Integrating Deep Learning and Augmented Reality in English as a Foreign Language Teaching (EFLT): a Literature Review

Ruslina Tri Astuti
MTs Negeri 1 Yogyakarta, Indonesia

Keywords:

Augmented Reality; Deep Learning.

Correspondence to:
Ruslina Tri Astuti,
MTs Negeri 1 Yogyakarta,
Indonesia
e-mail:
ruslinatriastuti@gmail.com

ABSTRACT

In recent years, both Deep Learning and Augmented Reality (AR) have emerged as transformative approaches in education, particularly in English as a Foreign Language Teaching (EFLT). However, a gap remains in synthesizing research that explores their combined pedagogical potential, especially in the context of developing countries such as Indonesia. This systematic literature review aims to examine the integration of Deep Learning and AR in EFLT, focusing on their roles in enhancing learner engagement, critical thinking, and language acquisition. Relevant peer-reviewed studies published between 2015 and 2024 were collected from databases such as Scopus, ERIC, and Google Scholar. The analysis identified recurring themes including AR's positive impact on student motivation and contextual understanding, and Deep Learning's support for higher-order thinking and collaborative tasks. Challenges such as limited infrastructure, insufficient teacher training, and lack of localized content were also highlighted. The review concludes with recommendations for future research, including the need for culturally responsive AR tools, professional development for teachers, and longitudinal studies on learning outcomes. This synthesis offers practical and theoretical insights for educators, policymakers, and researchers aiming to innovate EFLT through technology integration.

INTRODUCTION

Deep Learning, in the educational sense, refers to instructional approaches that go beyond rote memorization to foster critical thinking, reflection, and transfer of knowledge (Dede, 2010). In language education, it emphasizes the development of communicative competence, creativity, and real-world language use. Suwandi (2022) connects deep learning with Indonesia's Merdeka Belajar curriculum, which encourages learner autonomy, inquiry-based tasks, and student-centered learning experiences.

.

In English as a Foreign Language (EFL) classroom, Deep Learning has been linked to the development of higher-order skills such as analyzing authentic texts, applying vocabulary in context, and producing original written or spoken output. According to Chickering and Gamson (1987), principles such as cooperation among students, active learning, and prompt feedback are essential to fostering this kind of learning environment. Rahmawati and Yulianti (2023) note, however, that despite policy support, many Indonesian teachers face challenges in applying deep learning effectively due to limited professional development and rigid classroom traditions.

Several researchers have emphasized that Deep Learning in language education fosters not only academic achievement but also the development of 21st-century competencies such as collaboration, communication, and digital literacy. Bloom's Taxonomy (1956), which classifies educational objectives into cognitive levels—from remembering to creating—remains foundational in promoting deep engagement with content. In English classrooms, this means encouraging students to evaluate arguments in opinion essays, synthesize themes across literary works, and creatively express personal viewpoints. Duman and Seferoglu (2018) further argue that project-based and problem-based language tasks rooted in Deep Learning principles help learners internalize language functions while solving authentic problems, thus bridging the gap between language form and meaningful use. These approaches shift the focus from teacher-centered instruction to learner-driven exploration, which aligns with global best practices in English language teaching.

Moreover, recent studies have highlighted the role of digital tools in supporting Deep Learning in language classrooms. According to Wang and Qi (2021), the integration of digital platforms that facilitate collaboration, reflection, and personalized feedback can significantly enhance students' engagement in EFL learning. These technologies support differentiated instruction and formative assessment, both of which are crucial in scaffolding deeper learning processes. As Indonesian schools increasingly adopt blended and technology-supported models, such insights provide practical pathways for implementing Deep Learning in varied contexts.

Augmented Reality (AR) is a rapidly growing educational technology that enriches learning environments by overlaying digital content (e.g., 3D models, audio, or video) onto physical spaces. In language teaching and learning, AR has been associated with increased learner engagement, enhanced vocabulary acquisition, and improved contextual understanding (Andujar & Salaberri-Ramiro, 2021). The use of AR aligns with multimodal and experiential learning theories, allowing students to interact with content in a more meaningful and immersive way.

Keskin and Yildirim (2020) found that AR-based learning activities improved EFLT learners' attitudes and performance by providing authentic, visual, and interactive stimuli. Such tools can make abstract vocabulary more tangible and encourage language use in context. These affordances are particularly valuable in environments where students have limited exposure to real-world English usage.

Beyond vocabulary learning, AR has also been shown to support the development of communicative competence and intercultural awareness in EFLT settings. For example, Godwin-Jones (2017) notes that AR facilitates situated learning, where students use language in contextually rich scenarios—such as navigating a virtual city or conducting interviews with AR-animated characters. This contextualization encourages spontaneous language use and fosters pragmatic competence.

