IJLECR (International Journal of Language Education and Cultural Review)
E-Jurnal: http://journal.unj.ac.id/unj/index.php/ijlecr
Volume 12, Number 1, June 2026, Page: 25-37

IJLECR
International Journal of Language Education and Culture Review

E-ISSN: 2461-131x
P-ISSN: 2406-8586

DOI: *https://doi.org/10.21009/ijlecr.v12i1.63751*

Received: 14 December 2025
Revised: 21 April 2026
Accepted: 14 June 2026
Published: 14 June 2026

Integrating Augmented Reality and Emotionally Engaged Learning (EEL) to Transform English Vocabulary Instruction in Indonesian Primary Schools

Tiara Noviarini
(*Corresponding Author*)
Universitas Muhammadiyah Lampung, Bandar Lampung, Indonesia
Email: *tiaranoviarini140315@gmail.com*

Bastian Sugandi
Universitas Muhammadiyah Lampung, Bandar Lampung, Indonesia
Email: *bastian@uml.ac.id*

Mark Philip Castillo Paderan
University of Makati, Philippines
Email: *markphilip.paderan@umak.edu.ph*

ABSTRACT

This study aimed to examine the effects of integrating Augmented Reality (AR) with the Emotionally Engaged Learning (EEL) framework on students' vocabulary mastery and emotional engagement. A mixed-methods sequential exploratory design was employed, involving 28 fourth-grade students and two English teachers. The intervention consisted of six sessions using the AR Vocabulary Explorer application, structured according to the four stages of EEL: emotional hook, experience, reflection, and integration. Data were collected through pretest–posttest vocabulary assessments, emotional engagement questionnaires, classroom observations, and semi-structured interviews. Quantitative results indicated significant improvements in vocabulary scores (pretest mean = 58.4, posttest mean = 86.9, $p < 0.01$, Cohen's $d = 0.72$) and emotional engagement (pretest mean = 3.11, posttest mean = 4.49, $p < 0.05$, Cohen's $d = 0.65$). Qualitative findings revealed increased motivation, curiosity, active participation, and collaborative interaction among students. The study concludes that the integration of AR and EEL effectively enhances both cognitive and affective learning outcomes, transforming vocabulary learning from mechanical memorization into meaningful, interactive, and emotionally engaging experiences. These findings offer practical and theoretical implications for developing holistic, technology-supported instructional models and provide directions for future research on long-term retention and broader classroom application.

Keywords: *Augmented Reality, Emotionally Engaged Learning, Vocabulary Mastery, Emotional Engagement, Primary Education*

INTRODUCTION

Modern education requires students to develop not only cognitive skills but also social and emotional abilities. Learning English at the primary level is vital for nurturing early global communication skills. However, within the primary education landscape of developing nations such as Indonesia, many classrooms still rely heavily on rote memorisation and mechanical translation exercises (Herrera & Darragh, 2024; Mortimore, 2023; Rios et al., 2024). In the Indonesian context, this deeply entrenched traditional approach is often driven by rigid curriculum backlogs and a lack of communicative training for teachers, which leads to a superficial understanding, reduced motivation, and low confidence in using English in real-life communication situations (Abusalim et al., 2024; Gay et al., 2022). When teaching focuses

solely on cognitive achievements while neglecting emotional engagement, learning becomes less meaningful and disconnected from students' real-life experiences.

Globally, educational paradigms have shifted towards more interactive, reflective, and experiential learning models (Blyznyuk & Kachak, 2024; Bradberry & De Maio, 2019; Le et al., 2023). Research consistently demonstrates that children learn more effectively when they are emotionally involved with the learning content (Neagu & Stan, 2022; Zakharova Garcia, 2025; Zhou et al., 2025). Positive emotions such as curiosity, joy, and empathy are proven to enhance attention, intrinsic motivation, and long-term memory retention (Derakhshan & Zhang, 2024; Guo & Wu, 2021). Consequently, modern education emphasises teaching methods that not only pass on knowledge but also cultivate emotionally rich and personally meaningful experiences. This approach aligns with the natural learning preferences of young learners, who flourish through concrete experiences, exploration, and social interaction (Ganepola, 2022; Lu et al., 2025; Makhwathana et al., 2017; Xu et al., 2025).

A significant challenge in primary English teaching is bridging the gap between twenty-first century learning demands and traditional classroom methods (Muchie et al., 2025; Nazarian et al., 2024; Sumardi et al., 2020). Students are still often asked to memorise vocabulary lists without understanding the contextual meaning of words, which makes learning dull and uninspiring. Teachers also encounter challenges in creating classroom environments that foster curiosity and emotional engagement (Garcés-Manzanera, 2023; Teemueangsai et al., 2025; Vargo et al., 2024). The low enthusiasm among young English learners shows that traditional cognitively focused methods do not fully address their emotional and psychological needs. Therefore, a new pedagogical model that combines both cognitive and affective elements in language learning is necessary (Hovhannisyan, 2022).

