

Digital Pedagogy in English Language Education: A Bibliometric Review of Blended Learning, Learning Management Systems, and Technology-Enhanced Instruction

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Abstract

This study aimed to systematically review an integrated decade of digital-pedagogy scholarship in English language education (2015–2025) by combining a PRISMA 2020 systematic review with bibliometric mapping. An 866-article Scopus corpus retrieved 7 July 2026 was distilled from 2,858 records through 1,917 candidate studies and 867 date-filtered records, and analysed with VOSviewer and Biblioshiny. Results indicated that three pillars structure the field's evidence base: Blended Learning as the most prominent pillar; Learning Management Systems concentrating around data-driven optimisation; and Advanced Technologies — AI, ChatGPT, VR/AR, big data, and IoT — reaching data-driven consolidation earliest following ChatGPT's November 2022 release, while Institutional Readiness and Teacher Competence emerged as the cross-cutting determinant conditioning the three pillars' implementation at scale. Bibliometric insights surfaced an Asian–Gulf country co-authorship axis led by China, Saudi Arabia, Indonesia, and Malaysia alongside under-representation of Global South classrooms; a three-phase trajectory — technological foundations (2016–2020), learner-centred investigations (2021–2023), and data-driven optimisation (2024–2025); and four forward-agenda gaps covering assessment redesign, equity and access, teacher cognition, and methodological transparency. This review contributes by linking pedagogy, infrastructure, and teacher readiness, offering a unified framework for reading the three pillars jointly rather than as parallel research conversations. The findings offer guidance for educators, policymakers, and researchers pursuing integrative, equity-anchored, and methodologically transparent digital pedagogy in English language education.

Keywords: Bibliometric analysis, Blended learning, Learning management systems, Technology-enhanced instruction, English language education

1. INTRODUCTION

The rapid expansion of digital technology in English language education has played an increasing role in shaping contemporary language learning experiences ([Vaishnav, 2026](#)). Tools such as blended learning designs, learning management systems, mobile applications, multimedia resources, and digital game-based environments are encompassed within contemporary pedagogical frameworks for technology-enhanced language learning ([Bang, 2024](#)), ([Ng et al., 2026](#)). More recently, advanced technologies such as intelligent tutoring systems and emerging applications of artificial intelligence, along with learning

analytics, have expanded the analytical and pedagogical possibilities of the field ([Bang, 2024](#)). From a science and technology perspective, these developments signify a transition from descriptive accounts of technology use toward data-driven and evidence-based instructional models in language teaching ([Ng et al., 2026](#)).

Despite these advances, research and practice reveal significant barriers to the systematic integration of digital pedagogy in English language education ([kizi & kizi, 2025](#)). Specifically, when we consider the broader question of how digital tools shape contemporary ELT, three interconnected strands have come to define the field: blended learning, learning management systems, and technology-enhanced instructional practices ([Hashmi et al., 2020](#)). This transformation has been further intensified by the COVID-19 pandemic, which accelerated the use of video conferencing tools such as Zoom and Google Meet and normalized hybrid instructional arrangements in ELT contexts ([Metaria & Cahyono, 2024](#)). Digital pedagogy in English language education has come to be recognized as the set of practices that integrate digital tools, resources, and platforms into language teaching and learning ([Rawat et al., 2023](#)); in ELT more specifically, these practices must address the heterogeneity of learners across linguistic, cultural, and educational backgrounds in order to remain inclusive and responsive to varied learner needs ([Sheerah, 2020](#)), ([Bang, 2024](#)). The historical trajectory of digital language learning can be organized into three paradigmatic phases that continue to inform present-day practice. Between the 1970s and the 1980s, a behaviorist paradigm dominated computer-assisted language learning, with drill-and-practice software positioning the computer-learner relationship in stimulus-response terms ([Li & Lan, 2021](#)). Beginning in the late 1980s and through the 1990s, a cognitive and communicative shift supplanted behaviorism, emphasizing fluency, authentic communicative exercises, and the emergence of CALL software and language games ([Li & Lan, 2021](#)). In the 2000s, the paradigm moved toward socio-cognitive technology that foregrounded authentic contexts for learning, social interaction, and the integration of multimedia ([Li & Lan, 2021](#)), ([Li & Lan, 2021](#)). Hockly has argued, in this regard, that both researchers and practitioners must attend carefully to the meaning of blended learning within ELT specifically, rather than importing definitions wholesale from general educational technology contexts ([Sheerah, 2020](#)). Together, these layered developments explain why contemporary ELT is characterized less by a single dominant method than by a flexible repertoire of technology-mediated approaches responsive to varied learner needs.

Within this evolving landscape, blended learning has emerged as a foundational organizational structure for English language education in the digital age, with advanced technologies such as artificial intelligence understood to enhance rather than displace this approach ([Ng et al., 2026](#)). Definitions in the literature converge on the idea that blended learning involves the systematic and thoughtful combination of face-to-face instruction with technologically mediated interactions among students, teachers, and learning resources ([Alam et al., 2022](#)). Garrison and Kanuka's widely cited formulation describes blended learning as the "thoughtful integration of classroom face-to-face learning experiences with online experiences," emphasizing that the approach entails redesigning the instructional model rather than simply adding technology to existing practice ([Alam et al., 2022](#); [Sheerah, 2020](#)). Subsequent taxonomies have refined this conception by classifying blended learning according to the proportion of online learning—with categories ranging from web-facilitated instruction (below 30% online) to fully online learning (above 80%)—and by distinguishing implementation models such as rotation, flex, self-blending, and enriched-virtual configurations ([Park & Doo, 2024](#)). In higher education ELT specifically, six blended teaching models—flipped, mixed, station rotation, online-practicing, supplemental, and flex—have been identified and ranked by intensity and impact, with the flipped and mixed models emerging as the two most

frequently adopted designs ([Chen & Jumaat, 2023](#)). Research indicates that both the flipped and mixed models are effective in developing learner autonomy, interactivity, and collaboration ([Chen & Jumaat, 2023](#)).

Educational technology integration in ELT extends well beyond blended learning as a delivery format to encompass a wider ecology of digital tools and platforms. Learning management systems such as Moodle, Blackboard, Canvas, and Desire2Learn have become widely embedded in language instruction, supporting the distribution of digital materials, asynchronous communication, and the development of language mastery among EFL learners ([Suriaman et al., 2023](#)). Recent empirical syntheses indicate that LMS platforms significantly enhance learner autonomy, motivation, and proficiency in reading and writing through interactive, multimedia, and gamified features, although gains in speaking and listening remain less consistent and are moderated by technical limitations, teacher digital literacy, and infrastructural disparities ([BAKHADURALIYEVNA & G.K., 2025](#)). Systematic reviews of blended learning in ESL further confirm the centrality of LMS, alongside collaboration-based learning, social media applications, and broader technology-based learning, as the four organizing themes of contemporary scholarship and practice ([Ramalingam et al., 2022](#)). Educational technology integration in this review is therefore operationalized broadly to include digital resources, LMS, mobile-assisted language learning, digital game-based learning, and emerging applications of artificial intelligence that operate individually, in combination, or as components within blended designs ([Bang, 2024](#)).

The expansion of these theoretical, pedagogical, and technological strands has generated a substantial and rapidly growing body of scholarship that is increasingly difficult to synthesize through traditional narrative review alone. Bibliometric analysis offers a rigorous complementary approach by applying statistical methods to large volumes of published information and their associated metadata to describe patterns, identify influential works, and visualize relationships across the literature ([Ninkov et al., 2021](#)). Through techniques such as document counting, citation analysis, word frequency analysis, co-word analysis, and collaboration analysis, bibliometric studies can trace the evolution of a field, map research themes and clusters, and surface methodological and thematic gaps that may not be visible in conventional reviews ([Kraus et al., 2022](#)). Visualization tools such as VOSviewer extend the value of bibliometric analysis by rendering networks of co-authorship, keyword co-occurrence, citation, bibliographic coupling, and co-citation in interpretable graphical form, thereby supporting more transparent and reproducible mapping of research landscapes ([Martins et al., 2022](#)).

