Foreign Language Instruction Probe
Vol. 5, No. 1, May, 2026
https://jurnal.stit-buntetpesantren.ac.id/index

DOI: https://doi.org/10.54213/flip.v5i1
p-ISSN: 2830-5949
e-ISSN: 2830-4837

Augmented Reality in Integrated Sustainability Concept for English Language Learning

Dewi Sari Wahyuni[1*]
Universitas Sains dan Teknologi Indonesia[1]
dewisariwahyuni@usti.ac.id[1]

T. Sy. Eiva Fatdha[2*]
Universitas Sains dan Teknologi Indonesia[2]
syarifaheiva@usti.ac.id[2]

Received: May 4, 2026
Revised: May 22, 2026
Accepted: May 28, 2026

***Corresponding author:**
Dewi Sari Wahyuni, Universitas Sains dan Teknologi Indonesia, Indonesia.

Abstract

This position paper proposes a conceptual framework for integrating Augmented Reality (AR) into English Language Learning (ELL) through an integrated sustainability lens. The study addresses the persistent fragmentation between AR-ELL research and sustainability-oriented English education, which has limited the design of pedagogically coherent and ethically grounded immersive practices. Adopting a conceptual-analytical method, supported by a structured review of 48 Scopus-indexed publications retrieved on 4 May 2026, the analysis examines how immersive technologies and sustainability principles have been addressed in language education from 2015 to 2026. Three findings are reported: AR-ELL and sustainability-ELL operate as parallel discourses with minimal intersection; structural conditions, including disciplinary boundaries and divergent epistemological commitments, sustain this separation; and principled integration is both feasible and pedagogically generative. The paper contributes the AR-Integrated Sustainability Concept (AR-ISC), a five-dimensional framework spanning ecological, social, economic, pedagogical, and digital sustainability. Recommendations target curriculum design, teacher education, and empirical validation in Indonesian and broader Global South contexts.

Keywords: Augmented Reality; English Language Learning; Education for Sustainable Development; Educational Technology; Integrated Sustainability

To cite this article (Gaya APA Edisi 7th): Wahyuni et al. (2026). Augmented Reality in Integrated Sustainability Concept for English Language Learning. *Foreign Language Instruction Probe*. https://doi.org/10.54213/flip.v5i1.828

Introduction

The accelerating intersection of digital transformation and sustainability discourse has fundamentally reshaped the conceptual landscape of contemporary language education. The United Nations 2030 Agenda for Sustainable Development, particularly Sustainable Development Goal 4 on inclusive and equitable quality education, has compelled educators across disciplines to reimagine learning environments as sites of ethical formation, ecological awareness, and intercultural responsibility (UNESCO, 2017). At the same time, immersive technologies such as Augmented Reality (AR), Virtual Reality (VR), and mixed reality systems have entered mainstream classrooms at an unprecedented pace, particularly in English Language Learning (ELL) contexts where the demand for authentic, contextualized, and motivating input has long been a defining pedagogical concern (Chen et al., 2024; Hsu, 2017). In Indonesia, where English remains a foreign language taught from primary through tertiary levels, the convergence of these two trajectories represents both a remarkable opportunity and an unresolved theoretical problem. Educational technology research, ESD scholarship, and applied linguistics each address slices of this convergence, but rarely as an integrated whole.

Within the domain of AR-ELL, current research predominantly focuses on four areas. The first focus, vocabulary acquisition through marker-based or image-recognition AR applications, dominates the empirical literature, with studies consistently reporting moderate-to-large gains in retention compared to flashcards or conventional digital tools (Hashim et al., 2022; Solak & Çakır, 2015; Tsai, 2018; Yuan, 2021). The second focus, oral skills development through mobile AR combined with automatic speech recognition or context-aware tasks, has demonstrated improvements in pronunciation and listening comprehension across primary, secondary, and tertiary populations (Matin & Mangina, 2023; Tsai, 2023; Zhen & Hashim, 2022). The third focus, reading and writing supported by AR-augmented texts and authoring platforms such as Assemblr Edu, has been reported to increase compositional fluency and engagement, particularly in distance education contexts (Carrión-Robles et al., 2023; Muharlisiani et al., 2018; Zhao & Zhao, 2026). The fourth focus, motivational and affective outcomes from gamified AR experiences, has been a major preoccupation of recent systematic reviews (Pinto et al., 2021; Sin & Barkhaya, 2025; Taskıran, 2019). Methodologically, this body of work is dominated by quasi-experimental and design-based studies of short duration, typically employing pre-post questionnaires and skill tests (Bozdoğan et al., 2018; Hsu, 2017). Theoretically, it is anchored in cognitivist and constructivist learning theories, with situated and sociocultural perspectives appearing only in a minority of studies (Hellermann et al., 2019; Sydorenko et al., 2019). Consequently, while the AR-ELL literature has accumulated robust evidence of cognitive and motivational efficacy, it has been less attentive to the broader ethical, ecological, and political dimensions of language learning.

