



Journal of Education, Teaching, and Learning is licensed under  
A [Creative Commons Attribution-Non Commercial 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/).

# Leveraging Augmented Reality For Environmental Vocabulary Acquisition In Efl Contexts: Aligning With Sdgs In The Era Of Education 5.0

Umar Umar<sup>1)</sup> ✉, A. Rahman<sup>2)</sup>, Nidya Fitri<sup>3)</sup>, Yana Karisma<sup>4)</sup>

<sup>1)</sup> Universitas Teknoloji Sumbawa, Nusa Tenggara Barat, Indonesia  
✉ E-mail: [umar@uts.ac.id](mailto:umar@uts.ac.id)

<sup>2)</sup> Warsaw University of Technology, Warsaw, Poland  
E-mail: [a.rahman.dokt@pw.edu.pl](mailto:a.rahman.dokt@pw.edu.pl)

<sup>3)</sup> Universitas Andalas, Padang, Indonesia  
E-mail: [nidya.fitri@hum.unand.ac.id](mailto:nidya.fitri@hum.unand.ac.id)

<sup>4)</sup> Universitas Teknoloji Sumbawa, Nusa Tenggara Barat, Indonesia  
E-mail: [yana.karisma@uts.ac.id](mailto:yana.karisma@uts.ac.id)

✉ Correspondence Author

**Keywords:** Augmented Reality, Environmental Vocabulary, EFL, SDGs, Education 5.0

© **Copyright:** 2025. Authors retain copyright and grant the JETL (Journal of Education, Teaching and Learning) right of first publication with the work simultaneously licensed under a [Creative Commons Attribution License](https://creativecommons.org/licenses/by-nc/4.0/)

## Abstract

This study investigates the application of Augmented Reality (AR) to improve environmental vocabulary acquisition in English as a Foreign Language (EFL) context, aligning with the Sustainable Development Goals (SDGs) and Education 5.0. The objectives are to evaluate the effectiveness of AR in enhancing vocabulary acquisition and to explore students' perceptions of AR-based learning. The study involved 72 eighth-grade students from SMP Negeri 4 Labuhan Badas, Sumbawa, Indonesia. A mixed-methods approach was employed, integrating quantitative analysis of vocabulary test scores and qualitative insights from open questionnaires. Students interacted with a 3D AR application that visualized environmental vocabulary categories, including beach terms, marine life, and fishing gear. Quantitative results revealed a statistically significant improvement in vocabulary scores (mean difference = 9.903,  $p < 0.001$ , Cohen's  $d = 1.69$ ), indicating the substantial impact of AR intervention. Qualitative findings highlighted increased motivation, comprehension, and retention due to AR's immersive and interactive learning features, though technical barriers such as unstable internet were noted. The study implies that AR fosters experiential and contextualized learning, addressing gaps in traditional EFL vocabulary instruction. Beyond educational enhancements, AR supports SDG 4 by advancing quality education and SDG 14 by raising environmental awareness. These findings underscore AR's ability to create engaging learning environments that bridge theoretical knowledge and practical application. Further research should explore AR's applicability across diverse subjects, regions, and student populations to maximize its interdisciplinary potential and address technical challenges for effective integration in global educational systems.

**How to cite:** Umar, U., Rahman, A., Fitri, N., & Karisma, Y. (2025). Leveraging Augmented Reality For Environmental Vocabulary Acquisition In Efl Contexts: Aligning With Sdgs In The Era Of Education 5.0. *JETL (Journal of Education, Teaching and Learning)*, 10(1). doi:<http://dx.doi.org/10.26737/jetl.v10i1.6747>

## INTRODUCTION

English has solidified its status as a global lingua franca, serving as a vital medium of communication across diverse domains such as education, business, and international collaboration (Adawiyah, 2022; Pratiwi et al., 2022). In Indonesia, English is a core subject embedded in the national curriculum from primary school to university levels, reflecting its significance in preparing students for global engagement (Asrul & Dahlan, 2022; Lauder, 2008). Despite its classification as a foreign language in Indonesia, English is widely regarded as a crucial skill for fostering global competencies among students (Asrul & Dahlan, 2022; Haryanto et al., 2016).