The rapid advancement of digital technologies presents an opportunity to develop learning environments that are more dynamic and meaningful within context. One promising development in this field is Augmented Reality (AR), a technology that blends real-world settings with interactive digital elements (Hovhannisyan, 2022; Kiourexidou et al., 2024; Lin & Yu, 2023; Vashisht & Sharma, 2024). AR enables students to engage directly with three-dimensional visuals, sounds, and animations that relate to the learning material. When teaching English vocabulary, AR offers multisensory experiences that make abstract ideas concrete and memorable. Instead of simply reading the word "cat" or "bird," students can see, hear, and interact with animated representations, helping them connect linguistic symbols with real sensory experiences. This multisensory approach enhances both understanding and retention of new vocabulary (Cygnet & Sivakumar, 2024; Khodabandeh, 2025; Muangchan & Yanhua, 2025; Shemy et al., 2023).

Despite the increasing body of research on AR in education, most studies have primarily concentrated on cognitive outcomes such as achievement scores or concept mastery. Relatively few have examined how AR can foster emotional engagement and positive affective experiences during learning. However, emotional engagement is a vital factor shaping how deeply and durably knowledge is internalised, especially for young learners whose motivation relies on enjoyment and curiosity. (Alhebaishi & Stone, 2025; Olea-Ibarra et al., 2025; Pamungkas et al., 2025). This research gap emphasises the importance of exploring how AR can be combined with pedagogical models that deliberately promote emotional connection and engagement during the learning process.

The Emotionally Engaged Learning (EEL) framework provides a relevant theoretical basis for tackling this challenge. EEL considers emotion as a key element of the learning process, highlighting the connection between feelings, attention, and cognition. It suggests that learners understand and remember information better when they are emotionally involved in what they are learning (Prayogo et al., 2024; Ulutaş, 2023; Wang et al., 2025). Through its four stages—emotional hook, experience, reflection, and integration—EEL encourages learners to

feel, reflect, and internalise learning experiences personally. When applied to English vocabulary learning, this approach allows students not only to recognise new words but also to connect them with emotionally meaningful experiences, thereby enhancing both comprehension and engagement (Kralova et al., 2022).

Integrating AR with the principles of EEL creates a pedagogically effective combination that combines technology and emotion. AR functions as a visual and sensory stimulus that captures students' attention, while EEL provides the emotional framework that transforms sensory inputs into meaningful learning experiences (Jamil et al., 2023; Ulutaş, 2023). Together, they establish a comprehensive instructional approach where technology serves not just as a learning tool, but as a means to foster emotional connections between learners and content. This integration shifts vocabulary learning from a purely mechanical memorisation process to a more affective and socially engaging communicative experience.

From a theoretical perspective, this study adds to the expanding body of research on emotionally driven, technology-enhanced learning in primary education. It broadens the discussion on how emotion, interaction, and technology can work together to improve learning experiences. Practically, the study presents an instructional model suitable for young learners, who are mainly visual and kinesthetic by nature. The inclusion of AR and EEL also offers teachers an innovative strategy to address classroom disengagement and to promote meaningful emotional interactions in language learning. This approach supports current educational priorities that encourage digital integration to boost creativity, empathy, and character development. Based on this foundation, the present study aims to explore the impact of combining Augmented Reality (AR) and Emotionally Engaged Learning (EEL) on primary students' English vocabulary mastery and emotional engagement. The research focuses on how emotional interaction develops within AR-based instruction and how this integration affects students' learning outcomes and motivation. Using a mixed-methods sequential exploratory design, this study combines qualitative exploration of learners' experiences with quantitative assessment of instructional effects. Academically, it contributes to the development of holistic learning models that combine cognitive, affective, and technological factors. Practically, the findings are expected to help teachers and curriculum designers create more interactive, human-centred, and emotionally meaningful English learning experiences for young learners.

METHOD

This study employed a Mixed Methods Sequential Exploratory Design, integrating qualitative and quantitative methods conducted in two sequential phases. (Paiandeh et al., 2024). The qualitative phase aimed to explore students' and teachers' perceptions, experiences, and emotional responses towards Augmented Reality (AR)-based English vocabulary learning, while the quantitative phase assessed its measurable impact on emotional engagement and vocabulary mastery. This design was selected because it enabled a comprehensive understanding of both contextual and statistical aspects of learning, demonstrating how the integration of AR and Emotionally Engaged Learning (EEL) affects children's affective and cognitive development in the classroom. The participants included twenty-eight fourth-year students aged nine to ten years, along with two English teachers actively teaching at the same grade level. Participants were chosen using purposive sampling based on specific inclusion criteria: similar English proficiency, access to digital learning tools, and willingness to take part in technology-based instruction. The intervention lasted three weeks, consisting of six sixty-minute sessions. Teachers acted as facilitators during the implementation of AR-EEL learning and as collaborators during post-lesson reflections. All sessions were held during regular school hours to ensure natural learning conditions and minimal disruption to the school timetable.

Learning was carried out using AR Vocabulary Explorer, an Augmented Reality application that combines three-dimensional objects, pronunciation sounds, and animated

movements to enhance students' multisensory learning experiences. The classroom was equipped with tablets and Wi-Fi to facilitate real-time AR interaction. The AR environment displayed contextualised vocabulary, allowing students to visualise, hear, and manipulate digital representations of English words. The activity design adhered to the four stages of the EEL framework: emotional hook, experience, reflection, and integration. The emotional hook was introduced through storytelling or brief visual prompts that sparked curiosity. The experience stage involved direct AR interactions, while reflection enabled students to express their feelings about the activity. The final integration stage linked emotions and understanding, helping learners to internalise meanings more deeply.