In parallel, sustainability-oriented English language education has developed along distinct lines. Within this domain, four principal approaches can be identified. The first approach, ecocriticism and ecological literacy, integrates literary and environmental analysis into language teaching to cultivate ecological awareness alongside linguistic competence (Calvert, 2015; Hansford, 2015; Saiful & Setyorini, 2022). The second approach, Content and Language Integrated Learning (CLIL) for sustainability, embeds environmental, public health, or climate-justice content into disciplinary English instruction (Pun & Onder-Ozdemir, 2023; Wozniak, 2022). The third approach, translanguaging and ecological pedagogy, reconceives the multilingual classroom as

itself a site of sustainability transition by recognizing linguistic diversity as ecologically and ethically valuable (Holden & Airas, 2025; Zhou et al., 2021). The fourth approach, real-world and project-based language teaching, links classroom tasks to community engagement, lifelong learning, and digital citizenship (Alharbi, 2026; Jamil et al., 2025; Rifai & Andreani, 2021). Methodologically, this strand favors qualitative case studies, action research, and curriculum analysis. Theoretically, it draws on critical pedagogy, ecolinguistics, and posthumanist frameworks. While conceptually rich, this scholarship has paid limited attention to the design affordances of immersive technologies, frequently treating digital tools as neutral or even suspect rather than as potential vehicles for sustainability-oriented pedagogy.

A critical evaluation of these two strands reveals not merely an empirical gap but a theoretical and methodological asymmetry that helps explain why integration has remained elusive. The AR-ELL literature exhibits what may be termed an instrumental-cognitivist orientation: it operationalizes language learning as the acquisition of measurable skills, treats technology as a stimulus delivering optimized input, and measures success through pre-post gain scores (Hsu, 2017; Taylor, 2025; Tsai, 2023). This orientation is consistent with the broader trajectory of computer-assisted language learning since the 1990s, but it produces what Sydorenko et al. (2019) characterize as a thin theorization of context, in which the social and ecological positioning of the learner is reduced to a background variable. By contrast, sustainability-oriented ELT scholarship adopts a critical-relational orientation: it foregrounds power, ethics, and intercultural responsibility, and treats language learning as a site of identity formation and ecological positioning (Holden & Airas, 2025; Saiful & Setyorini, 2022). Yet this orientation often privileges discursive analysis over design intervention, leaving the question of how to instrument sustainability-oriented language pedagogies underdeveloped. The bifurcation, in other words, is not accidental; it is structured by divergent epistemological commitments, journal ecosystems, and methodological canons. Educational technology and applied linguistics journals reward different kinds of evidence than sustainability and critical pedagogy journals, and few scholars are positioned to translate across them (Bang, 2024). Contextually, this asymmetry is particularly acute in Indonesia and similar Global South settings, where rapid AR adoption proceeds alongside formal sustainability commitments, yet without an integrated pedagogical framework to coordinate the two trajectories (Mahyoob et al., 2024).

This position paper occupies the niche created by this gap. It advances the argument that Augmented Reality, when situated within an integrated sustainability concept, can become more than a tool for delivering language content; it can constitute a pedagogical infrastructure for cultivating sustainable, just, and ecologically literate English language learners. Specifically, the paper pursues three interrelated objectives: first, to map the current state of AR-ELL research in dialogue with sustainability-oriented language education; second, to articulate an integrated sustainability concept that encompasses ecological, social, economic, pedagogical, and digital dimensions; and third, to propose the AR-Integrated Sustainability Concept (AR-ISC) framework as a conceptual scaffold for curriculum design, teacher education, and future empirical research. The position advanced here is normative as well as analytical: it claims that the value of AR in ELL cannot be evaluated solely by cognitive or affective outcomes, but must also be assessed by its contribution to the sustainability of learners, communities, and the planet.

Research Methods

As a position paper grounded in conceptual-analytical inquiry, this study adopts a qualitative, interpretive, and synthetic methodological orientation rather than an empirical-experimental one. The aim is not to test hypotheses about AR in ELL but to construct a defensible theoretical position by integrating, comparing, and critically interpreting prior scholarship. The methodology follows established conventions for position and conceptual papers in educational technology, which typically combine systematic literature review with normative argumentation. Five operational components structure this inquiry: research type, data sources, sampling, data collection, and data analysis.

1. Research types

This study adopts a qualitative, conceptual-analytical design with elements of a structured literature review. The position paper genre is appropriate when a research field exhibits theoretical fragmentation, as is the case with AR-ELL and sustainability-oriented English education. The author's stance is to synthesize and reinterpret rather than to generate new empirical data, while maintaining transparency about the corpus and analytic procedures.

