

Development of Virtual Reality Web-Based Learning in Teaching English Language Skills

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Abstract

The transformation of learning media is happening rapidly, requiring responsive adaptation from both learners and educators. Virtual Reality (VR)-based media has gained significant popularity among students, offering innovative and immersive learning experiences. In contemporary education, providing adequate opportunities for learners to engage deeply with the material is essential, especially in acquiring English, which is often considered challenging through traditional methodologies. This study aims to develop Virtual Reality-based educational media that provides a unique experience for learners to enhance their English language skills. The design of this media integrates a website with 360-degree images, ensuring coherence between visual content and learning materials. The selected materials have been aligned with learning outcomes and curricula relevant to the study program. This website is specifically designed for English language learning in higher education, offering an interface accessible across various browsers and devices, both desktop and mobile. Research findings indicate a significant improvement in student learning outcomes, as evidenced by pre-test and post-test scores with average values of 69.95 and 85.33, respectively. These findings suggest the effectiveness of VR media in enhancing students' English language proficiency.

Keywords: Virtual Reality; Web-Based Learning; Learning Materials; English Language

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INTRODUCTION

To enhance students' engagement in learning, creating captivating educational media that offers challenges and novel experiences that stimulate their active participation is essential. The creation of effective learning media must be grounded in robust pedagogical principles and substantiated by empirical evidence to foster a dynamic and engaging educational environment for learners. Appropriate learning media effectively convey instructional messages or educational information, facilitating the achievement of learning objectives. The lack of instructional media in English language learning will result in an inadequate attainment of academic goals (Rukiati & Susanti, 2016). Selecting appropriate learning media is crucial for facilitating effective and practical learning experiences (Desti et al., 2019). The purpose of media in the educational process is essential for attaining optimal outcomes. Learning media convey information, enhance student engagement, aid comprehension of complex concepts, and accommodate diverse learning styles. By judiciously selecting media, such as multimedia, simulations, or visual aids, educators

can cultivate a more stimulating and interactive learning environment, fostering student motivation and participation (Iswari, 2017).

Virtual Reality Media is currently receiving considerable attention and experiencing a growing trend in its utilization. It can generate an immersive experience that provides a distinct sensation to the learning process. This technology offers a significant opportunity to create an interactive and engaging learning experience that can improve the education sector, particularly in areas where abstract concepts may be overly complex to comprehend (Predescu, 2023). This innovative technology delivers an extraordinary experience, captivating the user and fully immersing them in a world of sensory engagement and exploration. It offers a distinctive journey that transforms ordinary interactions into unforgettable adventures, enveloping users in a rich tapestry of sights, sounds, and sensations (Curcio et al., 2016).

Virtual reality, or VR, is a technology that generates an artificial digital environment, providing an interactive computer-generated experience designed to simulate a real-world setting (Chen, 2016). This technology can create a climate akin to the real world or a fantastical realm, facilitating an experience unattainable in conventional physical reality. A three-dimensional environment is simulated using virtual reality headsets or multi-projected systems that provide realistic visual and auditory feedback (Smutny, 2022). Virtual reality (VR) is a significant technological advancement poised to revolutionize education (Kadokia & Lisa, 2020) and (Arjunaita, 2020). It will bring about profound changes in the lifestyle and organizational structure that humans have grown accustomed to. VR offers unprecedented experiences and scenarios and is widely recognized as a highly effective tool for enhancing learning outcomes (Marougkas et al., 2023). The positive effects of VR in classrooms, where it has been successfully implemented, are a testament to its potential. The urgency and necessity of understanding how to use VR effectively and exploring its various applications cannot be overstated. This is the key to its successful integration into the education system. Because Virtual Reality (VR) allows users to immerse themselves in a computer-generated, interactive audio-visual environment using various visual and auditory interfaces and devices (Xanthidis, 2020) On the same side, another researcher argued that Virtual reality (VR) could create diverse and realistic scenarios, offering a heightened sense of presence, enjoyment, complete engagement, discovery, interactive experiences, and immediate visual responses (Wang, 2020).

Virtual reality integrates computer graphics, artificial intelligence, diverse image processing techniques, multiple modalities, sensor technology, and other fields to create an immersive and interactive experience within a virtual environment. This level of engagement and interactivity is unprecedented in the field of education, promising a new era of learning (Feng, 2020). Another article found that Virtual Reality (VR) educational experiences, which immerse students in a virtual environment, have gained attention as potential alternatives or additions to current multimedia educational tools (Adžgauskaitė, 2020). Virtual Reality has emerged as a captivating phenomenon in education. This technology enhances the diversity, adaptability, and engagement of the learning experience (Zhang, 2022). Virtual Reality can potentially enhance interaction within the learning process. Virtual reality-based resources may alleviate students' anxiety by fostering a sense of realism (Miharu

Fuyuno & Tomoko Yamashit, 2020). Virtual reality could enhance problem-based learning tasks in civil engineering education (Xavier et al., 2019).

Several key factors must be considered when creating instructional materials to ensure their effectiveness and relevance to the learning process. Initially, a clear understanding of the characteristics and needs of learners must serve as the foundation, ensuring that the developed materials align with their proficiency levels and learning preferences. Secondly, incorporating robust pedagogical principles is vital for creating significant learning experiences. Furthermore, the quality and credibility of the information sources must be evaluated to guarantee the accuracy and precision of the instructional materials. Ultimately, systematic evaluation and feedback must be implemented to assess the efficacy of the materials and facilitate necessary enhancements. By evaluating these factors, the creation of educational materials can be enhanced to facilitate the attainment of desired learning outcomes (Tomlinson, 2012). The other essential things in designing materials further provided in Table 1 (Tomlinson, 2012).

