

Enhancing Vocabulary Knowledge Through Virtual Reality Games Based on Local Wisdom: A Case Study of Elementary Schools Across Districts in Makassar City

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ABSTRACT: This study investigates the effectiveness of a Virtual Reality (VR) game based on Makassar local wisdom in improving English vocabulary acquisition among primary school students. Using a quasi-experimental design, data were collected from five schools through pre-tests and post-tests. The results showed a significant improvement in vocabulary knowledge, with mean scores increasing from 43.4 in the pre-test to 79.0 in the post-test, reflecting an overall gain of 35.6 points (82.1%). In addition to measurable gains, qualitative findings indicated that VR enhanced students' motivation, engagement, and retention. The integration of cultural elements—such as traditional markets, folklore, and local culinary practices—provided contextualized learning environments that supported deeper understanding and practical application of new vocabulary. Teachers observed notable shifts in classroom dynamics, with previously passive learners becoming more active and confident when using English. The findings suggest that VR games incorporating local culture can serve as effective and engaging pedagogical tools in EFL contexts, particularly at the primary level. The study concludes that combining immersive technology with scaffolding and cultural relevance offers a promising direction for vocabulary instruction.

KEYWORDS: Virtual Reality, vocabulary learning, primary school, local wisdom, EFL

I. INTRODUCTION

The rapid advancement of digital technology has significantly transformed the landscape of education, offering innovative tools to enhance teaching and learning processes. Among these emerging technologies, Virtual Reality (VR) has gained increasing attention in the field of language education for its ability to create immersive, interactive, and context-rich learning environments (Bailenson, 2018; Slater & Sanchez-Vives, 2016). Unlike traditional classroom methods, VR enables learners to engage with authentic scenarios that promote experiential learning, thereby fostering greater motivation, retention, and understanding (Dalgarno & Lee, 2010; Müller & Ferreira, 2021). Such features are particularly valuable in vocabulary learning, which remains one of the most fundamental and challenging aspects of English as a Foreign Language (EFL) acquisition for young learners (Lin et al., 2021; Wang & Zhang, 2022).

Vocabulary acquisition plays a crucial role in building communicative competence. For elementary school students, who are in the early stages of second language learning, vocabulary knowledge determines not only their ability to comprehend texts but also their capacity to express ideas effectively (Cheng, 2022). However, vocabulary instruction in many Indonesian elementary schools, including those in Makassar, still heavily relies on rote memorization, textbook exercises, and teacher-centered approaches (Muhsyanur, 2024). These methods often fail to capture the attention of digital-native learners, resulting in low engagement and limited vocabulary retention. Therefore, it is essential to explore more engaging and culturally relevant strategies to improve vocabulary learning outcomes (Radianti et al., 2020; Bower et al., 2020).

One promising approach is to design VR-based vocabulary games that integrate local cultural elements. Makassar, a city rich in traditions, folklore, and local wisdom, provides abundant opportunities to contextualize vocabulary learning through culturally embedded content. Incorporating local wisdom into VR games not only enriches the learning experience but also fosters cultural awareness and identity among students (Hidayah & Irmayani, 2025; Warman & Rahman, 2025). By encountering familiar contexts in a virtual environment—such as traditional markets, historical landmarks, or local festivals—students can associate new English vocabulary with meaningful cultural experiences. This approach aligns with the principles of contextual and meaningful learning,

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which emphasize that knowledge is better retained when it is connected to learners' real-life experiences (Shofyana et al., 2024; Sorohiti et al., 2025; Umar et al., 2025).

This study investigates the development and implementation of a Virtual Reality game designed to enhance vocabulary acquisition among elementary school students in several districts of Makassar. By integrating local wisdom into the VR learning environment, the research seeks to examine the effectiveness of this innovative approach in improving students' vocabulary knowledge, motivation, and engagement. Furthermore, it aims to provide insights into how digital technology can bridge global language learning objectives with local cultural values, thereby contributing to the discourse on culturally responsive pedagogy in the digital era (Parmaxi & Demetriou, 2020).

II. RESEARCH METHOD

This research applied a quasi-experimental design using a pre-test and post-test control group approach to measure the effectiveness of Virtual Reality (VR) games based on local wisdom in enhancing English vocabulary acquisition among elementary school students in Makassar. The participants consisted of fifth-grade students from several elementary schools representing different districts in Makassar, selected through purposive sampling to ensure diversity of context. The experimental group was exposed to vocabulary learning through VR games integrating elements of Makassar's local culture, while the control group received conventional English instruction without the use of VR. Data were collected through vocabulary tests administered before and after the intervention, supported by classroom observations and student feedback questionnaires to gain insights into engagement and learning experiences. The data were analyzed quantitatively using statistical tests to determine the significance of vocabulary improvement between the two groups, while qualitative data from observations and questionnaires were used to support and enrich the findings.

III. RESULTS AND FINDINGS

A. Findings

The implementation of the Virtual Reality (VR) game based on Makassar local wisdom to enhance English vocabulary yielded significant improvements across all participating schools.

Table 1 presents the comparative results of students' vocabulary scores in the pre-test and post-test.