2. Research Data Sources

Two categories of data informed the inquiry. Primary data consist of peer-reviewed scholarly publications retrieved from the Scopus database. Two Scopus exports were generated on 4 May 2026 using two complementary query streams: one focused on the conjunction of “sustainability”, “English”, and “language learning” (377 records), and one focused on “augmented reality”, “English”, and “language learning” (398 records). Secondary data comprises foundational works that ground the conceptual framework historically and theoretically. Crucially, these foundational works were not selected by the author's intuition but were identified through a transparent two-step procedure derived from the primary corpus itself. In the first step, the analytic matrix built from the primary corpus was inspected for theoretical references that recurred across multiple included studies but predated the 2015 inclusion window. References cited by five or more publications in the analytic sample were earmarked as candidate foundational sources. In the second step, citation tracing through the Scopus reference-linking function was used to confirm canonical status and retrieve the original publications. This procedure identified Azuma (1997) and Milgram and Kishino (1994) as foundational AR sources, and the UNESCO (2017) ESD Learning Objectives report as the principal reference for Education for Sustainable Development. By documenting this procedure, the study makes transparent the line between the systematically reviewed corpus and the canonically grounded works.

3. Research Population and Sample

The research population comprised all 775 records retrieved from the two Scopus searches. Inclusion criteria were applied as follows: publication year between 2015 and 2026; document type article, review, conference paper, or book chapter; substantive engagement with at least two of the three focal domains (AR or immersive technology; English language learning; sustainability or ESD); and availability of abstract or full text in English. After deduplication and screening of titles, abstracts, and where necessary full texts, a purposive analytic sample of forty-eight publications was retained. Of these, twenty-six addressed AR or immersive technologies in language learning without substantive sustainability framing, fifteen addressed sustainability in English education without substantive AR or immersive framing, and seven explicitly engaged with both clusters. The asymmetry of this distribution itself constitutes a finding.

4. Data Collection Techniques

Data were collected through systematic database searches followed by structured documentary analysis. For each retained publication, the author extracted bibliographic metadata, theoretical orientation, methodology, focal language skills, sustainability dimensions addressed, and key findings into an analytic matrix. The matrix served two functions: it enabled cross-study pattern recognition, and it disciplined the construction of the AR-ISC framework by making explicit which dimensions of sustainability were empirically supported and which remained underdeveloped. The same matrix was used in the foundational works identification procedure described above.

5. Data Analysis Techniques

The analysis followed three iterative phases, consistent with thematic synthesis in conceptual research. Phase one involved descriptive coding of each publication along predetermined dimensions: technology type, targeted language skill, sustainability framing, learner population, and pedagogical theory. Phase two involved interpretive coding, in which the author identified latent themes concerning the relationship between AR affordances and sustainability principles. Phase three involved theoretical synthesis, in which themes were integrated into a coherent conceptual framework. Throughout, the analysis was guided by criteria of internal coherence, external validity relative to existing scholarship, and pedagogical applicability in the Indonesian higher education context. As a position paper, this study does not claim statistical generalizability; its contribution lies in the construction of a defensible conceptual position, the visibility it lends to an underexamined integration, and the testable propositions it generates for subsequent empirical work.

Results and Discussion

Result

The analysis of the forty-eight selected publications produced three thematic findings that, taken together, describe the current configuration of the AR-ELL and sustainability discourses, identify the structural factors that sustain their separation, and articulate the implications of this separation. To make the analytic basis transparent, Table 1 presents the distribution of the corpus across thematic clusters and research foci, with representative studies for each cell.

Table 1. Distribution of the Analytic Corpus across Thematic Clusters and Research Foci (N=48)

	Research Focus	N	Representative Studies
AR-ELL only (n = 26)	Vocabulary acquisition	8	Solak & Çakır (2015); Tsai (2018); Yuan (2021); Jia et al. (2025)
	Speaking & listening	5	Matin & Mangina (2023); Tsai (2023); Zhen & Hashim (2022)
	Reading & writing	4	Carrión-Robles et al. (2023); Muharlisiani et al. (2018); Zhao & Zhao (2026)
	Motivation & affect	5	Taskıran (2019); Pinto et al. (2021); Sin & Barkhaya (2025); Hoffman (2022)
	Theoretical/conceptual	4	Hsu (2017); Sydorenko et al. (2019); Chen et al. (2024); Bozdoğan et al. (2018)
	Ecocriticism & ecological literacy	4	Calvert (2015); Hansford (2015); Saiful & Setyorini (2022)

Sustainability-ELL only (n = 15)	CLIL & content integration	3	Pun & Onder-Ozdemir (2023); Wozniak (2022)
	Translanguaging & ecological pedagogy	3	Holden & Airas (2025); Zhou et al. (2021); Hellermann et al. (2019)
	Real-world & lifelong learning	5	Alharbi (2026); Jamil et al. (2025); Rifai & Andreani (2021)
AR-ELL × Sustainability (n = 7)	Integrated/intersectional studies	7	Hashim et al. (2022); Mei & Yang (2019); Tang (2024); Muthmainnah et al. (2025); Sumardiyani & Ambarini (2025); Pinto-Llorente & Izquierdo-Álvarez (2024); Al Fraidan & Alaliwi (2024)
	Total	**48**	

Source: Authors' analysis of Scopus Export (4 May 2026)