In the specific domain of English language education, bibliometric methods have already begun to yield important structural insights. Recent analyses of technology-assisted English language teaching research document an impressive rise in both research output and citations, identifying *Computers and Education*, the *ACM International Conference Proceedings Series*, and the *International Journal of Emerging Technologies in Learning* as the principal publication venues for the field ([Alnakeeb et al., 2025](#)). A bibliometric review of 1,816 technology-enhanced language learning publications identified eight research fronts, with flipped learning well established at the core and mobile-assisted language learning and digital game-based learning expanding in influence, particularly in writing instruction ([Hasumi & Chiu, 2024](#)). Within the narrower subdomain of blended English language learning, a 2026 bibliometric study based on 499 Scopus documents traced publication growth from 2005 to 2025 and identified three distinct phases—technological foundations (2016–2020), learner-centered investigations (2021–2023), and data-driven optimization (2024–2025)—alongside three major research clusters ([Ng et al., 2026](#)). A closely related study of 200 Scopus-indexed articles on blended learning and English language proficiency

from 2020 to 2025 specifically revealed a pandemic-driven research surge followed by decline, underuse of AI and gamification in ELP contexts, and pronounced geographic disparities with limited contribution from Global South regions ([Chano et al., 2025](#)). Despite these advances, however, none of the existing bibliometric studies jointly map the three interconnected strands of blended learning, learning management systems, and broader technology-enhanced instructional practices within English language education across the post-pandemic research surge. The absence of a focused, integrated bibliometric synthesis that addresses digital pedagogy in ELT in this tripartite form represents an important scholarly gap. Without such a synthesis, researchers, teacher educators, curriculum designers, and policymakers may lack the structured evidence base required to guide technology adoption, curriculum innovation, and teacher professional development in an era when technology-mediated instruction is no longer ancillary to ELT but foundational to its future development.

The present bibliometric review addresses that gap by systematically examining the scholarly landscape of digital pedagogy in English language education, with particular attention to the three focal strands of blended learning, learning management systems (LMS), and broader technology-enhanced instructional practices. By drawing on bibliometric techniques and network visualization, the study aims to chart publication trends, identify influential authors and works, map thematic clusters and emerging frontiers, and surface under-researched areas that warrant further scholarly attention. The novelty of the study lies in its integrated treatment of the three intertwined strands within a single bibliometric framework, an approach that responds to the increasing demand for scalable and data-driven syntheses of how digital tools are conceptualized, implemented, and evaluated in English language education. The impact of this review is threefold. First, it contributes to theoretical advancement by linking blended learning theory, LMS scholarship, and broader technology-enhanced practices into a coherent structural map of the field. Second, it informs practice by offering evidence-based directions for educators and institutions seeking to adopt, refine, or scale digital pedagogy in language education. Third, it supports policy by identifying areas where investment in teacher training, infrastructure, and research capacity is most needed, particularly in regions that remain underrepresented in the global literature.

2. METHODS

This study adopts a systematic literature review approach based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 framework ([Page et al., 2021](#)). The PRISMA framework was chosen because it provided a structured procedure for ensuring rigor and reproducibility in literature selection. Figure 1 presents the PRISMA flowchart that guided the systematic review process. The diagram illustrates the four key stages (identification, screening, eligibility, and inclusion) to ensure methodological transparency and replicability in constructing the final dataset ([Page et al., 2021](#)).

The review process began with the identification phase, in which bibliographic data were retrieved from the Scopus database on 7 July 2026. Scopus was selected because of its broad coverage of peer-reviewed journals and its reliability in indexing multidisciplinary educational research ([Rahman et al., 2021](#)).

The initial search query, ("digital pedagogy" OR "technology-enhanced learning" OR "technology-enhanced instruction" OR "blended learning" OR "LMS" OR "learning management system") AND ("English language education" OR teaching OR learning OR instruction OR pedagogy), was applied to article titles, abstracts, and keywords and produced 2,858 records. The query was then refined to the Boolean string "Digital Pedagogy" AND "English Language Education" applied to the title, abstract, and keyword fields, yielding 1,917 candidate studies. The dataset was subsequently limited to publications

from 2015 to 2025 in order to capture both pre-pandemic baseline scholarship and the post-pandemic research surge that has reshaped digital pedagogy research in English language education, retaining 867 studies.

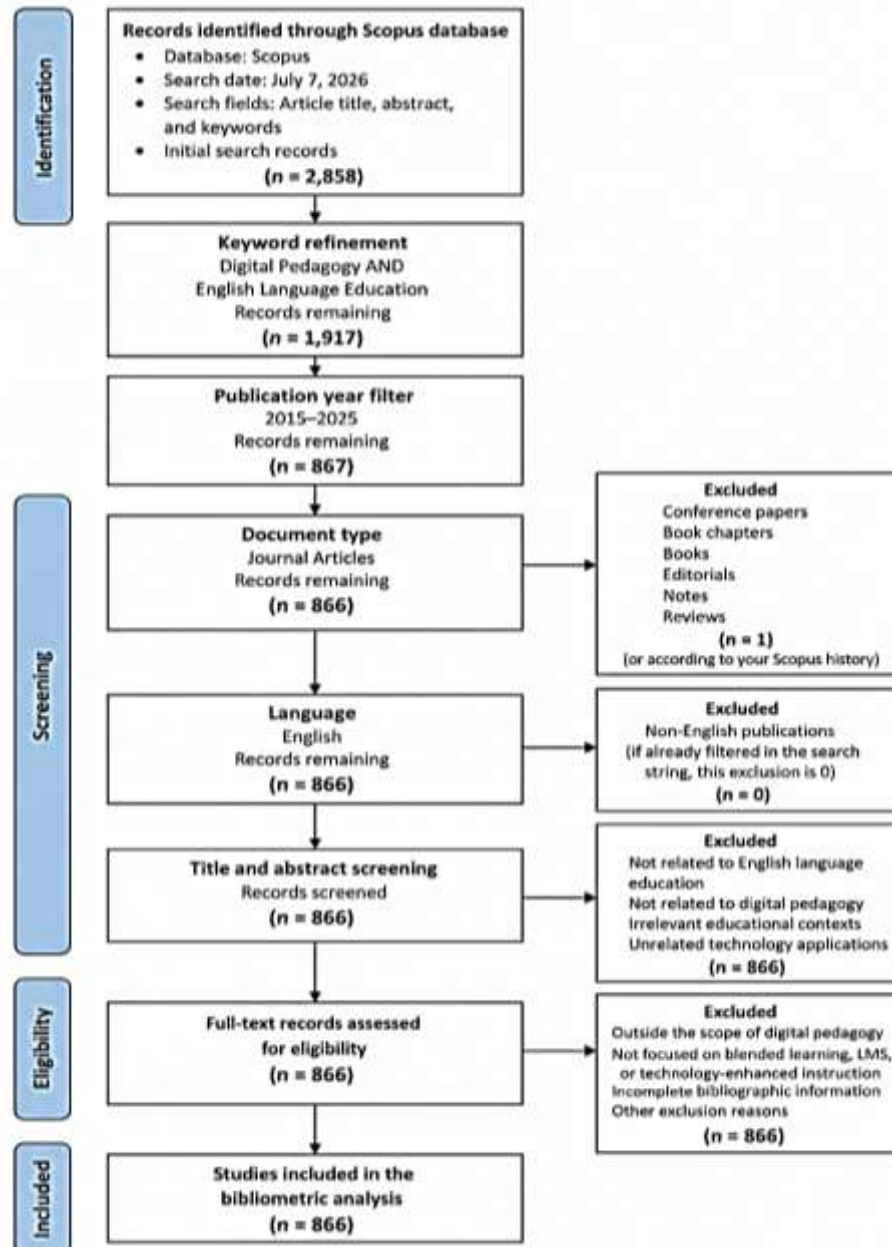


Figure 1. PRISMA Flowchart of Identification and Selected Studies

During the screening stage, non-eligible document types were removed, including conference papers, book chapters, reviews, books, editorials, and conference reviews, leaving 866 articles. In the eligibility phase, non-English publications were assessed for exclusion; as none were identified, the 866 records advanced to full-text appraisal against the predefined eligibility criteria. The final inclusion phase confirmed 866 studies that met all predefined criteria — peer-reviewed, indexed in Scopus, written in English, focused on blended learning, learning management systems, or broader technology-enhanced instructional practices in English language education, and containing complete bibliographic metadata. For the

bibliometric analysis, VOSviewer software (version 1.6.20) and the Biblioshiny web interface of the Bibliometrix R package were employed to construct and visualize bibliometric networks, including co-authorship, keyword co-occurrence, and citation patterns ([Arruda et al., 2022](#); [Moral-Muñoz et al., 2020](#); [Omer et al., 2025](#)). Detailed information regarding how to use bibliometrics is explained elsewhere ([BÜYÜKKIDIK, 2022](#)), ([Ninkov et al., 2021](#)).