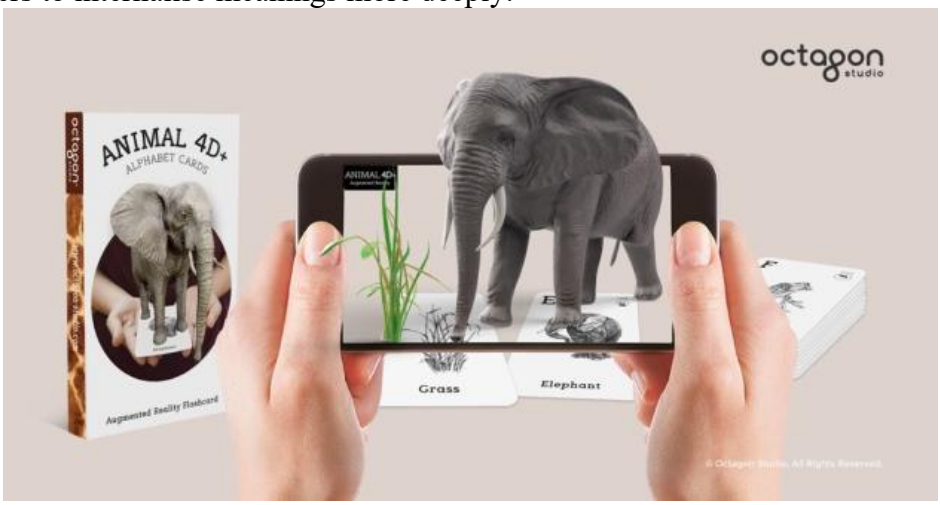

Figure 1. Interface of the AR Vocabulary Explorer Application Utilised in the Study

To gather comprehensive data, four research tools were used. The semi-structured interview guide examined participants' emotional and cognitive perceptions during AR-based learning, while the observation checklist recorded emotional engagement indicators such as enthusiasm, focus, and verbal interaction, adapted from the Emotional Engagement Scale for Children (Liu et al., 2025; Zhao et al., 2025). A vocabulary mastery test consisting of 20 illustrated multiple-choice items was used to assess students' understanding of key English words, with a reliability coefficient of KR-20 = 0.81. The emotional engagement questionnaire, containing 15 Likert-scale items (1–5), measured enthusiasm, empathy, and enjoyment, and demonstrated strong reliability with Cronbach's $\alpha = 0.86$. All instruments were validated by two educational experts and pilot-tested with a comparable sample to ensure clarity and consistency. The research process involved two stages. The first, a qualitative exploration, included interviews with two teachers and ten students, along with classroom observations across three sessions to capture emotional and behavioural responses during AR lessons. Qualitative data were analysed thematically following a reflexive approach, involving familiarisation, coding, theme development, and interpretation. (Campbell et al., 2021; W. Xu & Zammit, 2020). The second phase, a quantitative verification, used a pretest–posttest design. All students completed both the vocabulary test and emotional engagement survey before and after the AR-EEL intervention.

Data analysis employed an integrative approach that combined qualitative interpretation and quantitative verification. The qualitative findings explained the underlying emotional and cognitive phenomena observed during the intervention, while the quantitative data offered empirical validation of those effects. Statistical analyses were performed using SPSS version 26.

Given that the sample size was under 30 (N=28), a Shapiro-Wilk test of normality was conducted prior to executing parametric operations. The results confirmed that both the vocabulary test data ($W=0.942$, $p=0.124$) and the emotional engagement questionnaire data

(W=0.961, p=0.381) did not significantly violate the assumption of normality (p>0.05). Consequently, a paired sample t-test was applied as follows:

$$t = \frac{\bar{X}_{Post} - \bar{X}_{Pre}}{S_d/\sqrt{n}}$$

where $\bar{X}_{post}$ and $\bar{X}_{pre}$are the mean posttest and pretest scores, S_d is the standard deviation of the score differences, and n is the sample size. The effect size was calculated to measure the strength of the treatment using Cohen's d formula:

$$d = \frac{\bar{X}_{Post} - \bar{X}_{Pre}}{S_p}$$

where S_p represents the pooled standard deviation. An effect size of 0.2 is considered small, 0.5 medium, and 0.8 or higher large (Brydges, 2019). These formulas were used only for interpretive significance and are generally known within quantitative research conventions.

To ensure methodological rigour, triangulation of sources and methods was employed, and a comprehensive audit trail documented all research activities. Validity was strengthened through expert review and member checking, while reliability was evaluated using internal consistency measures. Ethical protocols were rigorously followed: all participants and their parents provided informed consent, participation was voluntary, and confidentiality was maintained through anonymisation. The study adhered to ethical standards for educational research involving children, prioritising safety, comfort, and psychological well-being during learning activities. This methodological approach ensured that the study could be replicated in similar settings and that both qualitative insights and quantitative data were integrated coherently. By combining technological innovation with emotional learning principles, the research established a balanced methodological framework that links cognitive performance with affective engagement in primary English language education.

RESULTS AND DISCUSSION

Results

This study aims to explore how the integration of Augmented Reality (AR) and the Emotionally Engaged Learning (EEL) approach enhances elementary students' vocabulary mastery and emotional engagement. The analysis was conducted in two stages: a qualitative phase to examine students' and teachers' learning experiences, followed by a quantitative phase to empirically evaluate improvements in learning outcomes. Overall, the findings show that using AR-based media combined with emotion-focused instructional strategies successfully creates a learning environment that is enjoyable, interactive, and meaningful. Students not only demonstrated a significant improvement in vocabulary acquisition but also showed higher levels of emotional engagement throughout the learning process.