1. Description of the Form of the Issue or Phenomenon

As Table 1 illustrates, AR-ELL research and sustainability-oriented English language education exist as parallel but rarely intersecting discourses. Of the forty-eight publications, only seven (14.6 percent) explicitly bridged the two clusters, and most of those bridges were thematic rather than structural, embedding sustainability content within AR activities without theorizing the integration (Hashim et al., 2022; Mei & Yang, 2019; Muthmainnah et al., 2025; Tang, 2024). Within the AR-ELL cluster, vocabulary acquisition was the single largest focus, accounting for nearly one-third of cluster-A studies, while motivational and theoretical inquiries together accounted for approximately a third. Within the sustainability-ELL cluster, the largest focus was real-world and lifelong learning, followed by ecocriticism and ecological literacy. Notably, the cluster of intersectional studies, despite its small size, was the most heterogeneous in geographic origin, including studies from Indonesia, China, the Middle East, and Europe.

2. Factors that Influence

Several structural factors sustain the observed fragmentation. First, disciplinary boundaries between educational technology, applied linguistics, and ESD scholarship are reinforced by distinct journal ecosystems, theoretical canons, and methodological preferences, as the table makes visible: the cluster-A studies cluster in computing, instructional technology, and CALL journals, whereas cluster-B studies appear in applied linguistics, sustainability, and curriculum venues. Second, technology adoption in many contexts, including Indonesia and Vietnam, remains driven by infrastructural and curricular logics rather than pedagogical-philosophical ones (Hoai et al., 2024; Mahyoob et al., 2024); AR is often introduced as a marker of modernization rather than as a means of deeper educational reform. Third, sustainability itself is conceptually contested: when narrowly equated with environmental content, it offers limited theoretical traction for AR designers; when expanded to include social, economic, and pedagogical-digital sustainability, it requires interdisciplinary literacy that few research teams cultivate (Al Fraidan & Alaliwi, 2024; Pinto-Llorente & Izquierdo-Álvarez, 2024). Fourth, the digital divide and the environmental footprint of immersive technologies are rarely interrogated within AR-ELL studies, despite their direct relevance to sustainability arguments.

3. Implications of Research Findings

The implications of these findings extend across individual, classroom, institutional, and normative levels. At the individual level, learners encounter AR-enhanced English instruction and sustainability-themed language activities as separate

experiences, missing the formative potential of their convergence. At the classroom level, teachers lack a coherent design vocabulary for combining immersive multimodality with ESD principles. At the institutional level, curriculum committees and teacher educators struggle to articulate why AR investment should align with sustainability commitments, and vice versa. At the normative level, the absence of an integrated framework constrains the field's ability to respond to mounting calls from UNESCO and other policy actors for technology-enabled, sustainability-oriented education (UNESCO, 2017). These implications collectively justify the construction of an integrated framework, presented and elaborated in the discussion that follows.

Discussion

Rather than restating the findings, this discussion interprets them by placing each in conversation with the theoretical and empirical literature reviewed in the Introduction. The aim is to specify, for each finding, whether it supports, extends, differs from, or challenges prior scholarship, and to articulate the distinctive contribution this study makes to the field.

1. Summary of Research Findings

The synthetic picture emerging from the analysis is that AR has become a robust resource in English language learning, while sustainability has emerged as a generative orientation for ELT, yet the two operate in parallel with only marginal overlap. This finding supports earlier diagnoses by Sydorenko et al. (2019) regarding the underdeveloped contextual theorization of AR-mediated language tasks, and it extends those diagnoses by showing, through the corpus distribution in Table 1, that the underdevelopment is not idiosyncratic but structural. The pattern is consistent across geographic contexts, including studies originating in Indonesia (Muharlisiani et al., 2018; Muthmainnah et al., 2025; Rifai & Andreani, 2021; Sumardiyani & Ambarini, 2025), where the gap is particularly consequential given the country's sustainability commitments and its rapid expansion of educational technology infrastructure.

2. Reflection of Research Findings

Reflecting critically on the structural conditions that produce this pattern, three reinforcing factors deserve emphasis, each interpreted in light of the prior literature. The first is the legacy of cognitive-instrumental framing in educational technology. This study's findings differ from the implicit framing in Hsu (2017) and Tsai (2023), where AR's value is captured almost entirely by pre-post test gains: the present analysis suggests that this framing, while empirically defensible, systematically excludes the ethical and ecological positioning of the learner from the analytic horizon. The second factor is the historical evolution of ESD scholarship, which the present analysis shows has emphasized critical pedagogy, content reform, and teacher transformation, often at the expense of substantive engagement with emerging technologies. This finding extends, but also nuances, the curricular emphasis of Saiful and Setyorini (2022) and Hansford (2015): while their work demonstrates that English teachers can develop pedagogical content knowledge of sustainability, it does not explain why immersive technologies have not entered such curricula in any sustained way. The third factor is the political economy of educational innovation, in which AR adoption is frequently tied to vendor relationships, infrastructural investments, and institutional branding, none of which inherently reward sustainability framing (Bang, 2024; Hoai et al., 2024). The interpretive payoff is that integration cannot be achieved by individual teachers alone; it requires curricular, institutional, and theoretical scaffolding.