Table 1. Essential Things in Designing Materials

Items	Points
Learners	<ol style="list-style-type: none"> 1. Relevant to the experience and background of learners 2. Relevant to learners' target needs 3. Relevant to learners' affective needs
Learning	<ol style="list-style-type: none"> 1. Focuses on discovery, problem-solving, and Analysis 2. Focus on specific skills and strategies
Language	<ol style="list-style-type: none"> 1. Focus on relevant aspects of language, including language itself, language functions, and vocabulary. 2. Integrate the four language skills, which include listening, speaking, reading, and writing 3. Focus on understanding and using authentic texts
Social Context	<ol style="list-style-type: none"> 1. Focus on intercultural communication 2. Development, including language itself, language functions, and vocabulary, social critical awareness
Activities	<ol style="list-style-type: none"> 1. Aim at authentic assignments 2. Role-playing and group work 3. Varied activities
Materials	<ol style="list-style-type: none"> 1. Authentic texts, e.g., realia 2. Variety, e.g., Print, visual, and audio materials, etc.

In addition to the previously mentioned aspects, other considerations in the design of language learning materials include (Akker et al., 2013) the criteria provided in Table 2.

Table 2. Criteria for designing materials

Criterion	Description
Relevance (also referred to as content validity)	There is a need for the intervention, and its design is based on state-of-the-art (scientific) knowledge.
Consistency (also referred to as	The intervention is 'logically' designed

Criterion	Description
construct validity)	
Practicality	<p>Expected The intervention is expected to be usable in the settings for which it has been designed and developed.</p> <p>Actual The intervention is usable in the settings for which it has been designed and developed.</p>
Effectiveness	<p>Expected Using the intervention is likely to result in desired outcomes.</p> <p>Actual Using the intervention results in the desired outcomes</p>

Given these considerations, this study aims to design, develop, and evaluate a Virtual Reality (VR)-based web platform—Virtualisize—as an innovative instructional medium to enhance English language learning in higher education. Specifically, the objectives are to: (1) analyze learners' needs and learning challenges in mastering English, especially in speaking, listening, and contextual usage; (2) design VR-integrated English instructional materials based on pedagogical principles, content validity, and curriculum alignment; (3) develop a responsive and accessible website integrating 360-degree immersive environments; (4) implement the VR platform within a real classroom context and assess its practical usability; and (5) evaluate the effectiveness of the platform in improving learners' language proficiency, motivation, and engagement, as demonstrated through pre- and post-test outcomes and formative feedback.

METHOD

Research Design

This research employed the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model as its methodological framework (Branch, 2009; R. A. H. Cahyadi, 2019; Kusumawati, 2017). The ADDIE model was selected for its capacity to offer a systematic and comprehensive framework at each phase of instructional material development. The initial phase of the analysis will ascertain learners' requirements and the learning environment. The design stage involves creating lesson plans that incorporate suitable pedagogical principles. During the Development stage, the designed teaching materials will be actualized as innovative learning media. The implementation stage assessed the efficacy of the materials in an authentic educational setting, which will be followed by the evaluation phase, which seeks to gather feedback and data necessary to evaluate the impact and quality of the created teaching resources (Drljača et al., 2017).



Figure 1. ADDIE Model

Analysis

The analysis phase serves as the foundation for the entire instructional design process by identifying the learning needs and contextual parameters that inform the development of effective materials. At this stage, several critical components are examined. First, a thorough needs identification is conducted to determine what learners must achieve and why such competencies are essential within the scope of their academic and professional development. This involves diagnosing gaps in current learning outcomes and aligning them with expected competencies. Second, an audience analysis is performed to understand learners' characteristics, such as their educational background, preferred learning styles, and existing knowledge or skills related to English language acquisition. This step ensures that the materials are tailored to their cognitive and affective profiles. Third, the learning objective analysis translates these findings into specific, measurable, and curriculum-relevant objectives that guide the structure and content of the instructional materials. Together, these components ensure that the design process is grounded in actual learner needs and aligned with institutional goals, providing a strong foundation for the subsequent design and development phases.

Design

The design phase translates the insights gained from the analysis stage into a structured and pedagogically sound lesson plan. It begins with the formulation of detailed learning objectives, derived directly from the identified learner needs and aligned with curriculum standards, ensuring specificity, measurability, and relevance. Following this, appropriate learning strategies are selected, encompassing instructional methods and techniques that best support the delivery of content and the achievement of objectives. The material design process is grounded in a thorough needs analysis and a comprehensive review of the syllabus used in the English Education study program. This ensures that the content aligns with the expected competencies and learning outcomes, facilitating the holistic development of students' English language skills.

In addition, media and learning resources are carefully chosen to enhance instructional delivery – ranging from traditional tools to advanced digital platforms and VR-based components. To maintain academic rigor and technological feasibility,

the materials undergo a validation process involving two expert reviewers: one specializing in material development and the other in information technology. Using the Aiken formula, these experts evaluate the materials to ensure their quality, coherence, and effectiveness in integrating technology into the learning process.

Development

The development phase is dedicated to producing the instructional materials and operationalizing the design into a functional learning platform. This process commenced with instructor training, where four lecturers from the English Education Study Program at the Faculty of Teacher Training and Education, Universitas Muhammadiyah Parepare, were equipped with the necessary skills to implement the newly developed materials and learning strategies effectively. Concurrently, a cohort of 30 students from the same program was prepared to engage with the platform, ensuring that they were familiar with the learning objectives and the technological tools to be used.

The teaching materials were hosted on a dedicated website, www.virtualisize.com, where students accessed the content using their laptops. Under guided instruction, learners interacted with the materials in a structured manner, ensuring consistent engagement. Throughout this phase, systematic observations were conducted to monitor the learning process, complemented by data collection efforts aimed at understanding how students interacted with the materials and identifying areas for refinement. This stage was essential for validating the usability and practicality of the instructional design in a real-world academic setting.