Moreover, mobile AR applications allow for location-based language tasks that blend digital content with learners' physical environments, promoting both mobility and learner autonomy. These features of AR not only increase motivation but also align with learner-centered pedagogies central to both Deep Learning and 21st-century language education.

METHODS

This study employed a literature review (library research) method, which focuses on collecting, analyzing, and synthesizing data from various relevant sources. The primary aim of this method is to obtain comprehensive theoretical insights and critical perspectives related to the research problem. Data was gathered from books, peer-reviewed journal articles, conference proceedings, official reports, and other credible online sources.

The process of the literature review involved several steps. First, the researcher identified relevant keywords and concepts to guide the search process. Second, academic databases such as Google Scholar, ResearchGate, SpringerLink, and other indexed journals were explored to collect appropriate references. Third, the collected sources were examined critically to ensure their validity, reliability, and relevance to the research objectives.

The analysis was conducted through content analysis, in which the researcher compared different perspectives, highlighted similarities and differences, and identified emerging patterns or themes. The results of this process were then synthesized into a coherent narrative to answer the research questions and to provide a strong theoretical foundation for further discussion.

RESULT AND DISCUSSION

The findings from this review underscore the growing recognition of both Deep Learning and Augmented Reality (AR) as transformative tools in English as a Foreign Language Teaching (EFLT). Deep Learning, as promoted in educational reforms like Merdeka Belajar, emphasizes learner autonomy, collaboration, critical thinking, and real-world application of knowledge—competencies essential for 21st-century education (Suwandi, 2022; Rahmawati & Yulianti, 2023). Parallelly, AR has been widely acknowledged for its capacity to enhance student motivation, contextual engagement, and multimodal learning through immersive experiences (Andujar & Salaberri-Ramiro, 2021; Keskin & Yildirim, 2020).

Despite these individual strengths, the intentional integration of AR and Deep Learning remains underdeveloped, particularly in the Indonesian context. While some AR applications have shown promise—such as visualizing vocabulary in 3D environments or supporting descriptive writing through object interaction—these uses often fall short of engaging students in sustained higher-order thinking. Most implementations focus on surface-level engagement (e.g., increased attention or vocabulary gains) rather than on cognitive depth, such as hypothesis testing, analytical writing, or collaborative inquiry. As a result, AR is frequently used as a technological enhancement rather than a vehicle for Deep Learning.

Moreover, many of the reviewed studies lack a coherent pedagogical framework for integrating AR with Deep Learning principles. There is often an implicit assumption

.

that immersive technology will naturally result in deeper engagement; however, without structured task design aligned with frameworks such as Bloom's Taxonomy or inquiry-based learning, this potential remains underutilized (Lin & Chen, 2021). Few studies link AR use to reflective practices, metacognitive development, or peer collaboration, all of which are core to Deep Learning environments.

Contextually, Indonesia presents both opportunities and constraints. Policy frameworks advocate innovation, but systemic issues—such as limited infrastructure, unequal access to mobile devices, teacher readiness, and localized content development—continue to hinder adoption at scale. The use of tools like Assembler Edu in specific classrooms demonstrate grassroots innovation, yet these initiatives remain fragmented and under-researched in terms of impact and scalability. In many cases, AR use is not yet fully integrated into curriculum planning, teacher professional development, or assessment practices.

In sum, while the complementarity of AR and Deep Learning is theoretically sound and supported by emerging international findings, their combined application in EFLT remains fragmented. There is a clear need for further research that investigates how AR can be pedagogically aligned with Deep Learning frameworks in linguistically, culturally, and technologically diverse environments like Indonesia. Future work should also consider systemic enablers—including teacher training, curriculum alignment, and leadership support—to facilitate sustainable implementation. Only through such integrated efforts can AR and Deep Learning move from experimental innovation to meaningful, scalable transformation in language education.

1. Integrating AR and Deep Learning in EFLT

While the individual benefits of AR and Deep Learning are well-documented, research combining both in EFL contexts is still emerging. Theoretically, these approaches are highly compatible: AR can serve as a vehicle to deliver deep learning experiences by fostering inquiry, problem-solving, and collaboration. For example, students can explore 3D models or AR-enhanced simulations and then describe or analyze them using English, thereby engaging in higher-order thinking and language production simultaneously.

Few studies explicitly focus on the integration of AR and Deep Learning in EFLT teaching. Existing work tends to address either technological implementation or pedagogical design in isolation. This gap presents an opportunity to explore how technology-enhanced learning environments can be systematically aligned with deeper cognitive and linguistic goals.

Recent research suggests that AR-supported tasks can be intentionally designed to align with Bloom's Taxonomy and other Deep Learning frameworks in language education. Lin and Chen (2021) emphasize the potential of AR to scaffold inquiry-based language tasks, where learners must hypothesize, test, and reflect using English as a medium of communication. For instance, AR-based role-play or digital storytelling allows students to assume roles, explore narrative elements, and co-construct knowledge—all while practicing English. This integration not only supports language learning but also cultivates metacognitive skills, creativity, and engagement with authentic problems, which are key outcomes of Deep Learning.