3. Interpretation of Research Findings

Interpreting these findings through the lens of integrated sustainability theory yields the AR-Integrated Sustainability Concept (AR-ISC), the central conceptual contribution of this paper. The framework proposes that AR-enhanced English language learning should be designed and evaluated along five mutually constitutive dimensions. The ecological dimension concerns the use of AR to render visible the more-than-human world that English learners inhabit, drawing on ecocritical and place-based pedagogies (Calvert, 2015; Hellermann et al., 2019; Saiful & Setyorini, 2022). The social dimension concerns how AR-mediated language tasks foster intercultural awareness, linguistic justice, and inclusive participation, including for learners with disabilities and from minoritized communities (Hashim et al., 2022; Holden & Airas, 2025). The economic dimension concerns the cost structures, equity of access, and longer-term affordability of AR deployments, particularly relevant in Global South contexts where infrastructural sustainability is a real constraint (Mahyoob et al., 2024). The pedagogical dimension concerns the design of AR-mediated tasks that enact authentic, situated, and reflective language use rather than mere drill (Sydorenko et al., 2019; Tang, 2024). The digital sustainability dimension concerns the ethical and ecological footprint of immersive technologies themselves, including data practices, energy consumption, and platform dependency (Pinto-Llorente & Izquierdo-Álvarez, 2024). In the AR-ISC framework, these dimensions are interdependent: a design that scores well ecologically but poorly economically, for example, will not be sustainable in any meaningful sense. The framework, therefore, reframes the evaluative question for AR-ELL from "does it improve learning outcomes?" to "does it improve learning outcomes in ways that are ecologically, socially, economically, pedagogically, and digitally sustainable?"

4. Comparison with Previous Research

AR-ISC framework can be situated in relation to several prior contributions to clarify both its lineage and its novelty. Hashim et al. (2022) introduced an AR vocabulary application for autistic children explicitly framed as a response to sustainable education for learners with disabilities; their work supports the social and pedagogical dimensions of AR-ISC, but does not theorize the integration as a generalizable framework. The present study extends their contribution by articulating the multidimensional logic that makes such designs sustainable rather than merely accessible. Mei and Yang (2019) demonstrated that mobile AR and gamification can support tertiary environmental education in China, illuminating the ecological dimension while leaving the social and digital dimensions less developed; AR-ISC differs from their analysis by treating environmental content as one component of a broader sustainability commitment rather than as the principal object of pedagogy. Tang (2024) examined how digital immersive technology relates to critical thinking and self-directed learning in pursuit of educational sustainability, anticipating the pedagogical dimension of AR-ISC; the present study extends Tang's argument by showing that the pedagogical dimension cannot be evaluated in isolation from the ecological, social, economic, and digital dimensions. The systematic review by Sin and Barkhaya (2025) emphasizes the integration of AR and gamification in English language learning, but does not engage substantively with sustainability discourse; AR-ISC challenges this exclusion by demonstrating that sustainability framing changes the design questions, the evaluation criteria, and the equity implications of AR-ELL. By contrast, scholarship on sustainable language education such as Alharbi (2026), Jamil et al. (2025), Pun and Onder-Ozdemir (2023), and Wozniak (2022) articulates principled positions on sustainability in ELT, but does not theorize immersive technologies. The novelty of AR-ISC, then, lies not in any single dimension, each of which has antecedents, but in the explicit, multidimensional, and co-

constitutive integration that neither cluster of literature has so far supplied. The framework supplies a vocabulary for discussing AR-ELL design choices and sustainability commitments as inseparable concerns, and it generates testable propositions for empirical follow-up that prior work, by virtue of its disciplinary positioning, has been unable to formulate.

5. **Research Actions and Recommendations**

Building on the AR-ISC framework, several actionable recommendations follow. For curriculum design, English language programs should articulate explicit AR-ISC objectives at the syllabus level, ensuring that immersive activities are evaluated not only for linguistic outcomes but also for their ecological framing, social inclusivity, economic affordability, pedagogical depth, and digital footprint. For teacher education, pre-service and in-service English teachers in Indonesia and similar contexts need professional development that combines AR design literacy with ESD content knowledge, drawing on existing models such as the ecocriticism course documented by Saiful and Setyorini (2022) but extending these to immersive technologies. For institutional policy, universities and ministries should align AR procurement and adoption with sustainability commitments and require transparent assessments of the implications for equity, energy use, and platform dependency. For research, empirical validation of AR-ISC is a priority: design-based research, case studies in Indonesian classrooms, and comparative work across Global South contexts will be essential to refine the framework, identify boundary conditions, and develop measurable indicators for each of its five dimensions. The integration of immersive technology and sustainability in English language education is too important and too consequential to leave to ad hoc convergence. A principled, integrated framework is overdue.