Implementation

The implementation phase involves the application of the developed teaching materials within an authentic educational environment. If required, additional training sessions are conducted to ensure that instructors are fully prepared to utilize the VR-based learning tools and accompanying strategies effectively. The instructional materials are then systematically deployed in a designated classroom setting, allowing learners to engage with the content as part of their regular coursework. This stage emphasizes the real-time use of the materials, providing an opportunity to observe the practical dynamics of the teaching-learning process. Throughout implementation, close observation and structured data collection are carried out to capture learners' interactions with the materials, assess their engagement levels, and identify any challenges or areas for improvement. This real-world application is essential for determining the functional viability of the instructional design and for informing subsequent refinements.

Evaluation

The evaluation phase serves to determine the overall effectiveness and quality of the teaching materials that have been developed and implemented. This stage is divided into two essential components: formative and summative evaluation. Formative evaluation is carried out concurrently with the development and implementation phases, focusing on collecting feedback from both instructors and students. This ongoing feedback is used to make iterative improvements to the content, user interface, navigation, and instructional design. In contrast, summative evaluation is conducted after the full implementation of the learning platform to assess the extent to which the established learning objectives have been achieved. It

also evaluates the impact of the instructional materials on learners' academic performance and engagement. Together, these evaluations provide a holistic view of the platform's pedagogical effectiveness and inform future enhancements to optimize learning outcomes.

By systematically following each phase in the ADDIE model, developing teaching materials can become more structured and produce high-quality products that meet learners' needs. This English language development employs a website as an auxiliary medium for virtual reality-based learning. Using a website in this context enhances learners' educational experience by offering broader access to interactive resources that facilitate language skills development (Suriaman et al., 2018). Integrating this technology is anticipated to strengthen learners' English speaking and comprehension skills while boosting their motivation and engagement in learning. Consequently, using a website as an auxiliary medium is a tool and a platform to enhance learning outcomes innovatively and engagingly.

Ethical Statement

This study adhered to ethical standards in educational research to ensure the protection and respect of all participants involved. Prior to data collection, informed consent was obtained from all participating students and instructors, with a clear explanation of the research objectives, procedures, and their rights, including the right to withdraw at any time without penalty. Participants were assured of the confidentiality and anonymity of their responses, and all data were securely stored and used solely for academic purposes. The study did not involve any form of physical or psychological risk to the participants. Moreover, the implementation of instructional materials was integrated into regular classroom activities to avoid disruption to the learning process. The research protocol was reviewed and approved by institutional authorities within the Faculty of Teacher Training and Education, Universitas Muhammadiyah Parepare, ensuring compliance with institutional ethical guidelines.

RESULTS AND DISCUSSION

A web-based virtual reality platform for English language learning was developed using the Research and Development (R&D) approach. The stages of development followed a systematic process to ensure that the final product met the needs of both learners and educators.

Analysis

The initial step involved conducting a comprehensive needs analysis to identify the gaps in current English learning methodologies and the expectations of students and instructors. Based on the results of surveys and interviews, students often encountered difficulties in mastering English, particularly in speaking, listening, and applying the language in real-life situations. Therefore, there was a strong demand for integrating innovative learning media that could provide immersive, contextual, and interactive learning experiences. Virtual reality (VR) technology was identified as a potential solution to address these challenges.

Design

After the needs were identified, the design phase focused on constructing a web-based VR learning platform that integrates 360-degree images to simulate authentic

learning environments. The instructional content was carefully aligned with curriculum standards and learning outcomes at the higher education level. The material was divided into two major sections: Meetings 1–7 and Meetings 9–15.

In Meetings 1–7, learners were introduced to fundamental language skills through topics such as descriptive texts, comparative structures, and personal opinions. Learners were trained to describe objects, places, and situations using accurate vocabulary and sentence structures, as well as to compare entities using appropriate comparative expressions. Furthermore, students were encouraged to express their personal opinions and develop their argumentation skills, which fostered confidence in oral communication. Meetings 9–15 focused on more complex, application-oriented language activities. This stage emphasized the practical application of language skills acquired in the initial phase. Learning topics included acquisition and disposition (buying and selling transactions), presentations, procedural texts, and job descriptions. These activities provided learners with real-world contexts to practice language use through role-plays, presentations, and simulations that mirrored authentic professional and social interactions.

To ensure that the instructional design and learning materials were valid and feasible for implementation, an expert validation process was conducted. The product validity score obtained was 0.904, which indicates a very valid category based on expert assessment criteria. This high score confirms the alignment of the product design with pedagogical standards and user needs.

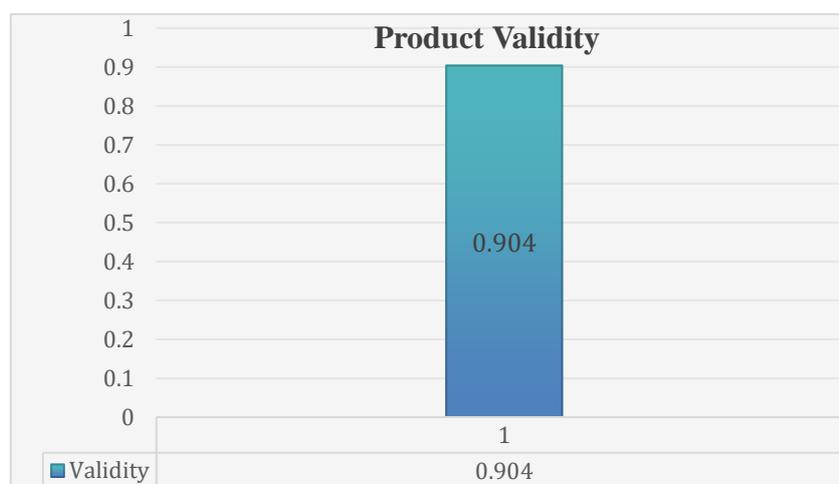


Figure 2. Product Validity

Development

The web-based platform titled *Virtualisize* (<https://virtualisize.com/>) was developed as the primary learning tool. The development process involved selecting appropriate hosting services and integrating 360-degree images as visual learning media. These images were carefully curated to ensure that they were pedagogically relevant and aligned with the instructional goals, rather than being randomly selected visuals. The integration of virtual reality into the learning process was intended to create an immersive learning experience that allows students to engage with the learning content both visually and practically. This approach aligns with (Hegarty, 2004), who emphasized that integrating interactive visual resources into instructional design can significantly enhance students' cognitive engagement and understanding.