Vocabulary acquisition is a fundamental aspect of English language learning, as it underpins effective communication and comprehension (Sitompul, 2020). Indonesian EFL learners frequently rely on traditional methods such as rote memorization and flashcards, which may lack engagement and contextual relevance (Jumatri et al., 2022). Although digital tools, including vocabulary apps and online quizzes, have been introduced, unequal access to these resources—particularly in underprivileged schools—limits their widespread adoption (Dharmayanti et al., 2021). Furthermore, insufficient exposure to authentic contexts constrains learners' ability to apply vocabulary meaningfully, undermining both retention and practical usage (Faridah & Addinna, 2022; Rosyada-AS & Apoko, 2023).

In addressing these challenges, Augmented Reality (AR) has emerged as a promising solution for enhancing vocabulary acquisition. AR enables learners to visualize and interact with vocabulary within immersive, context-rich environments, fostering engaging and effective learning experiences that transcend traditional approaches (Billinghurst & Duenser, 2012; Ibáñez & Delgado-Kloos, 2018). By combining visual and kinesthetic modalities, AR facilitates multisensory learning, which has been shown to significantly enhance vocabulary retention and comprehension (Dunleavy et al., 2009). In specialized fields such as environmental and maritime education, AR applications have successfully demystified complex terms, providing learners with meaningful contexts to support deeper understanding (Chen et al., 2019; Kuo et al., 2021).

Given these advantages, the integration of AR into EFL vocabulary instruction offers transformative opportunities for Indonesian learners. By enabling experiential and context-based learning, AR tools address the lack of real-world exposure to English, creating practical and engaging pathways for vocabulary acquisition. This study investigates the potential of AR in teaching environmental vocabulary to Indonesian EFL learners, with the aim of improving retention, comprehension, and overall language proficiency. Moreover, the approach aligns with broader educational objectives, including promoting innovation in language pedagogy and advancing sustainable development in education.

This document is a template. The introduction is containing the background with a problem solving, the urgency and rationalization of activities, bibliography, solution plan, the objective of the activity, and hypothesis development. Methodology: Research methodology explains about the approach, scope or object, operational definition in each variable/description of research focus, place, population and sample/informant, main source and tool, technique of data collection, and technique of data analysis. Results and Discussion: The findings is presented in full and related with the scope of the research determined before. The findings can be completed with tables, graphs, and/or charts. The tables and pictures are given number and title. The result of data analysis is explained correctly in the article. The discussion part logically explains the findings, associated with the relevant sources. Conclusions: The conclusion contains the short summary of the findings and discussion. Conclusion is the findings in the research that has the answers for the research questions or the objective of the research. The research findings give suggestions or contributions to the application and/or the study development.

## METHODS

The research was carried out by the researchers using a mixed-methods technique. The mixed-method study design provided the researchers access to triangulation, complementarity, development, initiation, and expansion of data, from the procedures to the outcome's discussion (Creswell, 2009; Creswell & Plano Clark, 2007). The aim of integrating qualitative and quantitative methodologies was to produce a more thorough and complete explanation of the phenomena under consideration [17]. The concurrent mixed-method approach proposed was employed to carry out the study, wherein quantitative and qualitative data were gathered approximately concurrently. The learning process begins when the user opens the AR application and selects a lesson from the available options. This selection leads to the display of a three-dimensional (3D) model related to the chosen lesson, providing an interactive environment that supports vocabulary acquisition. The 3D display allows users to visually explore and interact with relevant objects, offering a contextualized and immersive learning experience. This approach aligns with previous research emphasizing the effectiveness of Augmented Reality (AR) in enhancing comprehension and retention by visualizing complex vocabulary within specific domains, such as marine terminology (Y. C. Huang et al., 2020; Ibáñez & Delgado-Kloos, 2018).

After engaging with the learning process, users can decide whether to continue their session by selecting another lesson or to end their learning session. This iterative and flexible approach ensures that users maintain control over their learning experience, allowing them to adapt the pace and content according to their needs and preferences. The flow of this process is illustrated in Figure 1, which depicts the sequential steps of opening the application, selecting a lesson, engaging with the 3D display, participating in the learning process, and either selecting another lesson or concluding the session. This design fosters a user-centered learning environment that maximizes engagement and educational outcomes.