Toward Empirical Operationalization of AR-ISC

The AR-ISC framework is conceptual but is intended to be empirically tractable. To operationalize it, future studies can develop indicator sets for each dimension. Ecological indicators may include the proportion of AR scenes referencing local biodiversity, the frequency of place-based tasks, and the linguistic moves enabled by such tasks. Social indicators may include accessibility audits, learner demographic representation, and intercultural communicative competence outcomes. Economic indicators may include per-learner cost over time, infrastructural dependence, and recurring vendor lock-in risks. Pedagogical indicators may include task authenticity, depth of cognitive engagement, and alignment with sociocultural theories of second language acquisition. Digital sustainability indicators may include energy and bandwidth profiles, data minimization practices, and platform interoperability. A composite AR-ISC profile, presented as a radar chart, can support transparent comparison across designs and over time. While the construction of validated instruments is beyond the scope of this position paper, the operational logic outlined here demonstrates that AR-ISC is not only normatively coherent but also empirically actionable. As immersive technologies converge with artificial intelligence and adaptive learning systems (Chen & Lai, 2026; El Tayara et al., 2026; Yun et al., 2024), the framework will require periodic recalibration; it should therefore be understood as a starting point for principled design rather than a closed taxonomy.

Conclusion

This position paper has examined how Augmented Reality and integrated sustainability can be productively aligned within English Language Learning. Three

findings emerged from the structured review of forty-eight Scopus-indexed publications: AR-ELL and sustainability-ELL operate as parallel discourses with only marginal intersection; this fragmentation is sustained by divergent epistemological commitments, journal ecosystems, and political-economic conditions of educational innovation; and principled integration is feasible and pedagogically generative. The principal contribution is the AR-Integrated Sustainability Concept (AR-ISC), a five-dimensional framework spanning ecological, social, economic, pedagogical, and digital sustainability that supplies a vocabulary for designing and evaluating AR-mediated English language learning under sustainability constraints. Conceptually, AR-ISC fills an underdeveloped theoretical space; methodologically, it generates operational indicators for each dimension; pedagogically, it offers educators a principled basis for design decisions that connect technological aspiration with ethical and ecological commitments.

Several limitations should be acknowledged. The corpus, though carefully sampled from Scopus, may underrepresent grey literature, regional journals, and indigenous knowledge sources, particularly relevant to sustainability in language education. The AR-ISC framework is conceptual and awaits empirical validation through design-based research and longitudinal studies. The contextual orientation toward Indonesian higher education means that transferability to other educational levels and geographic settings requires explicit examination.

Future research should pursue three directions. First, empirical operationalization of AR-ISC through validated indicators for each of its five dimensions. Second, design-based and comparative case studies in Indonesian and other Global South classrooms to test the framework's pedagogical utility. Third, critical inquiry into the ecological footprint, equity implications, and platform dependencies of AR adoption in language education. Through such work, the integration of Augmented Reality and integrated sustainability in English language learning can move from theoretical position to operational reality.

Author Contribution Statement

The authors conceived and designed the position paper, conducted the literature analysis, developed the AR-Integrated Sustainability Concept (AR-ISC) framework, drafted and revised the manuscript, and approved the final version of the article. The authors accept full responsibility for all aspects of this work.

Statement of Interest:

The authors declare no financial or non-financial conflicts of interest relevant to this research.

Funding

This research did not receive any specific grant from any funding agency in the public, commercial, or nonprofit sectors.

References

Al Fraidan, A. A., & Alaliwi, M. (2024). Digital transformation for sustainable English language learning: Insights from Saudi Arabia and global perspectives. Forum for Linguistic Studies, 6(6), 439–449. https://doi.org/10.30564/fls.v6i6.7754

Alharbi, M. S. (2026). Greening the classroom: Cultivating sustainable futures through English language teaching. Social Sciences and Humanities Open, 13, 102491. https://doi.org/10.1016/j.ssaho.2026.102491

Azuma, R. T. (1997). A survey of augmented reality. Presence: Teleoperators and Virtual Environments, 6(4), 355–385. https://doi.org/10.1162/pres.1997.6.4.355

Bang, T. C. (2024). Technology integration in English language education: An evolving paradigm. In Exploring contemporary English language education practices. IGI Global. https://doi.org/10.4018/979-8-3693-3294-8.ch007

Bozdoğan, D., Kasap, B., & Köse, U. (2018). Design principles for an intelligent-augmented-reality-based m-learning application to improve engineering students' English language skills. In Virtual and augmented reality: Concepts, methodologies, tools, and applications. IGI Global. https://doi.org/10.4018/978-1-5225-5469-1.ch018

Calvert, K. (2015). The ecology of English: Real-world experiences in sustainability and language learning. In Language learning beyond the classroom. Routledge. https://doi.org/10.4324/9781315883472-29

Carrión-Robles, F., Espinoza-Celi, V., & Vargas-Saritama, A. (2023). The use of augmented reality through Assemblr Edu to inspire writing in an Ecuadorian EFL distance program. International Journal of Engineering Pedagogy, 13(5), 121–141. https://doi.org/10.3991/ijep.v13i5.38049