3. RESULTS AND DISCUSSION

3.1. Bibliometric Analysis Results

Table 1 indexes three bibliometric studies in language education, each addressing a comparatively narrow slice of the digital-pedagogy landscape. The first synthesizes 60 SSCI-indexed articles on blended language learning (2000–2019) via a revised technology-based learning model to map participants, strategies, methods, focal constructs, technologies, and reported effectiveness. The second pairs a content analysis of 310 *Computer Assisted Language Learning* articles (2014–2019) with Web of Science bibliometric mapping of 469 records (2008–2019), surfacing dominant designs, educational levels, target skills, and keyword structures across the flagship CALL outlet. The third examines 500 Google Scholar articles on CEFR-aligned communicative English teaching in Thai primary education (2020–2024) through descriptive statistics and VOSviewer, tracing thematic trends, learner outcome gaps, and Sustainable Development Goals alignment. Methodologically congruent in their reliance on citation counting, co-occurrence analysis, and network visualization, the three nonetheless treat a single strand of the field rather than its full tripartite structure.

Individually, these works advance our understanding of blended language learning, CALL as a journal-shaped subfield, and CEFR-aligned policy implementation, but none jointly maps the three interconnected strands that define digital pedagogy in English language education today — blended learning, learning management systems, and broader technology-enhanced instructional practices — within a unified bibliometric framework. That limitation is the entry point of the present review, which extends the same performance-analysis and network-visualization toolkit to a single tripartite corpus assembled through a PRISMA 2020-guided systematic search of the Scopus database, executed on 7 July 2026 across the 2015–2025 publication window and progressively distilled from 2,858 identified records to 1,917 candidate studies, 867 date-filtered records, and 866 articles addressing all three strands simultaneously. In supplying a unified structural map of the field organized around blended learning, learning management systems, and broader technology-enhanced instructional practices, the review addresses what single-strand bibliometric syntheses of the kind listed in Table 1 cannot, by themselves, deliver.

Table 1. Previous Studies on Bibliometric Analysis

No.	Title	Ref.
1	Research Trends of Blended Language Learning: A Bibliometric Synthesis of SSCI-Indexed Journal Articles During 2000–2019	[22]
2	The Content Analysis and Bibliometric Mapping of CALL Journal	[13]
3	The Application of CEFR Standard Framework in Enhancing Communicative English Competencies: The Bibliometric Analysis and Its Support to Sustainable Development Goals (SDGs)	[31]

Table 2 presents a summary of three previous bibliometric studies that have examined trends in language education and educational technology. While these works highlight the growth of scholarship in the area,

most remain narrow in scope, focusing on a single strand of digital pedagogy — blended language learning, the *CALL* journal subfield, or CEFR-aligned implementation — rather than jointly mapping blended learning, learning management systems, and broader technology-enhanced instructional practices.

Table 2. Selected references on differentiated instruction and bibliometric analysis

No.	Title	Ref.
1	Research Trends of Blended Language Learning: A Bibliometric Synthesis of SSCI-Indexed Journal Articles During 2000–2019	[22]
2	The Content Analysis and Bibliometric Mapping of Computer Assisted Language Learning Journal	[13]
3	The Application of CEFR Standard Framework in Enhancing Communicative English Competencies: The Bibliometric Analysis and Its Support to Sustainable Development Goals (SDGs)	[31]

The bibliometric evidence in **Figure 2** illustrates that digital pedagogy scholarship in English language education has become a truly global research agenda, although concentrated leadership remains with a small group of countries anchored in Asia and the Middle East. This concentration suggests that while technology-mediated teaching models are being developed worldwide, their integration and evaluation often depend on strong research ecosystems in high-output nations, leaving Western traditions historically tied to ELT scholarship to recede toward the margins. Importantly, countries with emerging outputs demonstrate strategic potential because collaborative linkages with leading nations enable the transfer of models and methods, thereby expanding the scope of digitally mediated language pedagogy across diverse contexts.

Figure 3 illustrates the co-occurrence of keywords extracted from the 866-article Scopus corpus, demonstrating the thematic prominence of terms such as “blended learning,” “educational technology,” “e-learning,” and “English language teaching.” These keywords appear frequently and exhibit strong link strengths within the network. This connectivity identifies them as the foundational anchors of the current research landscape. Their visibility confirms that the review’s tripartite focus on blended learning, learning management systems, and technology-enhanced instructional practices constitutes the central nodes in contemporary digital ELT scholarship.

Create Map ×

 **Verify selected countries**

Selected	Country	Documents	Citations	Total link strength
☒	china	134	2678	48
☒	malaysia	75	576	42
☒	saudi arabia	114	1167	37
☒	iran	59	836	31
☒	hong kong	41	2093	28
☒	india	33	263	28
☒	indonesia	106	692	27
☒	iraq	17	128	25
☒	united states	30	239	20
☒	thailand	52	456	19
☒	australia	16	228	15
☒	jordan	22	90	15
☒	united kingdom	16	394	15
☒	oman	13	104	14
☒	russian federation	10	70	13
☒	turkey	39	295	13
☒	united arab emirates	10	130	12
☒	czech republic	7	92	11
☒	philippines	13	85	11
☒	south korea	23	867	9

Figure 2. Analysis of Scholarly Contributions by Country

Create Map ×

 **Verify selected keywords**

Selected	Keyword	Occurrences	Total link strength
☒	students	99	549
☒	e-learning	99	534
☒	teaching	48	397
☒	human	26	377
☒	online learning	124	356
☒	humans	22	332
☒	female	21	324
☒	male	20	314
☒	learning	28	310
☒	student	25	308
☒	adult	16	264
☒	learning systems	33	248
☒	covid-19	61	233
☒	language	20	227
☒	blended learning	91	221
☒	psychology	14	221
☒	distance learning	24	216
☒	education, distance	12	188
☒	educational technology	52	186
☒	article	11	161

Figure 3. Co-occurrences of Keywords

Figure 4 visualizes the VOSviewer keyword co-occurrence map of the 866-article Scopus corpus through color-coded cluster groupings, with high-link-strength anchors such as "e-learning," "online learning," "students," "teaching," and "English language teaching" forming the connective scaffolding of the network. The clusters resolve this scaffolding into three thematic groupings — a tools-and-platforms cluster anchored by "Google Classroom," "mobile-assisted language learning," "flipped classroom," and "higher education"; a learner-psychology cluster organized around "motivation," "engagement," "self-regulated learning," and "perception"; and a language-context cluster shaped by "EFL learners," "EFL teachers," "distance learning," "teaching," and "language skills" — that visually surface the review's tripartite focus on blended learning, learning management systems, and broader technology-enhanced

Figure 5 illustrates the network visualization of countries involved in the review's publications, surfacing the geography of cross-national collaboration in digital English language pedagogy. The United States, China, and the United Kingdom occupy the most central positions, joined by a European cluster — Germany, France, the Netherlands, Belgium, Switzerland, Italy, and Denmark — and by India and South Africa as interregional bridges. Longer-tail nodes including the Russian Federation, Ukraine, Ethiopia, and Australia extend the network into more peripheral regions. Cross-national collaboration matters because it enables the exchange of theoretical models and pedagogical practices, providing the critical mass needed to investigate technology-mediated language teaching across diverse contexts.

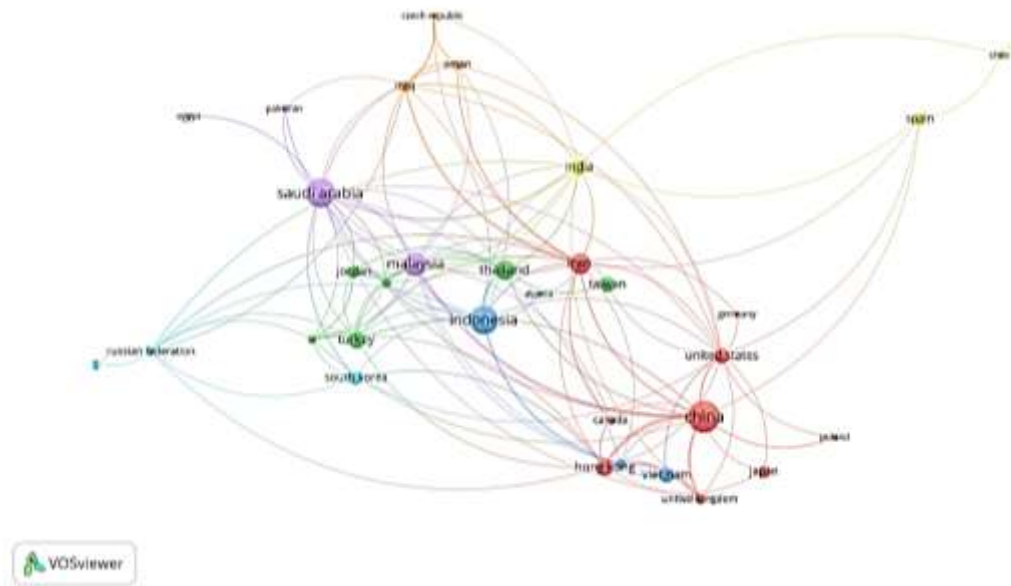


Figure 5. Network Visualization of Countries that are Involved

From the bibliometric results above, several patterns stand out with respect to how the nested framework depicted in **Figure 6** organizes the interpretive trajectory of the review, with five research questions (RQ1–RQ5) arranged along the left side and converging inward through concentric ovals toward the three analytical pillars (3.1 Bibliometric Foundations, 3.2 Digital Pedagogy Components, and 3.3 Pedagogical and Thematic Mapping) and outward toward two interpretive claims linking RQ4 to "a conceptual structure that integrates digital pedagogy themes, technologies, and methodological evidence" and RQ5 to "a comprehensive understanding of digital pedagogy in English language education and future research directions."