Qualitative Findings

Qualitative data were collected through in-depth interviews with two teachers and ten students, supplemented by classroom observations during three sessions of AR-based English instruction. The data analysis followed Braun and Clarke (2019) reflexive thematic approach, resulting in three main themes that illustrate how AR-EEL learning impacted students' emotional engagement and vocabulary learning experiences.

The first theme, Positive Emotions Enhance Focus and Learning Motivation, revealed that most students showed visible excitement and joy when AR objects appeared on their tablet screens. The children laughed, clapped, and expressed delight as the animated animals moved or made sounds. One student cheerfully said, "*It's so funny! The animal looks real! I want to know what it means.*" These responses indicated that visual and auditory stimuli from AR media evoked positive emotions that helped students focus more and become motivated to learn.

Teachers also observed that students became easier to guide and more eager to complete vocabulary-related tasks after using the AR media.

The second theme, Interactive Visualization Strengthens Vocabulary Retention, showed that students could remember vocabulary more effectively after observing and interacting with three-dimensional AR objects. For example, they recalled words such as rabbit and cat without the need for repetitive memorization because they connected the words with the images and sounds of the AR characters. One teacher commented, "*The students don't just memorize the words; they remember what they look and sound like, so they really understand their meaning*." This finding demonstrates that visual and interactive learning reinforces long-term memory by integrating visual, auditory, and semantic information into a coherent learning experience.

The third theme, Emotional Reflection Builds Empathy and Social Engagement, emerged during the "story talk" reflection sessions held after AR learning activities. During these sessions, students shared their feelings and impressions about the characters in the application. Some imitated animal sounds, while others related the characters to their pets or personal experiences. Teachers noted that the reflection sessions created a relaxed and joyful atmosphere, encouraging open communication and positive social interaction. This reflective process enabled students to express their emotions naturally while developing empathy, curiosity, and confidence in speaking with their classmates.

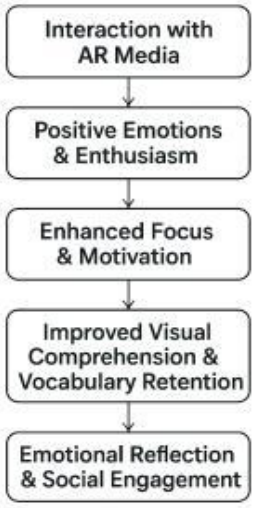

Figure 2. Thematic Model of Students' Emotional Engagement through AR-EEL Learning

Quantitative Findings

The quantitative phase of this study involved the 28 elementary school students who participated in a pretest–posttest design to assess changes in English vocabulary mastery and emotional engagement after implementing the Augmented Reality–Emotionally Engaged Learning (AR-EEL) model. This analysis aimed to provide empirical evidence of the intervention's effectiveness by comparing scores before and after. Statistical analysis was conducted using a paired sample *t*-test to identify significant differences, and Cohen's *d* was calculated to measure the effect size, reflecting the intervention's impact on learning outcomes.

The results showed a significant improvement in both vocabulary mastery and emotional engagement following the AR-EEL intervention. Table 1 displays the descriptive and inferential statistics derived from the 28 participants using SPSS version 26. All statistics have been carefully reconciled for N=28. The mean vocabulary score increased significantly from 58.40 to 86.90 (p<0.01). Likewise, the mean emotional engagement score rose from 3.11 to 4.49 (p<0.05). The effect size (Cohen's d) of 0.72 for vocabulary mastery signifies a robust

E-ISSN: 2461-131x
P-ISSN: 2406-8586

treatment effect, while the value of 0.65 for emotional engagement falls within the moderate–strong range.

Table 1. Descriptive Statistics of Pretest and Posttest Scores

Variable		Mean (Pretest)	Mean (Posttest)	SD	p-value	Effect Size (d)	Interpretation
Vocabulary Mastery	8	58.40	86.90	9.02	< 0.01	0.72	Strong Effect
Emotional Engagement	8	3.11	4.49	0.42	< 0.05	0.65	Moderate–Strong Effect

These increases indicate that integrating AR technology with an emotion-focused learning approach not only boosts students' cognitive skills in vocabulary acquisition but also enriches the emotional aspect of learning. Students showed higher levels of activity, concentration, and enthusiasm during the learning process. Many students displayed curiosity, smiled often, and actively engaged in discussions while interacting with three-dimensional objects within th

In addition to quantitative gains, teacher observations revealed a more dynamic and collaborative classroom atmosphere. Students engaged more frequently with peers and teachers, particularly when guessing word meanings based on animations or auditory cues from the application. This indicates that emotionally rich learning experiences play a crucial role in sustaining attention and motivation during English learning activities.