Additionally, Cheng and Tsai (2022) found that carefully designed AR-integrated learning environments can promote meaningful interaction and sustained engagement among EFL learners, particularly when paired with cooperative learning strategies. However, they caution that teachers must be trained not only in the technical aspects of AR but also in how to design tasks that stimulate reflection and conceptual transfer. In settings such as Indonesian secondary schools, where students' digital fluency and English proficiency may vary widely, task differentiation and alignment with curricular standards are essential. This highlights the need for professional development, teacher collaboration, and adaptive instructional design to successfully combine AR and Deep Learning for diverse learners.

2. The Indonesian Context: Opportunities and Constraints

In Indonesia, both the national curriculum and educational policy documents advocate for the use of innovative teaching methods, including digital tools that support creativity, collaboration, and learner autonomy (OECD, 2019; Suwandi, 2022). The Merdeka Belajar (Freedom to Learn) initiative explicitly encourages student-centered pedagogies, inquiry-based tasks, and the integration of technology to enhance instructional quality. These frameworks are well-aligned with the principles of Deep Learning. However, successful implementation remains uneven and heavily dependent on school infrastructure, teacher competence, and institutional support.

Rahmawati and Yulianti (2023) highlight that many teachers still face significant barriers to meaningful digital integration, particularly due to limited access to devices, insufficient internet connectivity, and a lack of sustained professional development. Moreover, traditional classroom norms and exam-oriented teaching often constrain innovation, making it difficult to apply Deep Learning strategies such as open-ended inquiry, collaborative learning, or formative feedback.

Despite these challenges, localized innovations are beginning to surface, offering promising models for AR integration in EFL classrooms. For instance, the use of Assembler Edu in MTs (Islamic junior high school) classrooms enables students to interact with 3D models of fruits, animals, or everyday objects before describing them in English. This multimodal input fosters vocabulary development and contextualized language use—key aspects of Deep Learning. Similarly, a pilot program in Central Java involved EFL students creating AR-based storyboards to narrate folktales, encouraging creative expression and cross-cultural communication (Yuniarti & Setiawan, 2022). These cases reflect a growing recognition among Indonesian educators that AR can serve not only as a technological enhancement but also as a catalyst for pedagogical transformation.

However, to scale such practices, there remains a pressing need for targeted teacher training, curriculum-aligned digital content, and research that documents classroom-based implementation. Without addressing these systemic gaps, AR and Deep Learning are at risk of remaining isolated experiments rather than becoming integral elements of Indonesian EFL education.

3. Gaps in the Literature and Future Research Directions

Despite the growing body of research on Augmented Reality (AR) and Deep Learning in English as a Foreign Language Teaching (EFLT), there remains a significant gap concerning their integrated application—especially within the Indonesian educational context. Most existing studies examine AR and Deep Learning independently, often focusing on their technological affordances or pedagogical strategies in isolation. Furthermore, relatively few studies adopt a culturally responsive or context-aware lens, resulting in findings that may not fully reflect the complexities of diverse educational settings, particularly in developing countries.

Much of the international literature also assumes high levels of technological readiness, including access to advanced digital tools and well-trained educators. However, these assumptions rarely align with the infrastructural and professional realities of many Indonesian schools, especially in rural or underserved regions. The digital divide and uneven access to teacher training represent substantial barriers to meaningful integration of innovative pedagogies.

In addition, there is a lack of robust empirical evidence demonstrating how the combination of AR and Deep Learning affects students' long-term language development. Many existing studies are short-term, small-scale, or exploratory in nature, which limits our understanding of the sustained cognitive and linguistic outcomes associated with these interventions. Crucially, learners' voices, especially those from marginalized or multilingual backgrounds—remain underrepresented in the research. This absence limits the development of inclusive frameworks that respond to students lived experiences, learning preferences, and motivational needs.

Moreover, while national policy frameworks like Merdeka Belajar advocate creativity, autonomy, and technological innovation, little research investigates how institutional or cultural factors mediate the enactment of these ideals in practice. Issues such as administrative support, curriculum rigidity, assessment practices, and teacher collaboration significantly influence the success or failure of technology-enhanced deep learning environments. These systemic conditions warrant more focused investigation.

To address these gaps, future research should prioritize:
a. Developing scalable models for AR-enhanced Deep Learning tailored to EFL contexts.
b. Designing context-specific AR content that aligns with Indonesian curricula, cultural narratives, and student profiles.
c. Conducting longitudinal studies to examine the sustained impact of AR use on student engagement, motivation, retention, and language proficiency.
d. Exploring teacher professional development models that integrate both technological fluency and pedagogical innovation.
e. Investigating institutional, cultural, and policy-level dynamics that shape the implementation and sustainability of such approaches in real-world classrooms.