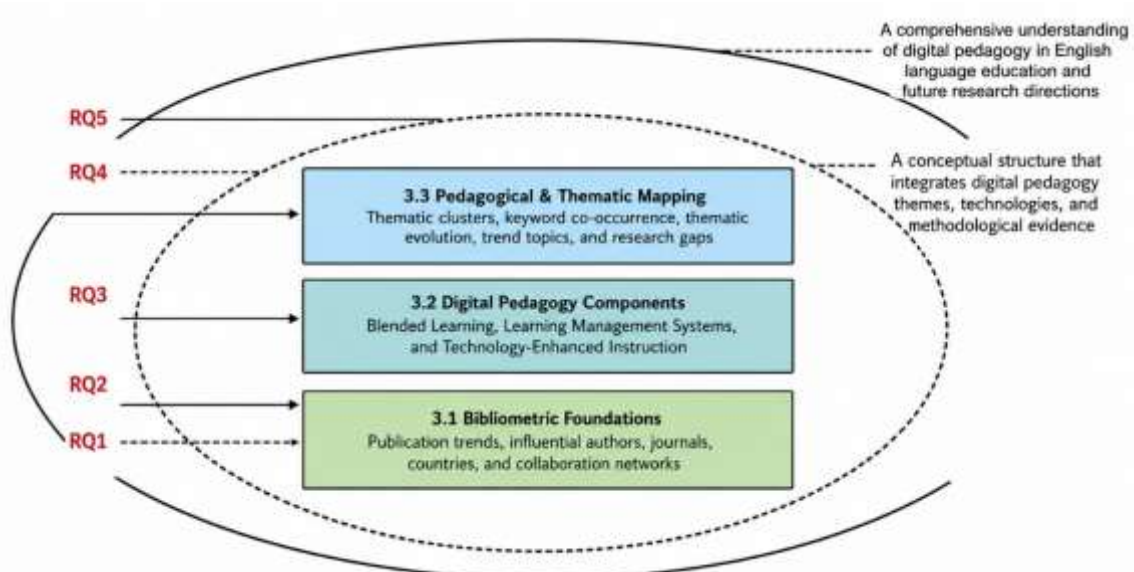


Figure 6. Conceptual Framework of Linking Digital Pedagogy in English Language Education; Blended Learning, LMS, and Technology-Enhanced Instruction

First, the framework's innermost pillar on Bibliometric Foundations, which addresses publication trends, influential authors, journals, countries, and collaboration networks, aligns closely with the volume-driven evidence retrieved from the 866-article Scopus corpus across the 2015–2025 window. The publication-trend analysis confirms a sustained upward trajectory in scholarship on digital pedagogy in English language education, with the steepest accelerations coinciding with the global shift to online and hybrid instruction during the COVID-19 pandemic ([Hamid et al., 2025](#)). Because the framework positions Bibliometric Foundations at its conceptual core rather than at the periphery, it treats volume-based indicators not as an end in themselves but as the empirical scaffolding through which the field's structural composition becomes interpretable, validating publication growth as evidence of contextual urgency rather than scholarly fashion alone.

Second, the framework's treatment of cross-national collaboration within the Bibliometric Foundations pillar is concretely grounded in the color-coded country co-authorship map produced through VOSviewer. The network resolves into several distinct collaborative neighborhoods — a Middle Eastern–South-East Asian purple core, a South Asian–African green cluster, an East Asian–Commonwealth blue cluster, a Pacific-Anglo red cluster, and an isolated Latin American yellow node — with the largest circles anchored by China (134 documents; 48 link strength), Saudi Arabia (114; 37), Indonesia (106; 27), and Malaysia (75; 42). Leadership in digital ELT scholarship is therefore unmistakably multipolar but Asia- and Gulf-anchored, while a peripheral ring of contributors from Latin America, Africa, and Eurasia widens the empirical base without yet restructuring the field's dominant theoretical vocabularies — an asymmetry that any framework ignoring regional heterogeneity risks overgeneralizing from the experience of high-output systems.

Third, the framework's Digital Pedagogy Components pillar — covering blended learning, learning management systems, and technology-enhanced instructional practices — is directly grounded in the keyword co-occurrence evidence presented earlier. Terms such as "blended learning," "educational technology," "e-learning," and "English language teaching" appear as high-frequency anchors with strong link strengths, confirming that the review's tripartite focus captures the thematic center of gravity of contemporary digital ELT scholarship ([Chen & Jumaat, 2023](#); [Ramalingam et al., 2022](#)). The framework's nested design treats these components as analytic categories that organize otherwise dispersed studies into a coherent instructional taxonomy, allowing RQ3 to be addressed through deductive content coding rather than ad hoc retrieval. This architecture also enables cross-pillar comparison, since differences between blended-learning studies (which tend toward classroom implementation and learner-experience evidence) and LMS or technology-enhanced-instruction studies (which tend toward platform evaluation and pedagogical design) can be tracked systematically rather than collapsed into a generic treatment of "digital" practice ([Bond et al., 2020](#)).

Fourth, the framework's Pedagogical and Thematic Mapping pillar, which addresses thematic clusters, keyword co-occurrence, thematic evolution, topic trends, and research gaps, extends interpretive scope to the phases of conceptual development through which the field has moved. Earlier scholarship emphasized technology foundations and infrastructure, while more recent work, particularly after 2020, foregrounds learner-centered investigations, data-driven optimization, and the integration of emerging tools such as AI-driven tutoring, mobile-assisted language learning, and digital game-based learning ([Hasumi & Chiu, 2024](#); [Ng et al., 2026](#)). The framework therefore allows the review to distinguish between thematic territories that are mainstreamed and those that are merely present, a distinction that the static reading of citation counts alone cannot produce.

Fifth, the framework's linking of RQ4 to "a conceptual structure that integrates digital pedagogy themes, technologies, and methodological evidence" foregrounds a long-standing imbalance in the field. Technology-oriented studies tend to adopt experimental or quasi-experimental designs testing the impact of AI or adaptive platforms, while studies from emerging or under-resourced contexts more often rely on descriptive surveys or small-scale case studies to document implementation barriers ([Choubsaz et al., 2023](#)). The bridging function between descriptive bibliometric evidence and content-domain synthesis is precisely what allows such methodological disparity to be named rather than smoothed over, highlighting a structural misalignment whose persistence would, if left unmarked, weaken the cumulative evidence base on which policy and curriculum decisions in English language education depend ([Meihami, 2020](#)). Sixth, the framework's outer ring, which extends from the descriptive pillars toward the integrative claim attached to RQ5 — "a comprehensive understanding of digital pedagogy in English language education and future research directions" — captures the recurring gaps identified through both systematic review and bibliometric mapping. Although digital differentiation is widely advocated, the bibliometric evidence shows that keywords relating to assessment practices, learner equity, and differential access appear infrequently and with lower connective density, indicating that these priorities remain peripheral to the field's aggregate research agenda even where individual studies treat them substantively ([Wang et al., 2024](#)). By translating missing keywords into identifiable structural openings, the framework demands that the reader recognize such silences as findings in their own right, converting bibliometric absence into a programmatic agenda for differentiated and integrated digital ELT research.

Seventh, situating the framework within the broader global trends documented across recent bibliometric and systematic reviews confirms its contemporary relevance. Comparable studies of ICT-enhanced English instruction, TELL scholarship, and technology-mediated language learning consistently report the same broad transitions — from foundational technology use toward more sophisticated and context-specific applications, from Western-led to Asia-led research leadership, and from quantity-driven growth toward phase-based thematic consolidation ([Hamid et al., 2025](#); [Malang et al., 2023](#); [Wang et al., 2024](#)). The nested framework developed in this review therefore does not stand in isolation but aligns with documented shifts across the wider field, providing an organizational architecture capable of absorbing new thematic fronts — such as AI-driven personalization, immersive learning, and data-intensive assessment — without losing its tripartite integrative logic ([Ng et al., 2026](#)).