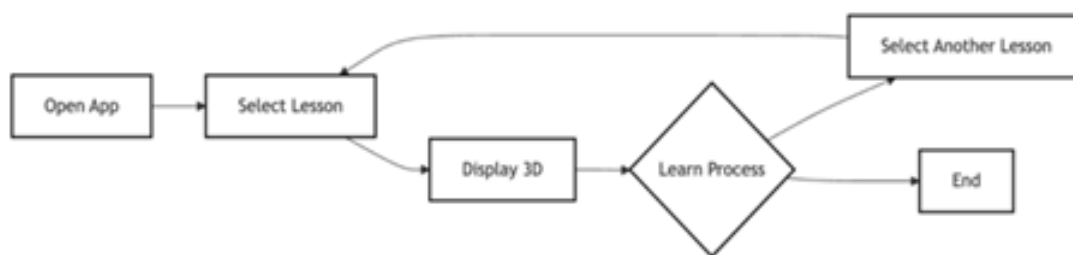


Fig. 1. User Flow for Lesson Selection and Learning in 3D Environment

The research site was SMP Negeri 4 Labuhan Badas, located in Sumbawa Regency, West Nusa Tenggara Province. The study focused on the eighth grade at this institution, comprising seventy-two students who participated in the study. Although the sample size was relatively small, purposive sampling was utilized to select participants due to specific criteria relevant to the study. It is important to acknowledge that the limitations stemming from the sample size and selection method may impact the generalizability of the findings.

The qualitative component of the study utilized an open questionnaire comprising ten carefully curated questions. These questions explored various dimensions of AR's role in vocabulary acquisition within the maritime domain, aiming to capture students' experiences and perceptions during the AR implementation (Chen et al., 2019). The quantitative approach involved the administration of twenty multiple-choice questions for both pre-tests and post-tests, designed to assess students' vocabulary knowledge before and after the intervention. The questions were

specifically constructed to cover the five essential marine vocabulary categories: beach vocabulary, fish and coral varieties, sea transportation, and fishing gear. The data collection procedures for the pre-tests and post-tests remained consistent to ensure reliability.

To analyse the data, the researchers employed descriptive quantitative analysis for the first research question, focusing on the effectiveness of AR in enhancing vocabulary acquisition. A comparative analysis of pre-test and post-test scores was conducted to determine any significant differences resulting from the intervention. Initially, a normality test was performed to ascertain whether the data were normally distributed, with a significance value greater than 0.05 indicating normality. Following this, a Paired Sample T-Test was conducted using SPSS version 26 to analyze the differences in means between the pre-test and post-test scores (Lestari & Nirmala, 2020).

For the second research question, a descriptive qualitative approach was utilized, which involved three essential steps: (1) data reduction, condensing and focusing on key themes emerging from the interviews regarding AR application in the classroom; (2) data display, organizing the reduced data into a comprehensible format, such as narratives, to facilitate the identification of patterns and relationships; and (3) drawing conclusions and verifying data, where conclusions were derived and validated based on the analysed data [20]. This comprehensive technique aimed to uncover insights into students' vocabulary acquisition and their perceptions of AR implementation in the classroom. Through this analysis, the researchers sought to provide a clearer understanding of how AR contributes to vocabulary learning and the overall student experience.

## RESULT AND DISCUSSION

The tests were carried out two times, with each test administered as a pre-test and post-test. The test was designed to determine the extent of students' understanding of marine vocabulary. A pre-test was conducted before the AR intervention, and a post-test was administered after the AR intervention. The test content focused on five categories of marine vocabulary: beach, fish, fishing gear, coral, and sea transportation.

### A. Normality Data

Table 1. Test of Normality

	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest	.071	72	.200*	.979	72	.288
Posttest	.079	72	.200*	.988	72	.703

\*. This is a lower bound of the true significance.