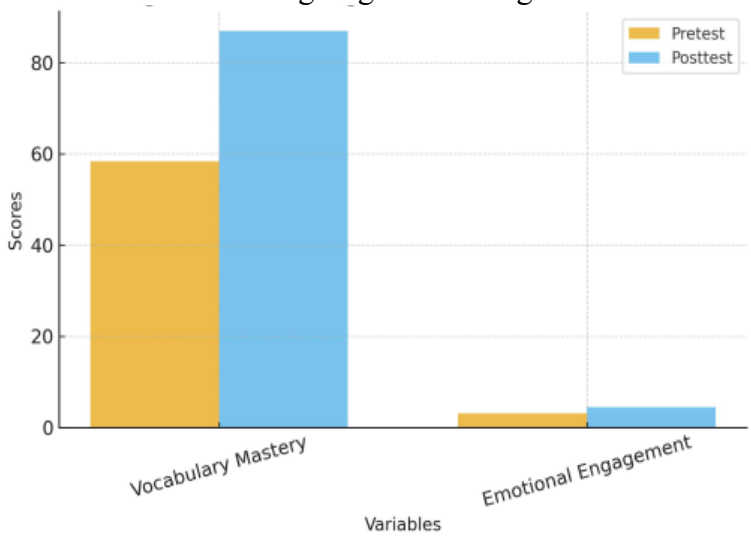

Figure 3. Comparison of Pre-test and Post-test Scores

The figure shows consistent improvements across both primary variables following the AR-EEL implementation. Nearly all students demonstrated increased scores in vocabulary mastery and emotional engagement. These improvements suggest that combining Augmented Reality with Emotionally Engaged Learning positively impacts cognitive learning outcomes while fostering positive emotions, curiosity, and self-confidence in active participation. Overall, the quantitative results support previous qualitative findings, showing that AR-EEL-based instruction creates enjoyable, interactive, and meaningful learning experiences. The concurrent enhancement in learning outcomes and emotional engagement emphasises the approach's effectiveness in integrating cognitive and affective domains, providing a pedagogically relevant model for 21st-century education.

Discussion

The findings of this study indicate that integrating Augmented Reality (AR) with the Emotionally Engaged Learning (EEL) approach significantly improves primary students' English vocabulary mastery and emotional engagement. Quantitative analysis revealed that the mean vocabulary scores increased from 58.4 to 86.9 ($p < 0.01$) with a strong effect size (Cohen's $d = 0.72$), while emotional engagement scores rose from 3.11 to 4.49 ($p < 0.05$) with a moderate to strong effect size (Cohen's $d = 0.65$). Qualitative observations supported these results, showing that students were more enthusiastic, actively participated, displayed increased curiosity, and collaborated more effectively during AR-based learning activities. These findings confirm that combining AR technology with an emotion-centred instructional framework can simultaneously enhance both cognitive and affective aspects of learning.

These results are consistent with previous studies highlighting the critical role of emotional engagement in improving learning outcomes (Tong & Singh, 2025; Zhoc et al., 2020). Similar findings were reported, demonstrating that technology-mediated multisensory learning experiences enhance attention and knowledge retention in children (Broadbent et al., 2018; Di Fuccio et al., 2025; Xiaojun et al., 2022). While earlier research predominantly focused on cognitive achievement, the present study contributes a novel perspective by emphasizing that AR can foster emotionally meaningful learning experiences, which are essential for sustaining intrinsic motivation among young learners (Arkhipova et al., 2024; Buchner & Zumbach, 2018; Xiaojun et al., 2022)

A critical interpretation of these outcomes can be understood through the lens of the EEL framework. The stages of emotional hook, interactive AR experience, reflection, and integration provided opportunities for students to connect linguistic content with personal and emotional experiences. Cognitively, dual coding through visual and auditory stimuli strengthened understanding and memory retention of vocabulary. Affectively, positive emotions such as curiosity, enjoyment, and social interaction enhanced focus and persistence (Alhazmi, 2024; Printer, 2023). The combination of technology and emotion transformed vocabulary learning from a mechanical memorisation process into a meaningful, interactive, and socially engaging experience. Contextually, the visual and kinesthetic learning preferences of Indonesian primary students further contributed to the effectiveness and relevance of AR-based instruction.

From a practical standpoint, these findings offer strong evidence that AR-EEL-based teaching strategies can be used to enhance both vocabulary skills and emotional engagement. Teachers can incorporate AR applications to create interactive, enjoyable, and emotionally meaningful learning experiences. Theoretically, this research contributes to the development of technology-supported learning models that combine cognitive, affective, and digital aspects, highlighting the significance of emotion-aware instructional design in achieving comprehensive learning outcomes in primary education, especially in settings where rote learning still prevails.

Nevertheless, the study has several limitations. The sample was confined to a single class within one school, which may limit the generalisability of the findings. The relatively short duration of the intervention, three weeks, may also restrict the long-term effects on vocabulary retention and sustained emotional engagement. In addition, emotional engagement was measured through observational scales and self-report questionnaires, which, despite triangulation, may be vulnerable to subjective bias.

Based on these limitations, future research could explore the long-term effects of AR-EEL interventions across multiple year groups and diverse school settings. Subsequent studies could also incorporate other interactive technologies, such as virtual reality or gamified learning platforms, to further enhance both cognitive and affective learning outcomes. The use of physiological or neurocognitive indicators to measure emotional engagement may provide

E-ISSN: 2461-131x
P-ISSN: 2406-8586

more objective data. Additionally, investigations into teachers' perceptions and implementation challenges in larger classrooms would offer practical insights for broader and more sustainable adoption.