Bibliometric mapping confirms that research on digital pedagogy in English language education is expanding, globalizing, and diversifying, but it also reveals enduring gaps in assessment, teacher competence, institutional readiness, and methodological balance. The framework's principal contribution is to render these patterns legible together, so that future scholarship can address differentiated and integrated digital ELT research with both descriptive breadth and conceptual depth, and so that the field can move beyond fragmented thematic reporting toward a cumulative, methodologically transparent, and geographically attentive research agenda.

3.2 Digital Pedagogy in English Language Education

The bibliometric results position Blended Learning in ELT — understood as the deliberate integration of physical classroom instruction with online activities, digital resources, and platform-mediated interaction to support English language teaching and learning — as the most volumetrically prominent of the three analytical pillars. Blended learning is a powerful anchor term within the ELT-related subset, as identified by keyword prominence evidence from bibliometric analysis using VOSviewer ([Miati et al., 2023](#)). The term constitutes a central focus within the field's research, as evidenced by the identification of major

research clusters ([Ng et al., 2026](#)). This positioning aligns with the major research clusters of pedagogical approaches and quality evaluation, effectiveness evaluation and implementation barriers, and learner psychological factors with technology acceptance ([Ng et al., 2026](#)). The bibliometric visibility of the term — measured in link strength rather than mere frequency — functions as a structural indicator that blended learning is the field's most discussed instructional architecture and that any framework representing digital ELT scholarship without foregrounding it would distort the empirical center of gravity of the corpus. The publication-trend evidence adds a temporal layer to this structural picture and aligns with the broader significant increase in scholarly output documented across comparable bibliometric work on ICT-enhanced English instruction ([Hamid et al., 2025](#)). The trajectory confirms a sustained upward arc in scholarship on blended English language education ([Ng et al., 2026](#)). Comparable Scopus retrievals covering 499 documents between 2005 and 2025 have identified three distinct thematic phases — technological foundations (2016–2020), learner-centered investigations (2021–2023), and data-driven optimization (2024–2025) ([Ng et al., 2026](#)). The same phase structure surfaces in the review's keyword-evidence base, where earlier scholarship emphasized infrastructure while more recent work foregrounds learner experience, adaptive sequencing, and AI-supported personalization. The implication for blended learning in ELT specifically is that the field's pivot from "blend as a transactional hybrid" to "blend as a learner-centered experience architecture" was compressed by crisis and is now stabilizing into a longer-term agenda whose central question is no longer whether to blend but how to sequence, instrument, and assess the blended experience in ways that translate into measurable learner outcomes.

The bibliometric evidence on blended learning English language teaching drawn from a comparable Scopus retrieval between 2017 and 2022 corroborates this geography, identifying China as the leading country of origin with 60 documents out of 272 scientific outputs and a peak of 74 publications in 2022 ([Ortega et al., 2023](#)). A broader bibliometric analysis of ICT-enhanced English instruction across the 2000–2025 period reinforces the pattern, with Malaysia and Indonesia identified as leading regional contributors ([Hamid et al., 2025](#)). The academic influence of leading contributors — particularly Yunus M.M. ([Hamid et al., 2025](#)) — highlights their substantial impact in the ICT-ELT field. The cited bibliometric analysis seeks to comprehend the internal logic and development trends of digital technology in education ([Wang et al., 2024](#)). This geographic concentration carries implications for representativeness that future scholarship must address through intentional diversification of country of origin coverage.

The design taxonomy evidence reveals a proliferation of classificatory schemas that the field's empirical center has not yet absorbed into a single working vocabulary ([Mestan, 2018; Park & Doo, 2024](#)). Multiple blends coexist in the literature: proportion-based models such as Allen et al.'s threshold schema assigning categories from "Web-facilitated" (below 30% online) through "blended learning" (30–79%) to "mostly online" (above 80%); rotation, flex, self-blending, and enriched-virtual models developed for K-12 contexts by Horn and Stalker; Margulieux et al.'s mixed instructional experience taxonomy for higher-education contexts; Caner's complementary branching decision trees; and Mestan's three-stage institutional transition model — Type A, Type B, and Type C — through which campuses move from augmented components to integrated unit-level redesign ([Mestan, 2018; Park & Doo, 2024](#)). This proliferation means that the bibliometric evidence cannot be read as a single coherent object, and any meta-synthesis claiming to characterize blended learning effectiveness must specify which category it samples from, since the empirical signal differs substantially between Type A replacement blends and Type C transformative redesigns ([Mestan, 2018; Park & Doo, 2024](#)). The theoretical anchoring of blended learning in ELT practice continues to draw heavily on the Community of Inquiry formulation developed

by Garrison and Vaughan, which positions cognitive presence, teaching presence, and social presence as constitutive dimensions of an educational experience irrespective of modality ([Hrastinski, 2019](#)). Within the 866-article corpus, however, the link-strength evidence suggests that the field's operational instrument vocabulary — anchored by Google Classroom, flipped classroom, mobile-assisted language learning, and higher education — has advanced more visibly than its underlying theoretical vocabulary, with much of the authored material treating blended learning as a structural arrangement rather than a philosophically grounded experience architecture. The implication is that the field's instrumental vocabulary has outrun its theoretical vocabulary, and restoring this balance by binding design choices to the pedagogies of inquiry is one of the structurally identifiable openings the corpus makes available for future scholarship. The methodological orientation of the blended-learning literature within the 866-article corpus exhibits the same experimental-versus-descriptive asymmetry documented for the broader digital-ELT field. Furthermore, recent reviews of blended-learning strategies for sustainable ESL education have identified four dominant themes: collaborative learning, learning management systems, social media applications, and technology-based learning ([Ramalingam et al., 2022](#)). Longitudinal evidence from CALL research over four decades shows parallel patterns, with eclectic methodologies outnumbering explicitly mixed-methods studies and a substantial share of studies leaving methodology unspecified ([Choubsaz et al., 2023](#)). The corroborating evidence from broader applied-linguistics research underscores further asymmetries, with methodological balance between quantitative dominance (1980–2000) and the qualitative and mixed-methods surge (2001–2019) remaining uneven ([Meihami, 2020](#)). Bond et al.'s systematic evidence map on student engagement and educational technology in higher education makes a related argument, confirming that integration of online distance and traditional face-to-face modes is becoming increasingly common but identifying effective integration as critically dependent on further professional development for educators applying these tools within their own teaching contexts ([Bond et al., 2020](#)). In contrast to the evidence on adopted blended designs and learner responses, Bond et al. note a need for further research on the effective application of these tools and on understanding research gaps in specific countries and regions ([Bond et al., 2020](#)). Moreover, bibliometric mapping of the 866-article corpus confirms that Blended Learning in ELT is the field's most volumetrically prominent pillar while remaining the one with the largest gap between its instrumental and theoretical vocabularies and the most visible mismatch between its design vocabulary and its evidence base on teacher readiness and equitable access.

3.3 Advanced Technologies

The bibliometric results position Advanced Technologies in ELT — understood as the constellation of artificial-intelligence-driven instructional tools, large language models including ChatGPT, intelligent tutoring systems, learning analytics pipelines, immersive virtual- and augmented-reality environments, big-data-enabled pedagogical modeling, and Internet-of-Things-connected classroom infrastructures — as the third pillar of the three-dimensional analytical architecture organising the 866-article Scopus corpus retrieved on 7 July 2026 from the 2015–2025 publication window. Across the corpus, advanced-technology vocabulary does not occupy the central scaffolding role blended-learning and LMS terms occupy; rather, it surfaces as a more peripheral yet accelerating constellation whose link strength is visibly weaker than the load-bearing keywords the field has already internalised, while still belonging to — rather than dominating — the network the VOSviewer map surfaces. This asymmetry is directly visible in Sahayu et al.'s bibliometric evidence on differentiated ELT, where "artificial intelligence" and "big data" appear in the keyword map with lower frequency and weaker connections than general terms such as

"education" and "digital technologies," confirming the systematic-review finding that advanced technologies are still in exploratory stages rather than serving as connected hubs ([Sahayu et al., 2025](#)). The Advanced Technologies sub-literature is therefore being explored by contemporary scholarship without yet consolidating into the load-bearing roles that foundational concepts like blended learning have already accumulated ([Sahayu et al., 2025](#)), ([Ng et al., 2026](#)). The triangulation the discussion adopts throughout is anchored in the parallel framework advanced by Sahayu, Triyono, and Ungu, whose 2025 systematic review established the same tripartite subdivision (pedagogical integration, institutional innovation, and data-driven personalization) and identified artificial intelligence, big data, and the IoT as emerging but underutilised technologies, mediated by teacher competence and infrastructure ([Sahayu et al., 2025](#)).