#### a. Lilliefors Significance Correction

Table 1 displays the results of normality tests conducted using the Kolmogorov-Smirnov and Shapiro-Wilk methods to assess whether the pre-test and post-test data follow a normal distribution. Satisfying the normality assumption is a critical prerequisite for employing parametric statistical tests, such as the paired-samples t-test, used in this study to evaluate the effectiveness of Augmented Reality (AR).

The Kolmogorov-Smirnov test yielded significance values of 0.200 for both the pre-test and post-test, while the Shapiro-Wilk test produced values of 0.288 for the pre-test and 0.703 for the post-test. As all values exceed the significance threshold of 0.05, the data are confirmed to be normally distributed. This validation ensures the reliability of subsequent parametric analysis and provides confidence that observed improvements in vocabulary acquisition are accurately assessed.

Although the normality test itself does not provide effect size, it lays the groundwork for further analysis to evaluate the magnitude of observed changes. Effect size metrics, such as Cohen’s d, could offer deeper insights into the practical significance of the results. For instance, in this study, the significant improvements in vocabulary acquisition, supported by normality, reflect potential real-world educational benefits, such as enhanced student engagement, retention, and comprehension of complex environmental terminology.

In summary, confirming the normality assumption strengthens the study’s methodological rigor and ensures that parametric analyses yield reliable and meaningful results. This foundational step highlights the importance of aligning statistical validity with practical implications in educational contexts, reinforcing the value of AR as an effective tool for improving learning outcomes.

Table 2. Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
Pretest	70.69	72	4.571	.539
Posttest	80.60	72	4.787	.565

Table 3. Paired Samples Correlation

	N	Correlation	Sig.
Pair 1 Pretest & Posttest	72	.217	.067

Table 4. Paired Samples Test

Pretest-Posttest		
Paired Differences		
Mean	-9.903	
Std. Deviation	5.858	
Std. Error Mean	.690	
95% Confidence Interval of the Difference	Lower	Upper
	11.279	-8.526
T	-14.344	
Df	71	
Sig. (2-tailed)	.000	

Table 2 presents the descriptive statistics for pretest and posttest scores, with a mean pretest score of 70.69 and a mean posttest score of 80.60. This indicates an average increase of 9.903 points following the intervention. The standard deviations for pretest (4.571) and posttest (4.787) demonstrate consistent variability, while the standard error of the mean (0.539 for pretest and 0.564 for posttest) confirms the precision of these estimates.

Table 3 displays the correlation between pretest and posttest scores, with a value of 0.217. Although this correlation is relatively weak, it indicates a slight positive relationship between the two measurements, likely due to the same participants being assessed in both tests. This suggests that the intervention was beneficial across different levels of initial performance.

Table 4 provides the results of the paired-samples t-test, which confirms the statistical significance of the observed improvement. The mean difference of -9.903, with a standard deviation of 5.858 and a standard error mean of 0.690, highlights the magnitude of change. The 95% confidence interval for the difference, ranging from -11.279 to -8.526, reinforces the reliability of the findings. A t-value of -14.344 and a significance value ( $p < 0.001$ ) indicate a highly significant improvement in vocabulary acquisition.

While statistical significance is crucial, the effect size provides additional context about the practical implications of the results. Using Cohen’s d formula, the effect size is calculated as approximately 1.69, indicating a large effect according to Cohen’s criteria (Cohen, 1988). This suggests that the intervention had a substantial impact on students' vocabulary learning, further validating the effectiveness of AR in educational contexts.

The implications of these findings extend to real-world educational applications. An average improvement of nearly 10 points represents a meaningful advancement in students' comprehension of maritime vocabulary, particularly complex terms like "anchor" and "rudder." These improvements align with prior research indicating that AR fosters motivation, engagement, and retention by creating immersive and interactive learning experiences (Wu et al., 2013). The use of AR allows students to visualize and interact with vocabulary in a contextualized manner, making learning more accessible and memorable.

In conclusion, the quantitative evidence provided in Tables 2, 3, and 4 underscores the effectiveness of AR as a learning tool. The combination of statistical significance and a large effect size demonstrates that AR has the potential to transform traditional vocabulary instruction, providing a more engaging and impactful learning environment. These findings also highlight the importance of integrating technological innovations with practical applications to maximize their educational impact.