CONCLUSION

This study shows that combining Augmented Reality (AR) with the Emotionally Engaged Learning (EEL) framework effectively improves primary students' vocabulary skills and emotional involvement. The intervention not only boosts language ability but also encourages intrinsic motivation, curiosity, active participation, and more social interaction during learning. These results support the study's initial aim that integrating AR and EEL can create meaningful, interactive, and enjoyable learning experiences for young learners. Additionally, the findings offer a better understanding of how emotional engagement and multisensory interaction can be systematically included in instructional design, highlighting the potential of comprehensive learning strategies that blend technology, cognition, and emotion to enhance primary education.

However, several practical and pedagogical limitations must be acknowledged, such as the steep learning curve required for primary teachers to effectively operate AR platforms and the critical infrastructure limitations found in low-resource environments. Furthermore, within the Indonesian educational framework, these findings carry vital policy implications; they suggest that to achieve the communicative goals of the Kurikulum Merdeka, future syllabus designs and national teacher training programs must move beyond traditional cognitive instruction to systematically institutionalize multisensory, technology-driven, and affective learning ecosystems. The study also suggests directions for future research, such as examining long-term vocabulary retention, applying AR-EEL interventions in different school settings, and using objective measures like physiological or neurocognitive indicators to assess emotional engagement, supporting the development of more effective and sustainable learning models.

REFERENCES

Abusalim, N., Rayyan, M., Alshanmy, S., Alghazo, S., & Rababah, G. (2024). Digital versus classroom discussions: Motivation and self-efficacy outcomes in speaking courses via Gather.town. *Journal of Applied Learning and Teaching*, *7*(1). https://doi.org/10.37074/jalt.2024.7.1.24

Alhamad, K., Manches, A., & McGeown, S. (2024). Augmented reality books: in-depth insights into children's reading engagement. *Frontiers in Psychology*, *15*. https://doi.org/10.3389/fpsyg.2024.1423163

Alhazmi, K. (2024). The Effect of Multimedia on Vocabulary learning and retention. *World Journal of English Language*, *14*(6), 390–399. https://doi.org/10.5430/wjel.v14n6p390

Alhebaishi, S., & Stone, R. (2025). Augmented sensory experience and retention: ASER framework. *International Journal of Advanced Computer Science and Applications*, *16*(4). https://doi.org/10.14569/IJACSA.2025.0160401

Arkhipova, M. V, Shutova, N. V, Orlova, O. A., Zhernovaya, O. R., Zintsova, Y. N., & Udalova, I. M. (2024). Digital transformations in education: augmented reality in the classroom. *AIP Conference Proceedings*, *2969*(1). https://doi.org/10.1063/5.0182525

Blyznyuk, T., & Kachak, T. (2024). Benefits of interactive learning for students' critical thinking skills improvement. *Journal of Vasyl Stefanyk Precarpathian National University*, *11*(1), 94–102. https://doi.org/10.15330/jpnu.11.1.94-102

Bradberry, L. A., & De Maio, J. (2019). Learning By Doing: The Long-Term Impact of Experiential Learning Programs on Student Success. *Journal of Political Science Education*, *15*(1), 94–111. https://doi.org/10.1080/15512169.2018.1485571

Braun, V., & Clarke, V. (2019). *Reflecting on reflexive thematic analysis to appear in Qualitative Research in Sport*.

Broadbent, H. J., White, H., Mareschal, D., & Kirkham, N. Z. (2018). Incidental learning in a multisensory environment across childhood. *Developmental Science*, *21*(2). https://doi.org/10.1111/desc.12554

Brydges, C. R. (2019). Effect size guidelines, sample size calculations, and statistical power in gerontology. *Innovation in Aging*, *3*(4). https://doi.org/10.1093/geroni/igz036

Buchner, J., & Zumbach, J. (2018). Promoting intrinsic motivation with a mobile augmented reality learning environment. *Proceedings of the 14th International Conference on Mobile Learning 2018, ML 2018*, 55–61. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85052241533&partnerID=40&md5=1161fc6ca92a8ea919a20ab7f112dbd6

Campbell, K. A., Orr, E., Durepos, P., Nguyen, L., Li, L., Whitmore, C., Gehrke, P., Graham, L., & Jack, S. M. (2021). Reflexive thematic analysis for applied qualitative health research. *Qualitative Report*, *26*(6), 2011–2028. https://doi.org/10.46743/2160-3715/2021.5010

Cygnet, A. B., & Sivakumar, P. (2024). Efficacy of augmented reality-based flashcards on learning Basic Tamil words among primary learners during neo - normal period. *Education and Information Technologies*, *29*(6), 6705–6722. https://doi.org/10.1007/s10639-023-12073-0

Derakhshan, A., & Zhang, L. J. (2024). Introduction to the special issue: new insights into the study of classroom emotions: emerging research methods for exploring the implications of positive and negative emotions in language education environments. *Iranian Journal of Language Teaching Research*, *12*(3), 1–8. https://doi.org/10.30466/ijltr.2024.121574

Di Fuccio, R., Ponticorvo, M., Nadim, M. A., & Limone, P. (2025). Exploring the effect of digital and multisensory educational materials on retention in primary school using Tangible User Interfaces. *Interactive Learning Environments*, *33*(4), 2928–2938. https://doi.org/10.1080/10494820.2024.2427277

Ganepola, D. (2022). Assessment of Learner emotions in online learning via educational process mining. *Proceedings - Frontiers in Education Conference, FIE*, *2022-October*. https://doi.org/10.1109/FIE56618.2022.9962490