The publication-trend evidence retrieved from the 866-article Scopus corpus adds a temporal layer to this structural picture and confirms the acceleration of advanced technologies, which is decisively shaped by a single external event ([Tong, 2025](#)). The November 2022 public release of ChatGPT triggered a measurable surge in ChatGPT-specific empirical work in ESL/EFL settings, with 70 empirical studies published within 1.5 years of its release documenting both affordances such as personalized learning, increased learning opportunities, and teacher support and drawbacks such as incorrect information, privacy leakage, and academic dishonesty ([Lo et al., 2024](#)). Tong's AI-in-English-Language-Studies bibliometric covering 850 Scopus records across 2018–2025 corroborates this acceleration directly, identifying exponential growth in publication output with a dramatic surge in 2024–2025 and a thematic shift away from earlier-generation tools such as machine translation and intelligent tutoring systems toward emerging topics including ChatGPT, automated feedback, and online learning ([Tong, 2025](#)). The broader ICT-ELT bibliometric evidence drawn from 477 Scopus documents across 2000–2025 corroborates this acceleration structurally, identifying a significant increase in research activity from 2010 onward and a thematic transition from foundational ICT use toward more sophisticated and context-specific applications in English instruction ([Hamid et al., 2025](#)). The country-level evidence extracted from the VOSviewer country co-authorship map anchors this structural and temporal picture in a particular geography whose advanced-technology imprint diverges from the broader ELT distribution, with the AI-in-EFL bibliometric on 3,300 Web of Science documents between 2013 and 2023 identifying China, the United States, and the United Kingdom as the most influential contributors to AI-enhanced EFL scholarship and naming ChatGPT, Grammarly, and Quilbot as the AI tools whose adoption is reshaping ELT writing ([Zhang & Umeanowai, 2024](#)). Tong's AI-in-English-Language-Studies bibliometric covering 850 Scopus records between 2018 and 2025 adds that the production landscape is distinctly multipolar but East Asia-centered, with the most influential scholars concentrated in China, South Korea, and the United States and strong journal concentration in Education and Information Technologies and Computer Assisted Language Learning ([Tong, 2025](#)). Sahayu et al.'s country-network visualisation analysis supplies the dependency caveat the present corpus inherits: the figure highlights that advanced technologies such as artificial intelligence, big data, and the IoT require robust research ecosystems and cross-institutional collaboration, while the dataset highlights asymmetries in international collaborative linkages that constrain the breadth of the diffusion ([Sahayu et al., 2025](#)).

Building on separate bibliometric analyses of Scopus corpora, including Ng, Sulaiman, and Md Yunus's three phases for blended learning ([Ng et al., 2026](#)), Sahayu et al.'s three-cluster trajectory for digital technology ([Sahayu et al., 2025](#)), and Tong's thematic evolution for AI in English language studies ([Tong, 2025](#)), the conceptual phases of the Advanced Technologies pillar can be understood as sharply inflected

at the advanced-technology-specific level. Ng, Sulaiman, and Md Yunus's bibliometric analysis identified three thematic phases — technological foundations (2016–2020), learner-centred investigations (2021–2023), and data-driven optimisation (2024–2025) — that supply the temporal scaffold within which the AI/ChatGPT-specific post-2022 surge must be located ([Ng et al., 2026](#)). Sahayu et al.'s three-cluster trajectory — pedagogical integration, institutional innovation, and data-driven personalisation — supplies the parallel diagnostic framework that situates the present review's evidence within a wider agenda in which data-driven personalisation remains underdeveloped even within the differentiated-ELT sub-literature ([Sahayu et al., 2025](#)). Bibliometric studies indicate that Advanced Technologies is a dispersed research area, with research clusters identified across varied technological applications and learner contexts ([Ng et al., 2026](#)), ([Sahayu et al., 2025](#)). The AI-in-L2-teaching and applied-linguistics bibliometric analysis of 185 SSCI articles from 1995 to 2022 refines the picture at the AI-specific level, identifying four main clusters — AI, natural language processing, robot-assisted language learning, and chatbots — that the Advanced Technologies pillar must engage with as operationally distinct sub-territories rather than as a single "AI-in-ELT" abstraction ([Kartal & Yeşilyurt, 2024](#)). The AI-in-EFL bibliometric analysis of 3,300 Web of Science documents from 2013 to 2023 further extends the cluster taxonomy by surfacing five distinct keyword clusters spanning AI-enhanced language learning, educational technology, EFL teaching factors, learner motivation, and assessment strategies, providing the additional cluster vocabulary the Advanced Technologies pillar must adopt when reading its corpus ([Zhang & Umeanowai, 2024](#)). The TELL bibliometric analysis of 1,816 Web of Science publications supplies the configured-front evidence, surfacing advanced-technology sub-fronts across its eight research fronts rather than concentrating them in any single research front, alongside the established flipped-learning, MALL, and DGBL fronts that anchor the tools-and-platforms macro-cluster more centrally ([Hasumi & Chiu, 2024](#)).

The design taxonomy and implementation evidence base for Advanced Technologies in ELT is the field's most rapidly evolving but least consolidated evidence layer, characterised by Sahayu et al.'s layered-ecosystem taxonomy — infrastructure layer via LMS, pedagogical layer via adaptive and blended approaches, and data layer via analytics — alongside complementary sub-literatures that specify each layer in operational terms ([Sahayu et al., 2025](#)). Within the AI-specific layer, Son, Ružić, and Philpott's review of ITS varieties with AI/machine-learning adaptation, Bibauw et al.'s and Heift's taxonomies of ITS, and Choi's argument that an ICALL tutoring system can support grammatical-concept acquisition supply the principal functional categories and the theoretical-practical bridge ([Son et al., 2023](#)), while Park and Doo's review of AI in blended learning identifies three operational AI roles — direct mediator, supplementary assistant, and new subject — alongside concrete implementation examples such as machine-learning classification models for academic-performance improvement, AI-enabled personalised video recommendations, and Moodle-based quiz modules ([Park & Doo, 2024](#)). The LLM-specific implementation evidence draws heavily on Lo et al.'s systematic review of 70 empirical ChatGPT studies in ESL/EFL education over the first 1.5 years following ChatGPT's November 2022 release, which documents affordances and drawbacks alongside a writing-skills concentration that leaves reading, speaking, and listening under-researched ([Lo et al., 2024](#)). The immersive-technology layer draws implementation evidence from Chengheben et al.'s review of immersive-technology-assisted language learning across 504 Web of Science publications from January 2014 to October 2024, which documents the rapid post-2019 growth alongside a thematic shift from game-based emphases toward experience-oriented and embodied learning, with prominent topics including vocabulary learning, spherical video-

based VR-supported writing, AR storybooks, and virtual-reality exposure approaches to public-speaking anxiety ([chengheben et al., 2026](#)); Çelik and Duran's mixed-methods review of VR/AR in language education across 634 publications (385 VR and 249 AR) further corroborates the implementation pattern, identifying motivation, engagement, and contextual learning as the dominant documented benefits alongside the observation that most studies prioritize technical development over pedagogical depth, with hardware costs, teacher training, and scarce longitudinal data flagged as the dominant barriers ([Çelik & Duran, 2025](#)). The big-data and IoT layers draw their implementation evidence from Sahayu et al.'s specific examples — big-data systems aggregating and analysing large-scale learner data through clickstream analysis and usage logs to identify patterns of engagement, and IoT devices such as smart boards, connected tablets, and sensor-based monitoring systems collecting multimodal data on learner interactions — accompanied by the explicit recognition that IoT remains at an exploratory stage and that high costs, infrastructure requirements, surveillance concerns, and the data-overload-versus-actionable-intelligence dilemma are the principal barriers ([Sahayu et al., 2025](#)). On the theoretical-anchoring side, the Advanced Technologies pillar draws on a thinner and more recently developed theoretical base than the Community of Inquiry formulation the prior Blended Learning subsection adopted as its principal frame, with Sahayu et al.'s technology-as-amplifier framing and TPACK-grounded teacher-competence vocabulary supplying the principal current anchors but without the consolidating theoretical weight that BL and LMS scholarship have accumulated ([Sahayu et al., 2025](#)), ([Sahayu et al., 2025](#)) Boelens et al.'s four blended-learning challenges — incorporating flexibility, stimulating interaction, facilitating learning processes, and fostering an affective climate — structure the problem-set that AI, LA, and ITS technologies, automated essay scoring, and personalised NLP-driven assistance — predicted by Dziuban et al., Floridi, and Norberg to be increasingly adopted in blended learning — are increasingly asked to solve ([Park & Doo, 2024](#)), while Chengheben et al.'s proposed Neurophysiological-Social-Pedagogical framework supplies the most developed theoretical vocabulary currently available for the immersive layer ([chengheben et al., 2026](#)). The link-strength evidence indicates that the Advanced Technologies sub-literature's theoretical vocabulary has not advanced at the same pace as its platform-level and tool-level vocabulary — with much of the authored material treating AI, immersive environments, big data, and IoT systems as structural arrangements of affordances rather than as theoretically grounded experience architectures — meaning that the field's instrument-and-layer vocabulary has outrun its theoretical vocabulary, requiring future work to bind technological innovation with pedagogical principles ([Sahayu et al., 2025](#)).