School	Pre-Test Mean Score	Post-Test Mean Score	Gain Score	Improvement (%)
SDN 56 Panakkukang	42.1	78.5	36.4	86.4%
SDN 18 Rappocini	45.7	80.2	34.5	75.5%
SD Inpres Bira 1 (Tamalanrea)	41.3	76.9	35.6	86.2%
SDN 200 Manggala	44.8	81.7	36.9	82.4%
SDN 12 Mariso	43.2	77.8	34.6	80.1%
Combined Average	43.4	79.0	35.6	82.1%

The results indicate that before the implementation of VR games, the students' vocabulary mastery was relatively low, with mean scores ranging between 41.3 and 45.7. After the integration of the VR game intervention, post-test scores increased substantially, averaging 79.0 across schools. The overall gain score of 35.6 points, equivalent to an 82.1% improvement, suggests that the VR-based learning intervention was effective in strengthening vocabulary acquisition.

Further analysis revealed that the VR game had a particularly strong impact on students' engagement and retention. Teachers observed that students demonstrated higher levels of motivation, especially when encountering vocabulary items embedded within familiar cultural settings, such as traditional markets, local folklore, and Makassar's culinary heritage. This cultural embedding appeared to enhance contextual learning, enabling students to better recall and apply new words in different communicative settings.

Additionally, informal interviews with participating teachers confirmed that students who were previously passive during English lessons became more active when interacting with the VR game. The immersive learning environment allowed learners to visualize and practice vocabulary in real-life contexts, bridging the gap between abstract word memorization and practical language use.

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Overall, the findings strongly support the integration of Virtual Reality games rooted in local culture as an effective pedagogical tool for improving vocabulary knowledge in primary school EFL contexts.

B. Discussion

The findings of this study demonstrate a significant improvement in students' vocabulary acquisition across the five participating schools after the implementation of scaffolding techniques. The increase in post-test scores compared to pre-test scores suggests that scaffolding is an effective pedagogical approach in enhancing young learners' English proficiency. This result is consistent with Vygotsky's socio-cultural theory, which emphasizes the Zone of Proximal Development (ZPD). Through scaffolding, teachers provide temporary support that enables learners to perform tasks beyond their independent capabilities, gradually fostering autonomy as support is withdrawn.

The improvement observed across different schools also highlights the adaptability of scaffolding techniques in diverse classroom contexts. Although variations existed in the magnitude of score increases, the overall trend supports the idea that scaffolding addresses both cognitive and affective dimensions of learning. For young learners, the use of modeling, guided practice, visual aids, and interactive questioning not only facilitated vocabulary retention but also enhanced motivation and engagement in learning activities. This aligns with previous studies (e.g., Gibbons, 2015; Hammond & Gibbons, 2005) which underline the role of scaffolding in bridging the gap between learners' current linguistic abilities and expected learning outcomes.

Another important implication of this study is the reinforcement of learner-centered pedagogy in EFL classrooms. Traditional approaches often focus on rote memorization, which may not sustain long-term retention. In contrast, scaffolding strategies promote active learning, allowing students to construct knowledge through meaningful interaction. This shift is particularly crucial in primary education, where learning engagement plays a decisive role in shaping future attitudes toward language learning.

Furthermore, the relatively consistent results across all five schools suggest that scaffolding can be effectively implemented even in contexts with limited resources, provided that teachers are adequately trained to apply the techniques. This finding echoes the argument of Walqui (2006) that scaffolding does not require sophisticated materials but rather thoughtful pedagogical practices tailored to learners' needs.

Overall, the study confirms that scaffolding techniques positively impact English vocabulary acquisition among young learners in EFL contexts. The findings advocate for wider adoption of scaffolding-based instruction in primary schools, especially in regions where English is taught as a foreign language, to foster both linguistic development and learner confidence.

V. CONCLUSIONS

The implementation of a Virtual Reality (VR) game grounded in Makassar local wisdom proved highly effective in enhancing English vocabulary acquisition among primary school students. The pre-test and post-test results across the five participating schools revealed consistent and substantial improvements, with an average gain score of 35.6 points (82.1% improvement). These findings confirm that VR-based interventions not only increase vocabulary mastery but also foster higher levels of student engagement, motivation, and retention.

The integration of local cultural contexts—such as traditional markets, folklore, and culinary heritage—played a pivotal role in making vocabulary learning more meaningful and memorable. This cultural embedding provided authentic learning experiences, enabling students to connect new words with their daily lives. Teachers also noted positive behavioral changes, with previously passive learners becoming more active and enthusiastic in English lessons.

Overall, this study highlights the potential of VR games rooted in local wisdom as a powerful pedagogical tool for primary EFL contexts. Despite challenges related to resources and teacher training, the evidence suggests that VR-assisted learning can significantly enrich vocabulary instruction, while also promoting cultural appreciation. Future studies should investigate the long-term impacts of VR on broader language skills and explore strategies for sustainable integration in schools with varying technological capacities.

ACKNOWLEDGMENT

The authors would like to express their deepest gratitude to the principals, teachers, and students of SDN 56 Panakkukang, SDN 18 Rappocini, SD Inpres Bira 1 (Tamalanrea), SDN 200 Manggala, and SDN 12 Mariso for their valuable participation and cooperation throughout this study. Sincere appreciation is also extended to the local education authorities in Makassar City for granting permission and providing support during the research process.

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We are indebted to our colleagues and peers who offered constructive feedback and encouragement in the development of the Virtual Reality game and the design of this research. Special thanks are given to the research team members who contributed their time, creativity, and commitment to ensuring the success of this project.

Lastly, the authors would like to acknowledge the inspiration drawn from Makassar's rich cultural heritage, which served as the foundation for integrating local wisdom into the Virtual Reality learning environment. Without the collaboration, guidance, and cultural insights from the community, this study would not have been possible.

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