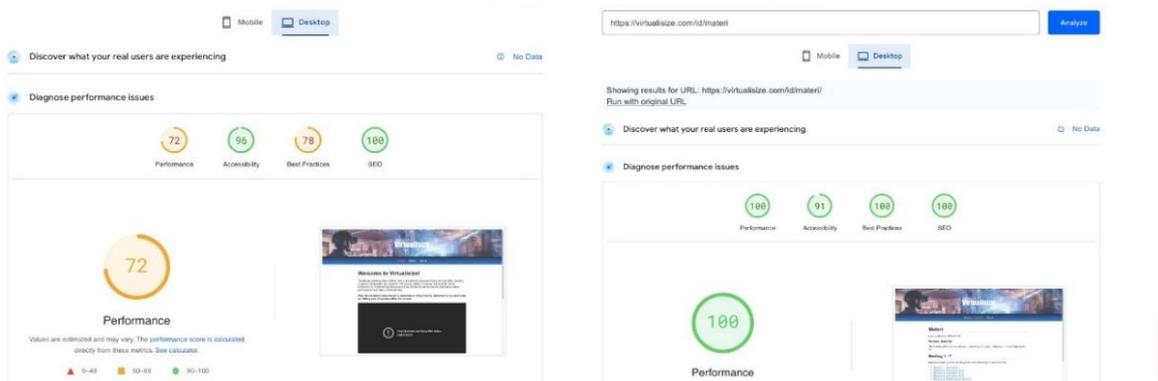


Figure 3. Development of SEO

The website <https://virtualize.com/> has gotten a lot better at SEO since it was made, going from a score of 78 to a perfect 100 (Figure 3). This improvement shows that a lot of work has gone into optimising the site, such as using keywords better, making the site structure better, and using meta tags correctly. The first analysis showed many ways to make things better, especially in SEO, which were fixed with specific plans. After these changes, the SEO score went up to 100, and the site's overall performance got better, showing that it was easier for people to find and use. This successful optimisation not only improves search engine rankings, but it also makes the user experience better, which shows how important it is to keep doing SEO work. The analysis shows that ongoing monitoring and optimisation are important for getting the best possible web performance.

Implementation

The platform was implemented in a higher education setting, allowing students to access learning materials via various devices, including desktops, laptops, tablets, and smartphones. Students engaged in a wide range of language activities such as descriptive speaking tasks, simulated transactions, opinion presentations, procedural demonstrations, and job description discussions. The platform's interface supported both self-directed learning and guided instructor-led sessions, maximizing student participation and learning outcomes.

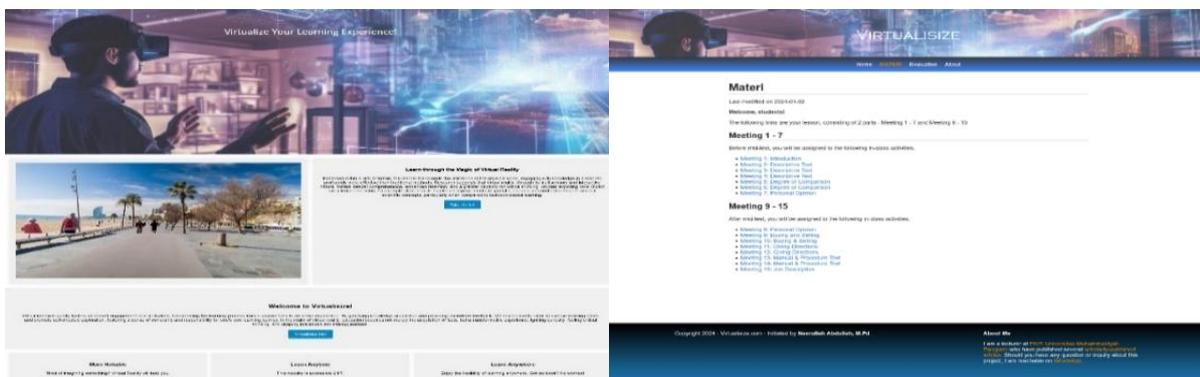


Figure 4. Home and Learning Material Menu

Figure 4 shows the display of educational materials that students can use on any device. The platform is meant to give everyone easy access to resources, making learning easier for everyone. It makes sure that students can access the content on a

variety of devices, which encourages self-directed learning and improves educational outcomes. This accessibility is important for creating a learning environment that is interactive and dynamic and meets the needs of all students.

Evaluation

Evaluation was conducted through formative and summative assessments. Formative evaluation included expert reviews and user feedback from both students and instructors during the trial phase. Based on the feedback, revisions were made to improve the clarity of instructions, the user interface, the quality of 360-degree images, and the overall navigational structure of the platform. Additionally, rubrics were integrated into the assessment menu to standardize the evaluation of students' speaking and writing performances.

Summative evaluation measured the platform's effectiveness after full implementation. The results showed that students exhibited improvements in their English language proficiency, especially in speaking fluency, vocabulary usage, sentence structure, and confidence during oral communication. The integration of VR elements contributed to a higher level of student engagement and motivation, as they were able to interact with authentic learning contexts that mirrored real-life situations. This aligns with the findings of Khumar and Wei (2024), who emphasized that digital learning environments improve learning outcomes, but to make them as effective as possible, it is important to fix the gaps in access and train teachers. Long-term effects and ways to make sure everyone has fair access to digital resources should be the focus of future research. Overall, the *Virtualisize* platform successfully provided a systematic, interactive, and context-rich English learning experience. The incorporation of virtual reality media allowed students to apply theoretical knowledge into practice in a meaningful way, thereby addressing both linguistic and pedagogical objectives effectively.