The methodological orientation of the Advanced Technologies sub-literature exhibits the sharpest experimental-versus-descriptive asymmetry of the three pillars, with the four-CALL-journal longitudinal analysis providing the most direct comparative baseline: 24.6 percent of highly cited CALL papers used quantitative methods, 21.3 percent used eclectic approaches, 20.6 percent used qualitative methods, only 5.1 percent used explicitly mixed methods, and 28.1 percent left methodology unspecified ([Choubsaz et al., 2023](#)). The applied-linguistics trajectory across 1980 to 2019 reinforces the pattern at the field level, with quantitative dominance through 2000 giving way to a qualitative surge between 2001 and 2019 and a partial mixed-methods turn from 2010 onward ([Meihami, 2020](#)), and Sahayu et al.'s own bibliometric synthesis recommends that future research combine rigorous experimental approaches with situated qualitative analyses to provide both breadth and depth ([Sahayu et al., 2025](#)). The structural-gap evidence constitutes one of the most programmatically consequential findings within the Advanced Technologies sub-literature because the gaps Sahayu et al. document are recurrent and concentrated around the

foundational infrastructural and ethical dimensions the pillar requires but has not yet consolidated: assessment practices (formative and summative) remain underrepresented despite LMS platforms frequently including assessment functions, equity and access issues are rarely foregrounded in keyword clusters despite their centrality, and teacher cognition — beliefs, attitudes, and self-efficacy toward digital differentiation — is mentioned less frequently in bibliometric mapping despite its foundational TPACK role ([Sahayu et al., 2025](#)). Lo et al.'s ChatGPT-specific systematic review adds the skill-matrix gap, with the writing-skills concentration of 70 empirical ChatGPT studies leaving reading, speaking, and listening under-researched ([Lo et al., 2024](#)), while Chengheben et al.'s immersive-technology bibliometric surfaces a progression from early AR applications toward cognitive, affective, and neurocognitive explanations that remain aspirational rather than empirically consolidated, alongside the identification of hardware costs, teacher training, and scarce longitudinal data as the dominant barriers ([chengheben et al., 2026](#)). Çelik and Duran's VR/AR mixed-methods review adds the technical-over-pedagogical-depth observation that most immersive-language-learning studies prioritize technical development over pedagogical depth ([Çelik & Duran, 2025](#)), and Bond et al.'s systematic evidence map supplies the cross-pillar geographic-representativeness concern the Advanced Technologies pillar inherits and intensifies through the additional AI-literacy requirement ([Bond et al., 2020](#)). The implication is that the field has produced evidence about infrastructure, pedagogy, and data analytics in differentiated ELT, but evidence remains thinner regarding assessment practices, equity, and teacher cognition ([Sahayu et al., 2025](#)). Bibliometric mapping of the 850-article Scopus corpus highlights the field's rapid transformation, with publication output surging post-2022, a thematic shift toward generative AI and automated feedback, and a geographic concentration of influential scholars in China, South Korea, and the United States ([Tong, 2025](#)). The discussion's principal contribution is to render this emerging-frontier axis legible together so that future scholarship can position new advanced-technology studies within a cumulative, methodologically transparent, geographically attentive, theoretically grounded, and ethically governed research program whose three pillars cohere — rather than fragment into three separate research conversations the integrative framework was designed to render mutually intelligible.

3.4 Institutional Readiness and Teacher Competence

The bibliometric results presented earlier in this review position Institutional Readiness & Teacher Competence — understood as the constellation of infrastructural, policy, financial equity, professional development, and teacher cognition conditions that determine whether emerging digital designs in English language teaching can be deployed at scale with quality and equity — not as a fourth pillar but as the cross-cutting determinant whose absence conditions the implementation of the field's three operational pillars ([Sahayu et al., 2025](#)). Across the Scopus corpus, institutional readiness and teacher competence vocabulary emerges with notably lower link strength than the load-bearing operational anchors documented, with terms such as "teacher competence," "teacher readiness," "professional development," and "teacher cognition" appearing with visibly weaker connectivity than blended-learning, e-learning, and LMS terms even where individual studies treat the dimensions substantively ([Sahayu et al., 2025](#)). Sahayu et al. observe that 'teacher cognition' is relatively underrepresented in bibliometric mapping, confirming that the field's connective vocabulary remains organized around implementation-side rather than systems-conditions terms ([Sahayu et al., 2025](#)). Scholarship on teacher readiness, professional development, and institutional capacity has nonetheless shown a sustained upward arc across the 2015–2025 window, with Hamid et al.'s broader ICT-ELT bibliometric analysis identifying teacher professional development as one of the four core research themes alongside ICT integration, digital literacy, and blended learning ([Hamid](#)

[et al., 2025](#)). Sahayu et al. add that the surge in research activity reflects both contextual urgency and technological advancement, with the explicit acknowledgment that diffusion of advanced approaches has so far been concentrated in pilot projects rather than fully scaled classroom implementations because institutional readiness and teacher competence remain the bottleneck ([Sahayu et al., 2025](#)). The implication is that the field has stabilized into a sustained research program in which the operational questions of whether to deploy blended, LMS, and advanced-technology designs have been answered in the affirmative while the cross-cutting questions of who is competent to deploy them, under what institutional conditions, and with what equity safeguards have only just begun to receive the longitudinal, mixed-methods, and policy-anchored attention the field's forward agenda requires ([Hamid et al., 2025](#)). The VOSviewer country co-authorship map anchors the picture in a particular geography whose institutional readiness and teacher competence imprint mirrors but does not reverse the broader ELTE distribution, with the color-coded collaboration network resolving into the same neighborhood structure documented in the prior three subsections. The differentiated-ELT bibliometric identifies the United Kingdom as showing strong international collaborations ([Sahayu et al., 2025](#)). Bond et al.'s systematic evidence map sharpens the geography at the educational-technology engagement level, suggesting the need to critically evaluate publication policies of major, Western-based journals to ensure a more representative evidence base ([Bond et al., 2020](#)).

Sahayu et al.'s layered ecosystem model identifies the infrastructure layer, the pedagogical layer, and the data layer as three coupled layers in which institutional readiness and teacher competence operate simultaneously rather than in isolation ([Sahayu et al., 2025](#)). The technology acceptance framework supplies a complementary anchor through Ng, Sulaiman, and Md Yunus's bibliometric on blended English language learning, which identifies the gap that "investigations focus narrowly on basic Technology Acceptance Model constructs without comprehensive frameworks" and recommends UTAUT2 with attitude as mediator and self-directed learning readiness as moderator — a recommendation generalizing to the teacher-as-user case as much as to the student-as-user case ([Ng et al., 2026](#)).

Institutional Readiness and Teacher Competence scholarship draws on a thinner and more recently developed theoretical base than the formulations the prior subsections adopted, with the principal anchors distributed across TPACK, UTAUT2, Self-Regulated Learning, the layered-ecosystem framing, and the technology-as-amplifier framing ([Hrastinski, 2019](#); [Ng et al., 2026](#); [Sahayu et al., 2025](#); [Wang et al., 2024](#)). Sahayu et al. explicitly position TPACK as "essential for realizing the promise of differentiation in digital contexts" and argue that "these technologies are not substitutes for teachers but amplifiers of instructional capacity," supplying the integrative vocabulary through which IR and TC operates as the cross-cutting determinant that moderates between technological potential and pedagogical practice ([Sahayu et al., 2025](#)). The Community of Inquiry formulation continues to function as a generic theoretical vocabulary for any educational experience irrespective of modality, but its primary levers translate into IR & TC vocabulary chiefly through the teaching-presence dimension, which translates into professional-development mechanisms for teaching presence ([Hrastinski, 2019](#)). Within the corpus, the IR and TC dimension's theoretical vocabulary has not advanced at the same pace as its operational framing, with much of the authored material treating institutional readiness and teacher competence as background conditions or PD-recommendation lists rather than as theoretically grounded moderation mechanisms ([Ng et al., 2026](#)). The IR and TC sub-literature within the 866-article Scopus corpus exhibits the experimental-versus-descriptive asymmetry the prior subsections documented, with the methodological split mapping unevenly onto the four framework orientations because some frameworks lend themselves to experimental

testing while others lend themselves to descriptive or qualitative inquiry ([Sahayu et al., 2025](#)). Sahayu et al. suggest that research should aim for greater variety across contexts, combining rigorous experimental approaches with situated qualitative analyses to provide both breadth and depth ([Sahayu et al., 2025](#)). The four-CALL-journal longitudinal analysis documents the inherited methodological distribution, with 24.6 percent of highly cited CALL papers using quantitative methods, 21.3 percent using eclectic approaches, 20.6 percent using qualitative methods, only 5.1 percent using explicitly mixed methods, and 28.1 percent leaving methodology unspecified — a split the IR and TC sub-literature inherits because CALL research has historically been the methodological home of digital-ELT inquiry ([Choubsaz et al., 2023](#)).