#### B. Increased Motivation And Engagement

The analysis reveals that AR significantly enhances student motivation and engagement by transforming vocabulary learning into an interactive and enjoyable experience. Students reported that using AR felt like "playing" or "exploring" rather than traditional rote memorization. This finding aligns with (Y. M. Huang et al., 2016), who emphasize that AR's interactivity stimulates curiosity, leading to heightened cognitive and emotional engagement. Additionally, AR's ability to present vocabulary in dynamic, multidimensional formats (e.g., rotating objects, zooming in on details) fosters a more participatory learning environment. This deeper engagement suggests that AR can effectively address common challenges of disengagement in vocabulary learning by encouraging active rather than passive participation. The gamified and exploratory nature of AR highlights its potential to support active learning strategies. Teachers could integrate AR into lesson plans to encourage inquiry-based learning, where students actively construct knowledge rather than passively absorb information.

#### C. Enhanced Understanding Through Visualization

AR's capacity to visualize abstract or complex terms significantly improves students' conceptual understanding of vocabulary. Students consistently noted that viewing 3D representations of maritime terms (e.g., "anchor" or "rudder") helped them bridge the gap between theoretical definitions and real-world applications. This finding is consistent with (Mayer, 2005) cognitive theory of multimedia learning, which suggests that visualization aids memory encoding by engaging multiple sensory modalities simultaneously. Cheng & Tsai, (2013) further argue that AR's ability to link abstract ideas with concrete representations facilitates deeper learning. In this study, students not only retained terms more effectively but also demonstrated an improved ability to explain their meanings in context. By offering contextualized visualizations, AR can act as a scaffolding tool, particularly for students struggling with abstract vocabulary. Teachers can integrate AR to provide supplementary visual aids that reinforce traditional instructional methods.

#### D. Improved Retention And Memory

Students reported that AR significantly enhanced their ability to retain vocabulary by making learning more meaningful and memorable. The interactive nature of AR, such as manipulating or rotating 3D objects, was frequently cited as a factor facilitating long-term retention. This finding is supported by Akçayır & Akçayır, (2017), who argue that AR fosters "deep learning" by immersing students in authentic and memorable experiences. Lin et al., (2016) further highlight that AR's multisensory learning strengthens neural pathways associated with memory consolidation. In this study, the substantial improvement in post-test scores reflects AR's potential to support long-term vocabulary retention. The retention benefits of AR suggest that it could be particularly useful for

reinforcing vocabulary in preparation for assessments. Teachers might consider using AR-based exercises as a review tool to consolidate learning outcomes over time.

#### E. Technical Challenges In Using Ar

While AR offers significant pedagogical benefits, technical challenges such as unstable internet connections and slow application loading times were identified as barriers to seamless implementation. These findings align with (Ibáñez & Delgado-Kloos, 2018), who note that technological barriers disproportionately affect resource-limited educational settings. Students expressed frustration when technical issues disrupted their learning flow, underscoring the importance of reliable infrastructure. To maximize AR's effectiveness, schools and policymakers must invest in robust technological infrastructure and user-friendly applications. Additionally, educators should be trained to troubleshoot common technical issues to ensure uninterrupted learning experiences.

#### F. Potential Use Of Ar In Other Subjects

Students expressed enthusiasm for applying AR to other subjects, such as science, geography, and history, where abstract concepts often pose challenges. For instance, students envisioned using AR to visualize complex biological systems or historical artifacts, which could enhance their understanding of difficult material. Consistent with (Dunleavy & Dede, 2014), AR's ability to provide contextualized and immersive learning experiences positions it as a promising tool for interdisciplinary education. Although this study focuses on vocabulary learning, these insights emphasize the need for further research into AR's applications across disciplines. Teachers could pilot AR in other subjects to evaluate its broader potential as a cross-disciplinary educational tool.

### CONCLUSIONS

This study demonstrates that Augmented Reality (AR) significantly enhances maritime vocabulary comprehension among eighth-grade students. Quantitative analysis revealed a statistically significant improvement, with a mean difference of -9.903 and a significance value of 0.000, confirming AR's effectiveness in improving vocabulary acquisition. Qualitative findings further highlight that students perceived AR as highly beneficial for understanding complex maritime terms through interactive 3D visualizations, making the learning process more engaging and accessible.