Garcés-Manzanera, A. (2023). Incidental vocabulary learning and retention in education-oriented L2 communicative tasks: the effect of testing conditions. *Miscelanea*, *67*, 15–40. https://doi.org/10.26754/ojs_misc/mj.20236858

Gay, P., Pogranova, S., Mauroux, L., Trisconi, E., Rankin, E., & Shankland, R. (2022). Developing students' emotional competencies in english language classes: reciprocal benefits and practical implications. *International Journal of Environmental Research and Public Health*, *19*(11). https://doi.org/10.3390/ijerph19116469

Guo, R., & Wu, Z. (2021). Empathy as a buffer: How empathy moderates the emotional effects on Preschoolers' sharing. *British Journal of Psychology*, *112*(2), 412–432. https://doi.org/10.1111/bjop.12466

Herrera, L. J. P., & Darragh, J. J. (2024). Social-emotional learning in English language teaching. In *Social-Emotional Learning in English Language Teaching*. https://doi.org/10.3998/mpub.14379488

Hovhannisyan, G. R. (2022). Psycholinguistic competencies and interculturality in ELT. In *English Language Education* (Vol. 24, pp. 15–33). https://doi.org/10.1007/978-3-030-91881-1_2

Jamil, M. A., Kadir, K., Kahar, N. H. A., Luqman, N. A. S., & Ahmad, I. (2023). Augmented reality for equipment and troubleshooting application. *ICSIMA 2023 - 9th IEEE*

International Conference on Smart Instrumentation, Measurement and Applications, 215–219. https://doi.org/10.1109/ICSIMA59853.2023.10373461

Khodabandeh, F. (2025). Enhancing vocabulary learning and retention in EFL Students: A comparative study of ARLOOPA augmented reality app in flipped online and flipped face-to-face classes. *Educational Technology Research and Development*, *73*(4), 2523–2541. https://doi.org/10.1007/s11423-025-10489-8

Kiourexidou, M., Kanavos, A., Klouvidaki, M., & Antonopoulos, N. (2024). Exploring the role of user experience and interface design communication in augmented reality for education. *Multimodal Technologies and Interaction*, *8*(6). https://doi.org/10.3390/mti8060043

Kralova, Z., Kamenicka, J., & Tirpakova, A. (2022). The impact of emotionally competent stimuli on language lexis retention. *XLinguae*, *15*(3), 51–60. https://doi.org/10.18355/XL.2022.15.03.05

Le, L.-A. T., Nguyen, D. T., Nguyen, H. T., Le, N. T., & Le, P. T. (2023). Investigation of primary teachers' perspectives on experiential learning for Vietnamese students. *International Journal of Education and Practice*, *11*(3), 462–473. https://doi.org/10.18488/61.v11i3.3404

Lin, Y., & Yu, Z. (2023). A meta-analysis of the effects of augmented reality technologies in interactive learning environments (2012–2022). *Computer Applications in Engineering Education*, *31*(4), 1111–1131. https://doi.org/10.1002/cae.22628

Lu, Y., Wei, D., & Li, Y. (2025). Teacher's emotional contagion on students: Evidence from multi-method approaches. *Teaching and Teacher Education*, *155*. https://doi.org/10.1016/j.tate.2024.104891

Makhwathana, R. M., Mudzielwana, N. P., Mulovhedzi, S. A., & Mudau, T. J. (2017). Effects of teachers' emotions in teaching and learning in the foundation phase. *Journal of Psychology*, *8*(1), 28–35. https://doi.org/10.1080/09764224.2017.1335677

Mortimore, L. (2023). A framework for developing social and emotional learning (sel) in pre-primary CLIL. In *Springer International Handbooks of Education: Vol. Part F1633* (pp. 79–100). https://doi.org/10.1007/978-3-031-04768-8_6

Muangchan, P., & Yanhua, Z. (2025). Augmented reality technology in a basic Chinese vocabulary course: a study in a Thai university. *Cogent Education*, *12*(1). https://doi.org/10.1080/2331186X.2024.2446088

Muchie, B., Yigzaw, A., & Simegn, B. (2025). Examining the application of innovative ELT strategies in primary school EFL classrooms. *PLOS ONE*, *20*(8 August). https://doi.org/10.1371/journal.pone.0328902

Nazarian, M., Alsheikh, N., & Alhosani, M. (2024). Between vision and revision: english language teachers accentuating their voices about 21st century skills. *International Journal of Learning in Higher Education*, *31*(1), 25–50. https://doi.org/10.18848/2327-7955/CGP/v31i01/25-50

Neagu, M.-I., & Stan, R.-I. (2022). Developing soft skills during EFL classes. In *Multimodal Communication and Soft Skills Development* (pp. 279–317). https://www.scopus.com/inward/record.uri?eid=2-s2.0-85139394216&partnerID=40&md5=b25e4b878fa09ca9a37c30911b19696c

Olea-Ibarra, D., Hartmann, C., & Bannert, M. (2025). The role of enjoyment and epistemic emotions in middle school ar learning: a quasi-experimental field study. *Journal of Computer Assisted Learning*, *41*(2). https://doi.org/10.1111/jcal.70016

Paiandeh, M., Nourizadeh, R., Mehrabi, E., Mirghafourvand, M., & Mohammadi, E. (2024). Design and implementation of interventions to improve unplanned pregnancy experiences: a mixed-methods study protocol with an interventional design. *Reproductive Health*, *21*(1). https://doi.org/10.1186/s12978-024-01889-9

