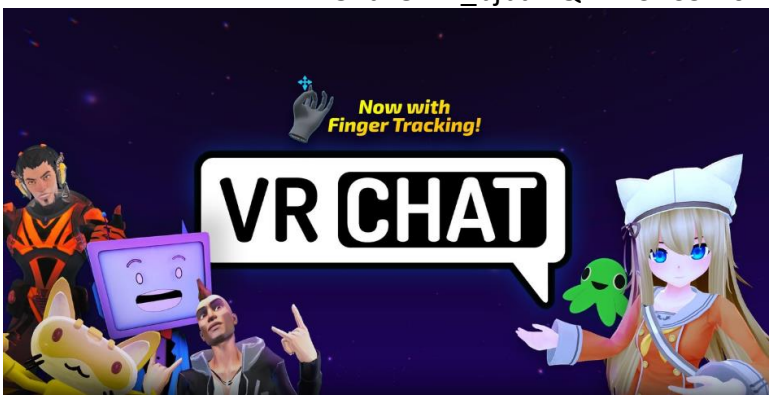
Zhao, X., Ren, Y., & L. Cheah, K. S. (2023). Leading Virtual Reality (VR) and Augmented Reality (AR) in Education: Bibliometric and Content Analysis From the Web of Science (2018–2022). *SAGE Open*. https://doi.org/10.1177/21582440231190821

Appendix 1
VR Sessions with Experimental Group VR

Appendix 2
VIRTUAL REALITY APPLICATIONS ON META QUEST 3 DATABASE

1. FIRST HAND APPLICATION
Link: https://www.meta.com/experiences/first-hand/5030224183773255/?srsltid=AfmBOoov7jY842tLOVABX2sSUSF0OqtZ-kv98hjV7xPBimu4mOBaKdQ3

2. FIRST ENCOUNTERS APPLICATION
Link: https://www.meta.com/experiences/first-encounters/6236169136472090/?srsltid=AfmBOorQGkuHwSFsdCahF4yv8pV8BtrlOB1f_bjbtkEQ27LrSNS3M6m4



3. VR CHAT APPLICATION
Link:
https://www.meta.com/experiences/vrchat/1856672347794301/?srsltid=AfmBOoou-0Lb19Z_NotHgwhVYTRDDzSnID06CKYqfsK0_kbli4rd2PAL

Appendix 3

Questionnaire: Please indicate the extent to which you agree or disagree with the following statements by selecting a number on the scale below:

Impact of VR on Listening Based Learning						
No	Questions	1 Strongly Disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree
1.	The use of VR technology helped me understand spoken English better.					
2.	Listening tasks in VR environments felt more authentic than traditional methods.					
3.	VR-based learning made me feel more confident in my listening skills.					
4.	I was able to focus better during VR-based listening activities compared to traditional methods.					
5.	The VR scenarios enhanced my ability to comprehend English in real-life situations.					
6.	The feedback provided in VR activities was useful for improving my listening comprehension.					
7.	I experienced noticeable improvement in my listening skills after participating in VR sessions.					
8.	The pace of the VR-based activities was suitable for my learning needs.					
9.	The audio quality in the VR activities supported my understanding of spoken English.					
10.	I think VR-based learning can be a valuable tool for students struggling with listening comprehension.					
Attitudes Towards VR Learning for ESL						
No	Questions	1 Strongly Disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree
11.	I enjoyed using VR as part of my ESL learning experience.					
12.	VR-based learning made the sessions more engaging compared to traditional methods.					

13.	I would like to use VR for learning other aspects of English besides listening.					
14.	The immersive nature of VR enhanced my overall learning experience.					
15.	I felt motivated to participate in the VR-based lessons.					
16.	Using VR made me feel like I was in a real English-speaking environment.					
17.	I would recommend VR-based learning to other students learning English.					
18.	I found VR-based learning to be more effective than traditional methods for learning ESL.					
19.	The use of VR technology increased my interest in improving my English skills.					
20.	I felt that the VR system was easy to use and navigate during the learning sessions.					