Chen, Y., & Lai, C. (2026). AI-enhanced augmented reality for L2 medical English learning and remote surgical collaboration. In Lecture Notes in Computer Science (Vol. 15913). Springer. https://doi.org/10.1007/978-3-031-98185-2_6

Chen, Y., Li, M., Huang, C., Cukurova, M., & Ma, Q. (2024). A systematic review of research on immersive technology-enhanced writing education: The current state and a research agenda. IEEE Transactions on Learning Technologies, 17, 919–938. https://doi.org/10.1109/TLT.2023.3341420

El Tayara, H., Milad, M., & Farran, M. (2026). Pedagogical application of artificial intelligence to English language teaching contexts in Arab world higher education. In Higher education in the Arab world: Artificial intelligence. Springer. https://doi.org/10.1007/978-3-031-99068-7_19

Hansford, D. (2015). Education for sustainability in primary English education. In Educating for sustainability in primary schools: Teaching for the future. SensePublishers. https://doi.org/10.1007/978-94-6300-046-8_10

Hashim, H. U., Yunus, M. M., & Norman, H. (2022). 'AReal-Vocab': An augmented reality English vocabulary mobile application to cater to mild autism children in response towards sustainable education for children with disabilities. Sustainability, 14(8), 4831. https://doi.org/10.3390/su14084831

Hellermann, J., Thorne, S. L., & Haley, J. (2019). Building socio-environmental infrastructures for learning. In Educational Linguistics (Vol. 38, pp. 193–218). Springer. https://doi.org/10.1007/978-3-030-22165-2_8

Hoai, V. T. T., Son, P. N., Duc, N. M., Thao, T. T., Giang, P. T. K., Huu, P. T., Thuong, N. T. K., & Bach, P. G. (2024). The current state of virtual reality and augmented reality

adoption in Vietnamese education: A teacher's perspective on teaching natural sciences. International Journal of Information and Education Technology, 14(3), 476–485. https://doi.org/10.18178/ijiet.2024.14.3.2068

Hoffman, R. (2022). Construction and launch of a virtual reality laboratory for EFL learners: A crossroad between cognitive and emotional learning. In English Language Education (Vol. 24, pp. 305–321). Springer. https://doi.org/10.1007/978-3-030-91881-1_15

Holden, M., & Airas, A. (2025). Translanguaging for more-than-English sustainability transitions. Local Environment, 30(5), 691–708. https://doi.org/10.1080/13549839.2024.2436021

Hsu, T.-C. (2017). Learning English with augmented reality: Do learning styles matter? Computers & Education, 106, 137–149. https://doi.org/10.1016/j.compedu.2016.12.007

Jamil, M. G., Zilany, G. K., & Islam, M. A. (2025). Bridging language, lifelong learning, and sustainability: Scope of real-world English language teaching in Bangladeshi higher education. Teflin Journal, 36(2), 250–278. https://doi.org/10.15639/teflinjournal.v36i2/250-278

Jia, W., Pack, A., Guan, Y., Zhang, L., & Zou, B. (2025). The influence of game-based learning media on academic English vocabulary learning in the EFL context. Computer Assisted Language Learning. https://doi.org/10.1080/09588221.2023.2276800

Mahyoob, M., Algaraady, J., & Elmahdi, O. E. H. (2024). Challenges and sustainability of e-learning adoption among EFL teachers in the post-COVID-19 era. In Instructional technology theory in the post-pandemic era. IGI Global. https://doi.org/10.4018/979-8-3693-7645-4.ch017

Matin, F., & Mangina, E. (2023). Exploring the potential of augmented reality in English language learning: Designing an interactive pronunciation training app. In Communications in Computer and Information Science. Springer. https://doi.org/10.1007/978-3-031-35998-9_40

Mei, B., & Yang, S. (2019). Nurturing environmental education at the tertiary education level in China: Can mobile augmented reality and gamification help? Sustainability, 11(16), 4292. https://doi.org/10.3390/su11164292

Milgram, P., & Kishino, F. (1994). A taxonomy of mixed reality visual displays. IEICE Transactions on Information and Systems, E77-D(12), 1321–1329.

Muharlisiani, L. T., Kurniasih, N., Istiqomah, L., Safriyani, R., Abid, N., Ramadhani, Y. R., Hukom, S. J., Siahaan, B. L., Ahmadi, E. A., & Hendrawati, E. (2018). Designing an augmented reality strategy: E-learning/extensive reading. International Journal of Engineering and Technology, 7(2.13 Special Issue 13), 410–412. https://doi.org/10.14419/ijet.v7i3.6.16014

Muthmainnah, M., Al Yakin, A., Cardoso, L., Aeni, N., Abdulhussein, H. M., & Nasir, A. (2025). Stewarding quantum intelligence and RALL in evolving EFL communication through maritime teaching materials for sustainability. Proceedings of International Conference on Applied Innovation in IT, 13(4), 297–305. https://doi.org/10.25673/122129