Pamungkas, O. Y., Purwoko, D., An-Nahidl, N. A., Mulyadi, M., & Wati, R. (2025). Augmented reality-based psycholiterary learning: enhancing emotional and narrative literacy in higher education. *Research Journal in Advanced Humanities*, *6*(3). https://doi.org/10.58256/n5ygh731

Prayogo, A., Khotimah, K., Istiqomah, L., & Maharsi, I. (2024). Students' emotional engagement in online classes: a conceptual framework. *International Journal of Information and Learning Technology*, *41*(1), 61–72. https://doi.org/10.1108/IJILT-04-2023-0052

Printer, L. (2023). Positive emotions and intrinsic motivation: A self-determination theory perspective on using co-created stories in the language acquisition classroom. *Language Teaching Research*. https://doi.org/10.1177/13621688231204443

Rios, G. N., Mendoza, K. G., Fabian, H. M., Reales, K., & del Carmen Ojeda Pertuz, D. (2024). Methodological strategies and techniques implemented by teachers in the teaching-learning process of English in Spanish-speaking students. *Procedia Computer Science*, *231*, 508–513. https://doi.org/10.1016/j.procs.2023.12.242

Shemy, I. E., Urrea, A. L., Erena-Guardia, G., Saldaña, D., Vulchanova, M., & Giannakos, M. (2023). Enhancing the vocabulary learning skills of autistic children using augmented reality: a participatory design perspective. *ACM International Conference Proceeding Series*, 87–96. https://doi.org/10.1145/3594781.3594791

Sumardi, L., Rohman, A., & Wahyudiati, D. (2020). Does the teaching and learning process in primary schools correspond to the characteristics of the 21st century learning? *International Journal of Instruction*, *13*(3), 357–370. https://doi.org/10.29333/iji.2020.13325a

Teemueangsai, S., Sukying, A., & Min, C. (2025). Improving L2 vocabulary acquisition through drawing games: insights into student engagement among thai efl learners. *Forum for Linguistic Studies*, *7*(5), 655–669. https://doi.org/10.30564/fls.v7i5.9327

Tong, Y., & Singh, B. S. M. (2025). The interaction between learning engagement and academic achievement in second language acquisition: a multivariate analysis. *Forum for Linguistic Studies*, *7*(7), 386–401. https://doi.org/10.30564/fls.v7i7.10142

Ulutaş, N. K. (2023). Rethinking learning engagement through emotional learning analytics in K-12 classrooms through social-emotional learning and mindfulness. In *Emergent Practices of Learning Analytics in K-12 Classrooms* (pp. 198–212). https://doi.org/10.4018/9798369300664.ch009

Vargo, A., Yamaguchi, K., Iwata, M., & Kise, K. (2024). A context-based multimedia vocabulary learning system for mobile users. *Informatics*, *11*(1). https://doi.org/10.3390/informatics11010001

Vashisht, S., & Sharma, B. (2024). Interactive Learning: travelling through history using augmented reality. *International Conference on E-Mobility, Power Control and Smart Systems: Futuristic Technologies for Sustainable Solutions, ICEMPS 2024*. https://doi.org/10.1109/ICEMPS60684.2024.10559274

Wang, Q., Quek, C. L., Wen, Y., & Chin, Y. J. (2025). Investigating learner emotional engagement in synchronous online learning. *Global Chinese Conference on Computers in Education Main Conference Proceedings (English Paper)*, *2025*, 54–57. https://www.scopus.com/inward/record.uri?eid=2-s2.0-105016646496&partnerID=40&md5=cdc533d3eb3b801724ded701ac27a394

Xiaojun, Z., Xinrui, K., & Xupeng, L. (2022). The influence of learning mode and learning sharing behavior on the synchronicity of attention of sharers and learners. *BMC Psychology*, *10*(1). https://doi.org/10.1186/s40359-022-00871-z

Xu, W., & Zammit, K. (2020). Applying Thematic Analysis to Education: A hybrid approach to interpreting data in practitioner research. *International Journal of Qualitative Methods*, *19*. https://doi.org/10.1177/1609406920918810

Xu, Y., Gu, H., Wang, Q., Yu, J. J., Tornquist, M., & Shen, J. (2025). A case study of a teacher's extrinsic emotion regulation on students' positive emotions and learning experience. *International Journal of Educational Research*, *134*. https://doi.org/10.1016/j.ijer.2025.102811

Zakharova Garcia, G. (2025). The Power Of Emotion in EFL: Discourse analysis of electronic study resources. *Journal of Vasyl Stefanyk Precarpathian National University*, *12*(1), 6–14. https://doi.org/10.15330/jpnu.12.1.6-14

Zhoc, K. C. H., King, R. B., Chung, T. S. H., & Chen, J. (2020). Emotionally intelligent students are more engaged and successful: examining the role of emotional intelligence in higher education. *European Journal of Psychology of Education*, *35*(4), 839–863. https://doi.org/10.1007/s10212-019-00458-0

Zhou, M., Liu, X., & Guo, J. (2025). The mediating effect of self-efficacy between teacher emotional support and interaction engagement in EFL learning. *Journal of Multilingual and Multicultural Development*, *46*(7), 1988–2002. https://doi.org/10.1080/01434632.2023.2267033