The test results conducted through the pre-test and post-test system showed a significant difference in student achievement. The average pre-test score was recorded at 69.97, while the average post-test score increased to 85.33 (see Figure 5). This increase reflects the effectiveness of the learning intervention implemented during the period. Further analysis showed that the significant difference in scores between the pre-test and post-test can be attributed to the improved understanding of concepts and skills acquired by students through the material presented. This finding supports the hypothesis that the teaching strategies have successfully improved students' academic competence in the studied areas.

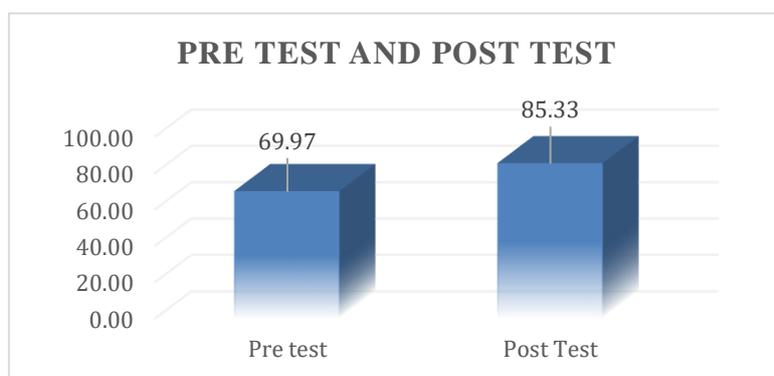


Figure 5. Students' Pre-test and Post-test score

Overall, the Virtualize platform successfully provided a systematic, interactive, and context-rich English learning experience. The incorporation of virtual reality media allowed students to apply theoretical knowledge into practice in a meaningful way, thereby addressing both linguistic and pedagogical objectives effectively.

Discussion

The integration of virtual reality (VR) into English language teaching represents a significant shift in educational methodologies, particularly in terms of engagement and contextual learning. The transformative potential of VR to facilitate language acquisition through immersive experiences is underscored by the results of the design and implementation of the "Virtualize" platform. This is consistent with modern pedagogical frameworks that emphasize active learning and real-world relevance, which starkly contrast with traditional methods that frequently rely on passive information reception. VR's increased engagement is one of the most significant benefits of incorporating it into the English language learning process. According to (Campos et al., 2022) Virtual reality has the potential to enhance students' comprehension of complex subjects significantly. Altun (2020) and Elme et al. (2022) Have confirmed that this immersive experience captivates attention and enables a more profound understanding of the material. This engagement is not merely about capturing interest; it is essential for promoting cognitive processing and retention. Research results (Mallek et al., 2024) indicate that virtual reality enhances learning outcomes when utilized in alignment with theories such as constructivism, experiential learning, and collaborative learning. This integration offers a tailored, engaging, and hands-on learning experience, highlighting the importance of incorporating educational principles into the development of VR applications. The other research also found that Students enhanced their intracultural awareness by utilising the features of VR technology, such as panorama, audio, interaction, and structuring. Additional discussions were conducted to clarify how each of these four features contributed to enhancing students' understanding of local culture (Yeh et al., 2022). Additionally, Reeves et al. (2022) in their study present compelling evidence that an innovative approach utilising VR technology can effectively address public speaking anxiety.

The integration of a website as a centralized hub for virtual reality (VR)-based materials enables learners to access educational content at any time and from any location, significantly enhancing the flexibility and convenience of their learning experiences. Recent findings suggest that providing on-demand access to academic resources significantly enhances student engagement and motivation (Li, 2023). A web-based platform accommodates various learning styles and speeds, enabling tailored learning pathways that meet individual requirements (Horváth, 2021). Utilising the accessibility of digital platforms allows educators to create a more inclusive and effective learning environment, which can lead to enhanced educational outcomes and better knowledge retention (Kassim et al., 2019). The incorporation of VR materials into a specialised website reflects current educational methodologies and the growing need for adaptable learning options, showcasing an innovative strategy for modern education. The incorporation of VR materials into a specialised website is in harmony with current educational theories and the growing need for

adaptable learning options, showcasing an innovative strategy for today's educational landscape (Mallek et al., 2024).

The organization of materials establishes a structured learning pathway that is essential for maintaining learner motivation into thematic sections, such as "Meeting 1 - 7" and "Meeting 9 - 15." This systematic approach corroborates the idea that precise learning trajectories are essential for the effective acquisition of a language (Warschauer & Healey, 1998). The platform's emphasis on specific skills, such as comparative analysis and descriptive language, ensures that foundational skills are established before progressing to more complex tasks, thereby fostering cognitive development. This sequential methodology is consistent with the findings of Cahyadi et al. (2022), which suggest that VR creates an engaging and interactive learning environment, encouraging active participation and exploration. As highlighted in the findings, students are not merely passive recipients of information; they are active participants in their learning journey. The significance of structured learning in acquiring language skills is underscored by research. The ability of VR to replicate real-world scenarios is particularly advantageous for language learners (Wan, 2024). Students can strengthen their language skills and develop confidence by engaging in activities such as role-playing, which allow them to practice English in real-world scenarios that they are likely to encounter outside the classroom. The emphasis on real-world relevance, as demonstrated in scenarios such as buying and selling, is crucial for equipping learners with practical language skills that apply to their daily lives. This method aligns with the findings of Troyan et al. (2022) and Lan (2021), emphasizing the importance of situational context in language education. Additionally, the inclusion of a variety of text genres, such as narrative, procedural, descriptive, and opinion pieces, caters to diverse learning styles and equips students with the necessary skills to navigate the multifaceted nature of communication. This diversity is consistent with the findings of Freeman et al. (2014) and Stieha et al. (2024), who demonstrated that interactive and diverse content significantly improves student motivation and engagement. The platform facilitates a more comprehensive comprehension of language use in diverse contexts by enabling students to analyze and generate a variety of text types, thereby equipping them with the necessary skills to navigate the intricacies of real-world communication.