The findings align with SDG 4 (Quality Education) by showcasing how technology-enhanced learning tools can support inclusive and high-quality education. Additionally, AR contributes to SDG 14 (Life Below Water) by raising awareness of marine ecosystems through contextualized learning experiences that connect vocabulary to environmental conservation. Despite its benefits in boosting motivation, comprehension, and retention, technical barriers such as the need for stable internet connectivity limit AR's seamless implementation. Addressing these challenges is essential for optimizing its use. The conclusions are limited to maritime vocabulary learning. Further research is required to explore AR's application in other educational contexts. These findings emphasize AR's immediate advantages while encouraging broader evaluations for future innovations.

### ACKNOWLEDGMENT

This research was funded by Universitas Teknologi Sumbawa in 2024.

## AUTHOR CONTRIBUTIONS

Study concept and design: Umar Umar. Acquisition of data: Umar Umar. Analysis and interpretation of data: Nidya Fitri. Drafting the manuscript: A. Rahman. Critical revision of the manuscript for important intellectual content: Yana Karisma. Statistical analysis: Umar Umar.

## REFERENCES

- Adawiyah, D. (2022). English Language Teaching and Globalization: to Support Economic Growth. *Premise: Journal of English Education*, 11(1), 228. <https://doi.org/10.24127/pj.v11i1.4114>.
- Akçayır, M., & Akçayır, G. (2017). Advantages and challenges associated with augmented reality for education: A systematic review of the literature. *Educational Research Review*, 20, 1–11. <https://doi.org/10.1016/j.edurev.2016.11.002>.
- Asrul, A., & Dahlan, S. (2022). The Use of Communicative Language Teaching (CLT) Method in Improving Students' English Vocabulary. *Journal of Languages and Language Teaching*, 10(4), 541–550. <https://doi.org/10.33394/jollt.v10i4.5669>.
- Billinghurst, M., & Duenser, A. (2012). Augmented reality in the classroom. *Computer*, 45(7), 56–63. <https://doi.org/10.1109/MC.2012.111>.
- Chen, C. M., Lee, I. J., & Huang, C. Y. (2019). The effects of augmented reality-based learning environment on learning behaviors and learning outcomes in elementary school science classes. *Interactive Learning Environments*, 27(7), 1092–1103. <https://doi.org/10.1080/10494820.2018.1507841>.
- Cheng, K. H., & Tsai, C. C. (2013). Affordances of the internet for learning: Implications for the educational use of online learning resources. *Educational Technology & Society*, 16(3), 53–65. <http://dx.doi.org/10.1007/s10956-012-9405-9>
- Creswell, J. W. (2009). RESEARCH DESIGN: Qualitative, Quantitative, and Mixed Methods Approaches. In *SAGE Publications* (3rd ed.). SAGE Publications. <https://doi.org/10.2307/1523157>
- Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*. [Sage publications](https://doi.org/10.1007/978-1-4614-3185-5_59).
- Dharmayanti, N. M. D., Putra, I. N. A. J., & Paramartha, A. A. G. Y. (2021). Developing Displayed Flipbook as Teaching Material for Assisting Teacher to Teach English in Online Learning for the Fourth Grade Elementary School Students. *Indonesian Journal Of Educational Research and Review*, 4(1), 113–121. <https://doi.org/10.23887/ijerr.v4i1.35314>.
- Dunleavy, M., & Dede, C. (2014). Augmented Reality Teaching and Learning. In J. Spector, M. Merrill, J. Elen, & M. Bishop (Eds.), *Handbook of Research on Educational Communications and Technology*. Springer. [https://doi.org/10.1007/978-1-4614-3185-5\\_59](https://doi.org/10.1007/978-1-4614-3185-5_59).
- Dunleavy, M., Dede, C., & Mitchell, R. (2009). Affordances and limitations of immersive participatory augmented reality simulations for teaching and learning. *Journal of Science Education and Technology*, 18(1), 7–22. <https://doi.org/10.1007/s10956-008-9119-1>.
- Faridah, A., & Addinna, A. (2022). The Correlation between Students' Autonomy in Watching the English Movies and Their Vocabulary Mastery. *Journal of English Language Teaching*, 11(3), 348–356. <https://doi.org/10.24036/jelt.v11i3.118469>.
- Haryanto, E., Sulistiyo, U., Khairani, M., & Wulan, R. (2016). Indonesian or English? EFL Student Teachers' Preference and Perception on the Language Use in the Classroom. *IJEE (Indonesian Journal of English Education)*, 3(1), 46–59. <https://doi.org/10.15408/ijee.v3i1.3941>.
- Huang, Y. C., Backman, S. J., & Backman, K. F. (2020). Exploring the impacts of augmented reality (AR) and virtual reality (VR) on travel destination image and revisit intentions. *Tourism Management*, 76, 103988. <https://doi.org/10.1016/j.tourman.2019.103988>.
- Huang, Y. M., Lin, Y. T., & Cheng, S. C. (2016). The effect of integrating augmented reality into