Pinto, R. D., Peixoto, B., Melo, M., Cabral, L., & Bessa, M. (2021). Foreign language learning gamification using virtual reality—A systematic review of empirical research. Education Sciences, 11(5), 222. https://doi.org/10.3390/educsci11050222

Pinto-Llorente, A. M., & Izquierdo-Álvarez, V. (2024). Digital learning ecosystem to enhance formative assessment in second language acquisition in higher education. Sustainability, 16(11), 4687. https://doi.org/10.3390/su16114687

Pun, J., & Onder-Ozdemir, N. (2023). Exploring students' perceptions in sustainable disciplinary language learning in an English-medium instruction university: A case study of Hong Kong veterinary medical students. Sustainability, 15(2), 1279. https://doi.org/10.3390/su15021279

Rifai, I., & Andreani, W. (2021). Bringing food sustainability issues into English classes: Preservice teachers' plans and strategies. IOP Conference Series: Earth and Environmental Science, 729(1), 012038. https://doi.org/10.1088/1755-1315/729/1/012038

Saiful, J. A., & Setyorini, A. (2022). Ecocriticism course: Development of English pre-service teachers' pedagogical content knowledge of sustainability. Journal of Teacher Education for Sustainability, 24(2), 5–18. https://doi.org/10.2478/jtes-2022-0013

Sin, A. C. K., & Barkhaya, N. M. M. (2025). Exploring the integration of augmented reality and gamification in English language learning: A systematic review. In Interdisciplinary Conference on Electrics and Computer (INTCEC 2025). IEEE. https://doi.org/10.1109/INTCEC65580.2025.11255917

Solak, E., & Çakır, R. (2015). Exploring the effect of materials designed with augmented reality on language learners' vocabulary learning. Journal of Educators Online, 12(2). https://doi.org/10.9743/jeo.2015.2.5

Sumardiyani, L., & Ambarini, R. (2025). Interactive app-based games for bilingual education: Advancing English proficiency and promoting digital sustainability in physical education. World Journal of English Language, 15(7), 121–133. https://doi.org/10.5430/wjel.v15n7p121

Sydorenko, T., Hellermann, J., Thorne, S. L., & Howe, V. (2019). Mobile augmented reality and language-related episodes. TESOL Quarterly, 53(3), 712–740. https://doi.org/10.1002/tesq.507

Tang, F. (2024). Understanding the role of digital immersive technology in educating the students of English language: Does it promote critical thinking and self-directed learning for achieving sustainability in education with the help of teamwork? BMC Psychology, 12(1). https://doi.org/10.1186/s40359-024-01636-6

Taskıran, A. (2019). The effect of augmented reality games on English as foreign language motivation. E-Learning and Digital Media, 16(2), 122–135. https://doi.org/10.1177/2042753018817541

Taylor, S. (2025). Comparing augmented reality and quick response code versions of a location-based task for foreign language learning. JALT CALL Journal, 21(3). https://doi.org/10.29140/JALTCALL.V21N3.102668

Tsai, C.-C. (2018). A comparison of EFL elementary school learners' vocabulary efficiency by using flashcards and augmented reality in Taiwan. New Educational Review, 51(1), 53–65. https://doi.org/10.15804/tner.2018.51.1.04

Tsai, S.-C. (2023). Learning with mobile augmented reality- and automatic speech recognition-based materials for English listening and speaking skills: Effectiveness and perceptions of non-English major English as a foreign language students. Journal of Educational Computing Research, 61(2), 444–465. https://doi.org/10.1177/07356331221111203

UNESCO. (2017). Education for Sustainable Development Goals: Learning objectives. UNESCO Publishing. https://unesdoc.unesco.org/ark:/48223/pf0000247444

Wozniak, M. (2022). Cultural literacy and sustainable development through English: A look from CLIL in pharmacy. Language Learning in Higher Education, 12(2), 587–604. https://doi.org/10.1515/cercles-2022-2065

Yuan, Y. (2021). An experimental study of the efficacy of augmented reality in Chinese kindergarten-level students' learning of English vocabulary. In ACM International Conference Proceeding Series. https://doi.org/10.1145/3498765.3498779

Yun, C.-O., Jung, S.-J., & Yun, T.-S. (2024). Interactive learning tutor service platform based on artificial intelligence in a virtual reality environment. In Lecture Notes in Computer Science. Springer. https://doi.org/10.1007/978-3-031-53827-8_32

Zhao, Y., & Zhao, J. (2026). Design of an immersive task-driven mobile interactive platform for EFL writing and analysis of language output complexity. International Journal of Interactive Mobile Technologies, 20(6), 39–53. https://doi.org/10.3991/ijim.v20i06.60863

Zhen, L. S., & Hashim, H. (2022). The usage of MALL in learners' readiness to speak English. Sustainability, 14(23), 16227. https://doi.org/10.3390/su142316227

Zhou, X., Li, C., & Gao, X. (2021). Towards a sustainable classroom ecology: Translanguaging in English as a medium of instruction (EMI) in a finance course at an international school in Shanghai. Sustainability, 13(19), 10719. https://doi.org/10.3390/su131910719