The product validity analysis conducted using the Aiken method shows encouraging results regarding the quality of Virtual Reality (VR)--based learning materials. The overall validity score approaching 1 reflects that most items evaluated by the evaluators are highly relevant and of high quality. In this context, Aiken's V assesses content validity, providing a clear quantitative picture of how well an item meets the established criteria (Apriwanda et al., 2021; Fauzizah et al., 2023; Ikhwan et al., 2021). This discovery is consistent with the assertion of Joshi and Mathews (2021), who underscored the significance of high-quality content in the improvement of conventional teaching methods. Nevertheless, the validity scores indicate that the content and design are robust; however, there are still opportunities for technical improvements, particularly in the areas of media optimization and responsive design. These technical aspects are essential because they directly affect the user experience and the overall efficacy of the learning process. These findings are further corroborated by the practicality assessment, which yields content assessment scores of 91%, which suggest that the educational objectives are aligned and that the

organization is effective. The high activity score of 92% emphasizes the engagement of interactive components, thereby supporting the findings of Freeman et al. (2014) that emphasize interactivity as a critical factor in improving motivation and participation. It is crucial to note that the assessment of features suggests that instructors consider the tools and functionalities contained within the VR material to be user-friendly. This promotes a learning environment that is conducive to students' effective engagement with the material. The visual interface and presentation are emphasized by the 95% display score, which is consistent with Lou (2017) assertion that effective visual design can significantly enhance comprehension, retention and students' interest.

The integration of VR in the teaching of English language provides a progressive model that improves student engagement and learning outcomes, while also supporting existing educational frameworks (Erita et al., 2024). The Virtualize platform demonstrates the potential of VR to transform language education by addressing both pedagogical and linguistic objectives. The results of this study are a valuable addition to the expanding body of literature on immersive learning technologies, as they illustrate that the platform is exemplary in terms of content and design, but it is imperative to continue to improve its technical capabilities (Dobrova et al., 2017). Future research should concentrate on longitudinal studies to evaluate the long-term effects of VR on language acquisition and to investigate innovative methods for incorporating technology into the curriculum (Ding et al., 2020). This continuous development will guarantee that VR continues to satisfy the requirements of modern education and effectively facilitates the acquisition of the English language (Situmorang, 2020).

CONCLUSION

Integrating Virtual Reality (VR) in relevant learning contexts and student engagement demonstrates the potential for significant transformation in teaching English. The "Virtualize" platform, which has been implemented, offers empirical evidence that immersive experiences can improve language acquisition by facilitating more dynamic interaction with learning materials. VR is a conduit between theory and practice by incorporating a contemporary pedagogical framework that prioritizes active learning, enabling students to participate in a more realistic and practical setting. Nevertheless, technical challenges persist, even though the product validity analysis indicates the high quality of the VR materials. To guarantee that the user experience remains optimal, it is essential to consider aspects of responsive design and media optimization. The potential of VR to improve learning may be impeded in the absence of improvements in these areas. This underscores the pressing necessity to prioritize the content and the technical components that facilitate technology integration into the educational process. Additionally, the significance of a well-organized and unambiguous learning trajectory is underscored by the structured approach employed in "Virtualize." Previous research has demonstrated that student engagement is enhanced when they follow a structured progression. Despite the efficacy of this approach, it is crucial to continue investigating novel approaches to organizing learning experiences that are not only sequence-focused but also capable of accommodating the unique requirements of each student.

In the context of language learning, the real-world relevance provided by VR, such as in role-play scenarios, offers students the opportunity to enhance their language skills and confidence. Nevertheless, it is crucial to acknowledge that not all students may respond to immersive experiences similarly. Consequently, conducting more comprehensive longitudinal research is essential to comprehending the long-term effects of VR on language acquisition. Lastly, while "Virtualize" demonstrates substantial advancements in language pedagogy, there are still opportunities for further development and challenges. Future research should concentrate on the efficacy of this technology and a comprehensive integration that considers the learning context, student preferences, and dynamic changes in educational approaches. Consequently, VR will satisfy contemporary education's requirements and facilitate more comprehensive and effective language acquisition.

RECOMMENDATIONS

Based on the findings of this study, it is recommended that future research should focus on exploring the depth of content and the functionality of features in virtual reality-based learning materials. Further investigation in these areas is essential to gain a more comprehensive understanding of the role and effectiveness of virtual reality technology in language education. This will allow for the development of more optimal and responsive instructional media that better meet the evolving needs of language learners.

Author Contributions

Each author has contributed sufficiently to the study, including the conceptualization and design of the study, development of virtual reality-based learning materials, data collection and analysis, interpretation of the results, drafting and revising the manuscript, as well as approving the final version for publication.

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Conflict of interests

The author declares that there are no conflicts of interest in this study.

REFERENCES

- Adžgauskaitė, M. (2020). How Virtual Reality Is Changing the Future of Learning in K-12 and Beyond: Using Needs-Affordances-Features Perspective. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 12425, 279–298. https://doi.org/10.1007/978-3-030-60128-7_22
- Akker, J. van den, Bannan, B., Kelly, A. E., Nieveen, N., & Plomp, T. (2013). Educational Design Research Part A. In *Netherlands Institute for Curriculum Development: SLO*.
- Altun, H. (2020). *Immersive Learning Technologies in English Language Teaching*. dspace.ewha.ac.kr.
- Apriwanda, W., Lubis, A. P., Meirani, D. L., Karolina, E., & Ayuningdyah, Y. (2021). Development Content Learning System (CLS) Material Inter-Molecular Force Based on Project Base Learning (PjBL) with Flipped Classrooms in Senior High School. *International Journal of High Information, Computerization, Engineering and*