Such research directions will help ensure that the integration of AR and Deep Learning in EFLT is not only technologically innovative but also pedagogically sound, contextually grounded, and equitably accessible.

CONCLUSION

This literature review examined the intersection of Deep Learning and Augmented Reality (AR) in English as a Foreign Language Teaching (EFLT), with particular attention to the Indonesian educational landscape. The analysis confirms that both approaches offer valuable pedagogical contributions—Deep Learning promotes autonomy, critical thinking, and reflective inquiry, while AR fosters immersion, engagement, and contextualized learning. However, their combined implementation in EFLT remains limited, especially in low-resource or developing contexts like Indonesia.

While national education reforms such as Merdeka Belajar advocate for learner-centered, technology-enhanced instruction, current applications of AR in Indonesian EFL classrooms often emphasize motivation and vocabulary development, without fully integrating higher-order thinking or collaborative problem-solving. This gap underscores the need to move beyond surface-level engagement and toward more intentional, cognitively rich uses of technology aligned with Deep Learning principles.

Key barriers—including infrastructure limitations, insufficient teacher training, and the lack of context-specific AR content—continue to challenge meaningful implementation. Addressing these issues requires the development of scalable pedagogical models, professional development programs, and research that reflects the realities of diverse classroom settings.

Ultimately, this review identifies a promising yet underexplored area of educational innovation. Future work should focus on designing culturally responsive, pedagogically grounded AR tools that explicitly support Deep Learning outcomes in language education. Bridging the gap between theory and practice will be essential for realizing the full potential of these technologies in transforming EFLT, particularly within Indonesia and similar contexts.

REFERENCES

Andujar, A., & Salaberri-Ramiro, M. S. (2021). Augmented reality in language learning: A review of the literature. *Education and Information Technologies*, 26(2), 1367–1386. https://doi.org/10.1007/s10639-020-10367-x

Bloom, B. S. (1956). *Taxonomy of educational objectives: The classification of educational goals*. Longmans, Green.

Cheng, K.-H., & Tsai, C.-C. (2022). Affordances of augmented reality in EFL learning: The roles of student engagement and task design. *Educational Technology & Society*, 25(1), 47–59.

Chickering, A. W., & Gamson, Z. F. (1987). Seven principles for good practice in undergraduate education. *AAHE Bulletin*, 39(7), 3–7.

Dede, C. (2010). *Comparing frameworks for 21st century skills*. In J. Bellanca & R. Brandt (Eds.), 21st century skills: Rethinking how students learn (pp. 51–76). Solution Tree Press.

Duman, B., & Seferoglu, G. (2018). Developing English language skills through project-based learning. *Journal of Language and Linguistic Studies*, 14(4), 177–192.

Godwin-Jones, R. (2017). Smartphones and language learning. *Language Learning & Technology*, 21(2), 3–17. https://doi.org/10125/44607

Kaplan, A., & Haenlein, M. (2019). Siri, Siri, in my hand: Who's the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence. *Business Horizons*, 62(1), 15–25. https://doi.org/10.1016/j.bushor.2018.08.004

Keskin, N. O., & Yildirim, Y. (2020). Investigating the effectiveness of augmented reality-based instruction on students' learning outcomes and attitudes in English as a foreign language class. *Educational Technology Research and Development*, 68, 2625–2645. https://doi.org/10.1007/s11423-020-09754-1

Lin, T.-J., & Chen, C.-C. (2021). Designing augmented reality learning environments for EFL learners: A framework based on inquiry-based learning and Deep Learning principles. Educational Technology & Society, 24(3), 70–83.

OECD. (2019). OECD future of education and skills 2030: Conceptual learning framework. OECD Publishing. https://www.oecd.org/education/2030-project/

Rahmawati, R., & Yulianti, S. (2023). Implementation of deep learning approach in Indonesian junior high schools: Teachers' perspectives and challenges. *Indonesian Journal of Educational Research and Review*, 6(2), 85–98.

Suwandi, S. (2022). Strengthening character education through deep learning in the Merdeka curriculum. *Jurnal Pendidikan Karakter*, 12(1), 123–135.

Wang, Y., & Qi, C. (2021). Enhancing EFL learners' deep learning through digital technology integration: A case study of collaborative writing. Computer Assisted Language Learning, 34(8), 1134–1156. https://doi.org/10.1080/09588221.2020.1724257

Yuniarti, S., & Setiawan, D. (2022). Storytelling through AR: Enhancing speaking skills in Indonesian EFL classrooms. *Journal of Language and Technology Integration*, 10(2), 55–68.