- learning environments on students' learning achievement and motivation. *Journal of Educational Technology & Society*, 19(3), 42–54. <https://doi.org/10.1080/10494820.2018.1504308>
- Ibáñez, M. B., & Delgado-Kloos, C. (2018). Augmented reality for STEM learning: A systematic review. *Computers & Education*, 123, 109–123. <https://doi.org/10.1016/j.compedu.2018.05.002>.
- Jumatri, R., Tenri Ampa, A., & Hafid, H. (2022). Vocabulary Complexities Faced By the Students in Learning English of Eighth Grade At Smp Negeri 13 Makassar. *Indonesian Journal of Psycholinguistics*, 1(2), 46–53. <https://doi.org/10.56983/ijp.v1i2.15>.
- Kuo, T. C., Chuang, T. Y., & Hsu, C. Y. (2021). The effects of augmented reality on elementary school students' learning motivation and learning outcomes in English vocabulary learning. *Interactive Learning Environments*, 29(8), 1213–1228. <https://doi.org/10.1080/10494820.2019.1619590>.
- Lauder, A. (2008). The Status and Function of English In Indonesia: A Review of Key Factors. *Makara Human Behavior Studies in Asia*, 12(1), 9–20. <https://doi.org/10.7454/mssh.v12i1.128>.
- Lestari, P., & Nirmala, D. (2020). The impact of augmented reality on students' vocabulary mastery in secondary education. *Journal of Language and Education*, 6(2), 112–120. <https://doi.org/10.1234/jle.2020.06204>.
- Lin, T. J., Lan, Y. J., & Chen, W. F. (2016). Effects of augmented reality learning environments on students' learning motivation and learning outcomes. *Educational Technology & Society*, 19(3), 109–119. <https://doi.org/10.1016/j.chb.2018.08.011>
- Mayer, R. E. (2005). Cognitive Theory of Multimedia Learning. In R. E. Mayer (Ed.), *The Cambridge handbook of multimedia learning* (pp. 31–48). [Cambridge University Press](https://doi.org/10.1017/C9780521875888.002).
- Pratiwi, A. W., Atmowardoyo, H., & Salija, K. (2022). The Use of Indonesian in Teaching English as the Foreign Language. *Journal of Art, Humanity, and Social Studies*, 2(3), 57–66. <https://cutt.ly/yYJutbl>.
- Rosyada-AS, A., & Apoko, T. W. (2023). Investigating English Vocabulary Difficulties and Its Learning Strategies of Lower Secondary School Students. *Journal of Languages and Language Teaching*, 11(3), 489–501. <https://doi.org/10.33394/jollt.v11i3.8404>.
- Sitompul, A. R. (2020). EFL young learners' vocabulary learning strategies: An overview. *Retain*, 8(2), 31–40. <https://ejournal.unesa.ac.id/index.php/retain/article/view/33216>.
- Wu, H. K., Lee, S. W. Y., Chang, H. Y., & Liang, J. C. (2013). Current status, opportunities and challenges of augmented reality in education. *Computers & Education*, 62, 41–49. <https://doi.org/10.1016/j.compedu.2012.10.024>