- Applied Science (JHICE)*, 1(1), 1–11. <https://doi.org/10.24036/jhice/vol1-iss01/34>
- Arjunaita. (2020). Pendidikan di era revolusi industri 5.0. *Prosiding Seminar Nasional Pendidikan Program Pascasarjana Universitas PGRI Palembang*, 2, 179–196.
- Branch, R. M. (2009). Approach, Instructional Design: The ADDIE. In *Department of Educational Psychology and Instructional Technology University of Georgia* (Vol. 53, Issue 9).
- Cahyadi, P., Wardhana, D. I. A., Ansori, W. I., & Farah, R. R. (2022). Enhancing Students' English Speaking Ability Through VRChat Game as Learning Media. *Journal of Research on Language Education*, 3(2), Article 2. <https://doi.org/10.33365/jorle.v3i2.2135>
- Cahyadi, R. A. H. (2019). Pengembangan Bahan Ajar Berbasis Addie Model. *Halaqa: Islamic Education Journal*, 3(1), 35–42. <https://doi.org/10.21070/halaqa.v3i1.2124>
- Campos, E., Hidrogo, I., & Zavala, G. (2022). Impact of virtual reality use on the teaching and learning of vectors. In *Frontiers in Education* (Vol. 7). Frontiers Media SA. <https://doi.org/10.3389/feduc.2022.965640>
- Chen, Y. L. (2016). The Effects of Virtual Reality Learning Environment on Student Cognitive and Linguistic Development. *Asia-Pacific Education Researcher*, 25(4), 637–646. <https://doi.org/10.1007/s40299-016-0293-2>
- Curcio, I. D. D., Dipace, A., & Norlund, A. (2016). Virtual realities and education. *REM - Research on Education and Media*, 8. <https://doi.org/10.1515/rem-2016-0019>
- Desti, B., Adriyanto, & Gundo, J. (2019). *Media Pembelajaran Bahasa Inggris Untuk Siswa Sekolah Dasar Kelas Satu Menggunakan Ren'Py* (Issue 702018706).
- Ding, Y. U., Li, Y., & Cheng, L. E. I. (2020). Application of Internet of Things and Virtual Reality Technology in College Physical Education. *Ieeexplore.Ieee.Org*, 8, 96065–96074. <https://doi.org/10.1109/ACCESS.2020.2992283>
- Dobrova, V., Trubitsin, K., Labzina, P., Ageenko, N., & Gorbunova, Yu. (2017). Virtual Reality in Teaching of Foreign Languages. *Advances in Social Science, Education and Humanities Research (ASSEHR)*, 97(Cildiah), 69–74. <https://doi.org/10.2991/cildiah-17.2017.12>
- Drljača, D., Latinović, B., & Stanković, Ž. (2017). ADDIE MODEL FOR DEVELOPMENT OF E-COURSES. 242–247. <https://doi.org/10.15308/Sinteza-2017-242-247>
- Elme, L., Jørgensen, M. L. M., Dandanell, G., & ... (2022). Immersive virtual reality in STEM: is IVR an effective learning medium and does adding self-explanation after a lesson improve learning outcomes? ... *Technology Research and ...* <https://doi.org/10.1007/s11423-022-10139-3>
- Erita, Y., Miaz, Y., Jupriani, J., Hevria, S., & Fauzi, R. (2024). *Using Virtual Reality to Enhance Twenty-First-Century Skills in Elementary School Students: A Systematic Literature Review*.
- Fauzizah, L., Sriyono, S., & Kurniawan, E. S. (2023). Pengembangan E-Booklet Interaktif Berbasis Project Based Learning (PjBL) untuk Meningkatkan Keterampilan Komunikasi Sains Peserta Didik. In *Jurnal Inovasi Pendidikan Sains (JIPS)* (Vol. 4, Issue 2, pp. 71–80). Universitas Muhammadiyah Purworejo. <https://doi.org/10.37729/jips.v4i2.3568>

- Feng, C. (2020). Research on the application of computer virtual reality technology in college physical education teaching. *Journal of Physics: Conference Series*, 1648(2). <https://doi.org/10.1088/1742-6596/1648/2/022035>
- Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences*, 111(23), 8410–8415. <https://doi.org/10.1073/pnas.1319030111>
- Hegarty, M. (2004). Dynamic visualizations and learning: Getting to the difficult questions. *Learning and Instruction*, 14(3). <https://doi.org/10.1016/j.learninstruc.2004.06.007>
- Horváth, I. (2021). An Analysis of Personalized Learning Opportunities in 3D VR. *Frontiers in Computer Science*, 3(September), 1–12. <https://doi.org/10.3389/fcomp.2021.673826>
- Ikhwan, F. H., Astuti, L., Apriandi, R., & Husni, I. (2021). Development Content Learning System (CLS) Material Corrosion Based on Project Base Learning (PjBL) with Shortened Flipped Classrooms in SMA MA. In *International Journal of High Information, Computerization, Engineering and Applied Science (JHICE)* (Vol. 1, Issue 2, pp. 84–91). Universitas Negeri Padang. <https://doi.org/10.24036/jhice/vol1-iss02/38>
- Iswari, F. (2017). Pengembangan Media Pembelajaran Bahasa Inggris Berupa Flashcard Bergambar pada Tingkat Sekolah Dasar. *Deiksis*, 9(02), 119. <https://doi.org/10.30998/deiksis.v9i02.1375>
- Joshi, T. M., & Mathews, E. (Eds.). (2021). Effectiveness of Virtual and Traditional Teaching and Learning in Current Scenario. In *Virtual and Classroom Learning in Higher Education: A Guide to Effective Online Teaching* (pp. 200–226). Bentham Science Publishers. <https://doi.org/10.2174/9781681089287121010015>
- Kadokia, C., & Lisa, Owens. D. M. (2020). *More Praise for Designing for Modern Learning*. ATD Press.
- Kassim, S., Witkin, N., & Stone, A. (2019). Student perceptions of virtual reality use in a speaking activity. *CALL and Complexity – Short Papers from EUROCALL 2019*, 2019(2019), 223–228. <https://doi.org/10.14705/rpnet.2019.38.1013>
- Khumar, R., & Wei, L. (2024). Exploring the Impact of Digital Learning Environments on Student Engagement and Academic Performance A Global Perspective. *Modern Education and Development*, 17(1), 6–8.
- Kusumawati, F. P. (2017). Developing English Learning Material for Speaking Skill Based on ADDIE. *Premise: Journal of English Education and Applied Linguistics*, 6(1), Article 1. <https://doi.org/10.24127/pj.v6i1.805>
- Lan, Y.-J. (2021). Language Learning in Virtual Reality: Theoretical Foundations and Empirical Practices. In *Chinese Language Learning Sciences* (pp. 1–21). Springer Singapore. https://doi.org/10.1007/978-981-16-3416-1_1
- Li, H. (2023). The effect of VR on learners' engagement and motivation in K12 English education. *Journal of Education, Humanities and Social Sciences*, 22, 82–89. <https://doi.org/10.54097/ehss.v22i.12291>
- Lou, M. (2017). A Virtual Reality Teaching System for Graphic Design Course. *International Journal of Emerging Technologies in Learning*, 12(9), 117–129. <https://doi.org/10.3991/ijet.v12i09.7492>

- Mallek, F., Mazhar, T., Shah, S. F. A., Ghadi, Y. Y., & Hamam, H. (2024). A review on cultivating effective learning: Synthesizing educational theories and virtual reality for enhanced educational experiences. *PeerJ Computer Science*, 10, e2000. <https://doi.org/10.7717/peerj-cs.2000>
- Maroungkas, A., Troussas, C., Krouska, A., & Sgouropoulou, C. (2023). Virtual Reality in Education: A Review of Learning Theories, Approaches and Methodologies for the Last Decade. *Electronics (Switzerland)*, 12(13). <https://doi.org/10.3390/electronics12132832>
- Miharu Fuyuno, & Tomoko Yamashit. (2020). Development of a system for English public speaking practice using 360-degree immersive virtual reality technology. *LET Kyushu-Okinawa Bulletin*.
- Predescu, S. L. (2023). Impact of VR Application in an Academic Context. *Applied Sciences (Switzerland)*, 13(8). <https://doi.org/10.3390/app13084748>
- Reeves, R., Curran, D., Gleeson, A., & Hanna, D. (2022). A Meta-Analysis of the Efficacy of Virtual Reality and In Vivo Exposure Therapy as Psychological Interventions for Public Speaking Anxiety. *Behavior Modification*, 46(4), 937–965. <https://doi.org/10.1177/0145445521991102>
- Rukiati, E., & Susanti, N. (2016). Pengembangan Media Pembelajaran Bahasa Inggris di Madrasah Aliyah Annuriyah Jember. *J-Dinamika: Jurnal Pengabdian Masyarakat*, 1(1), 29–38. <https://doi.org/10.25047/j-dinamika.v1i1.131>
- Situmorang, R. (2020). VR Use in Online Learning for Higher Education in Indonesia. *ijIM*, 1(14), 31–46.
- Smutny, P. (2022). Learning with virtual reality: A market analysis of educational and training applications. *Interactive Learning Environments*, 1–14. <https://doi.org/10.1080/10494820.2022.2028856>
- Stieha, V., Earl, B., Hagens, H., Haynes, M., Ulappa, A., Bond, L., & Oxford, J. T. (2024). An exploration of the relationship between active learning and student motivation in STEM: A mixed methods study. *Advances in Physiology Education*, 48(3), 621–638. <https://doi.org/10.1152/advan.00247.2022>
- Suriaman, A., Rahman, A., & Noni, N. (2018). Developing web-based english instructional material oriented to promote independent learning at indonesian university context. *Journal of Language Teaching and Research*, 9(2), 336–345. <https://doi.org/10.17507/jltr.0902.15>
- Tomlinson, B. (2012). Materials development for language learning and teaching. *Language Teaching*, 45(2), 143–179. <https://doi.org/10.1017/S0261444811000528>
- Troyan, F. J., Herazo, J. D., & Ryshina-Pankova, M. (2022). SFL pedagogies in language education: Special issue introduction. *System*, 104, 102694. <https://doi.org/10.1016/j.system.2021.102694>
- Wan, Y. (2024). A Study on the Enhancement of Learners' Language Proficiency by English Situational Simulation Teaching Based on Virtual Reality Technology. 9(1), 1–20.
- Wang, Y. T. (2020). Why people adopt VR English language learning systems: An extended perspective of task-technology fit. *Proceedings of the Annual Hawaii International Conference on System Sciences*, 2020, 4919–4928.
- Warschauer, M., & Healey, D. (1998). Computers and language learning: An overview. *Language Teaching*, 31(2), 57–71. <https://doi.org/10.1017/s0261444800012970>

- Xanthidis, D. (2020). Virtual and Augmented Reality: Enhancing the learning experience in higher education in the U.A.E. Current standing research directions. *2020 7th International Conference on Information Technology Trends, ITT 2020*, 206–211. <https://doi.org/10.1109/ITT51279.2020.9320882>
- Xavier, P., Holmes, M., Evans, R., & Clancy, J. (2019). Can Virtual Reality assist the recoupling of theory and practice in Civil Engineering education? In *Proceedings of the Virtual and Augmented Reality to Enhance Learning and Teaching in Higher Education Conference 2018* (pp. 33–42). IM Publications Open LLP. <https://doi.org/10.1255/vrar2018.ch4>
- Yeh, H. C., Tseng, S. S., & Heng, L. (2022). Enhancing EFL students' intracultural learning through virtual reality. *Interactive Learning Environments*, 30(9), 1609–1618. <https://doi.org/10.1080/10494820.2020.1734625>
- Zhang, D. (2022). Research on Virtual Reality Technology in Promoting Situational Classroom Teaching in Higher Vocational Colleges. In *Frontiers in Humanities and Social Sciences* (Vol. 2, Issue 11, pp. 187–191). Boya Century Publishing. <https://doi.org/10.54691/fhss.v2i11.2804>