Sahayu et al.'s three-part IR & TC gap diagnosis identifies, first, that "the literature underrepresents the role of assessment practices (formative and summative) in digital differentiation" even though "LMS platforms frequently include assessment functions"; second, that "equity and access issues are rarely foregrounded, even though digital differentiation depends heavily on infrastructure availability"; and third, that "teacher cognition (including beliefs, attitudes, and self-efficacy toward digital differentiation) is mentioned less frequently in bibliometric mapping, indicating a need for further empirical investigation" ([Sahayu et al., 2025](#)). Sahayu et al. emphasize that barriers such as high costs, infrastructure requirements, and ethical implications constrain the integration of advanced technologies in differentiated ELT ([Sahayu et al., 2025](#)). Bond et al. document that 109 studies in their review used a blended-learning design, noting that this makes "a case for further professional development" and questioning the reasons for the low number of published studies in certain countries and regions ([Bond et al., 2020](#)). The discussion's principal contribution is to render this cross-cutting dimensional axis legible together — rather than as a fourth pillar whose independent apparatus would compete with the tripartite framework — so that future scholarship can position new IR & TC studies within a cumulative, methodologically transparent, geographically attentive, theoretically grounded, framework-conscious, and equity-anchored research programme whose three pillars cohere through shared infrastructural readiness determinants whose absence conditions, rather than constitutes, a fourth pillar that the integrative framework was designed to render mutually intelligible ([Ng et al., 2026](#); [Sahayu et al., 2025](#); [Wang et al., 2024](#)).

3.5 Overall Insights from the Review

The bibliometric triangulation performed against the 866-article Scopus corpus over the 2015–2025 window positions this subsection as the cross-pillar integrative synthesis through which Blended Learning in ELT, Learning Management Systems in ELT, Advanced Technologies in ELT, and the cross-cutting Institutional Readiness and Teacher Competence determinant are read jointly rather than pillar-by-pillar, in line with RQ4 and RQ5 ([Bang, 2024](#); [Ng et al., 2026](#); [Wang et al., 2024](#)). Across the four dimensions, the load-bearing connector vocabulary — "blended learning," "e-learning," "educational technology," "online learning," and "English language teaching" — sits at the center of the network with high link strength, while the vocabulary through which the cross-cutting determinant and the Advanced Technologies pillar are operationalized ("teacher competence," "teacher readiness," "professional development," "institutional readiness," "equity," "artificial intelligence," "big data," "ChatGPT," "VR," "AR," and "ITS") registers visibly weaker connective density even where individual studies treat the dimensions substantively ([Ng et al., 2026](#); [Sahayu et al., 2025](#); [Wang et al., 2024](#)). The triangulating anchor is the parallel Overall Insights synthesis advanced by Sahayu, Triyono, and Ungu, whose 2025 review demonstrates that institutional readiness and teacher competence are fundamental determinants of whether digital technology achieves its potential in differentiated English language teaching ([Sahayu et al., 2025](#)). The cross-pillar implication is that the four dimensions cohere through shared infrastructural

readiness determinants whose presence or absence conditions the empirical centre of gravity, rendering Institutional Readiness and Teacher Competence legible as the cross-cutting determinant rather than as an independent fourth pillar whose apparatus would compete with the tripartite framework ([Sahayu et al., 2025](#)).

The VOSviewer country co-authorship map anchors this cross-pillar picture in a geography whose asymmetries are reproduced — rather than resolved — across the three pillars and the cross-cutting determinant, with the network resolving into a Middle Eastern–South-East Asian core, a South Asian–African cluster, an East Asian–Commonwealth cluster, a Pacific-Anglo cluster, and an isolated Latin American node; the largest circles are anchored by China (134 documents; 48 link strength), Saudi Arabia (114 documents; 37 link strength), Indonesia (106 documents; 27 link strength), and Malaysia (75 documents; 42 link strength), a concentration Yang et al. corroborate by reporting that "the United States, China, and the United Kingdom produce 76.3% of the research, while Southern Hemisphere countries contribute just 12%" ([Yang et al., 2025](#)). The cluster-architecture evidence drawn from Figure 4 establishes the three macro-clusters — tools-and-platforms, learner-psychology, and language-context — as the connective scaffolding through which all three pillars and the cross-cutting determinant distribute rather than concentrate, with advanced-technology vocabulary bridging into the learner-psychology and language-context clusters and IR & TC vocabulary distributed across all three clusters through visibly different mechanisms, a dispersed-cluster reading corroborated by Sahayu et al.'s three-cluster reading (pedagogical integration, institutional innovation, data-driven personalization) ([Sahayu et al., 2025](#)), by Yang et al.'s five-cluster reading of ELTE scholarship ([Yang et al., 2025](#)), and by Hasumi and Chiu's TELL bibliometric on 1,816 Web of Science publications ([Hasumi & Chiu, 2024](#)). Triangulating the 866-article Scopus corpus against Sahayu et al.'s parallel trajectory locates all three pillars and the cross-cutting determinant on the three-phase scaffold — technological foundations 2016–2020, learner-centred investigations 2021–2023, data-driven optimisation 2024–2025 — with Blended Learning in ELT tracking the canonical trajectory as the field's most mature pillar, LMS in ELT concentrating more pronouncedly around the data-driven-optimisation phase, Advanced Technologies in ELT reaching the data-driven phase earliest, and Institutional Readiness & Teacher Competence following its own differentiated phase structure from infrastructure-and-access (2015–2019) through capability-and-professional-development (early 2020s) into a cognitively-integrated and equity-anchored phase (2023–2025) ([Sahayu et al., 2025](#)). The temporal picture is corroborated by Hamid et al.'s 477-document ICT-ELT bibliometric documenting "a significant increase in research activity, particularly from 2010 onward" alongside a thematic transition "from foundational ICT use toward more sophisticated and context-specific applications," and by Lo et al.'s ChatGPT-specific review documenting the AI-driven publication pattern whose compounding differential-access effects must be read at the centre ([Hamid et al., 2025](#); [Lo et al., 2024](#)). The cross-pillar implication the geographic, cluster-architecture, and temporal triangulation supplies is that the four dimensions share a common developmental arc — paced differently pillar by pillar, reaching the data-driven phase earliest in Advanced Technologies, most unevenly in the evidence base on equity, teacher cognition, and assessment practices — and that the cross-cutting determinant is empirically anchored in the same Asian-and-Gulf axis whose Global South representatives are structurally under-represented despite being the geography where the determinant is most consequentially experienced.

The structural-gap evidence constitutes the forward research agenda the cross-pillar synthesis identifies as the boundary-setting piece for any cumulative research programme across the four dimensions, because the gaps are not random but recurrent and concentrated around the foundational systems-conditions

dimensions — Sahayu et al.'s three-part diagnosis identifies, first, that "the literature underrepresents the role of assessment practices (formative and summative) in digital differentiation" even though "LMS platforms frequently include assessment functions"; second, that "equity and access issues are rarely foregrounded, even though digital differentiation depends heavily on infrastructure availability"; and third, that "teacher cognition (including beliefs, attitudes, and self-efficacy toward digital differentiation) is mentioned less frequently in bibliometric mapping, indicating a need for further empirical investigation" ([Sahayu et al., 2025](#)). A systematic review by Lo et al. adds the cross-pillar skill-matrix gap, observing that "the impact of ChatGPT on other language skills, such as reading, speaking, and listening, remains under-researched" ([Lo et al., 2024](#)), while Chengheben, Shi, and Wang and Çelik and Duran reinforce the gap at the immersive layer with "hardware costs, teacher training, and scarce longitudinal data" identified as barriers ([chengheben et al., 2026](#)), ([Çelik & Duran, 2025](#)). Bond et al. and Wang et al. reinforce the PD-and-representativeness gap, the under-researched-participants dimension, and the equity-and-societal gap — identifying "further professional development" as empirically unavoidable and surfacing "digital equity, data privacy, and the sociocultural impact of technology on learning communities" as the broad educational-societal frontier — alongside the diagnosis that "objective constraints included the lack of infrastructure in some regions to support digital technologies, while subjective obstacles included psychological resistance among certain students and teachers" ([Wang et al., 2024](#)), ([Bond et al., 2020](#)). The methodological-orientation evidence, however, exhibits an experimental-versus-descriptive asymmetry that constitutes the integrative-methodological problem the framework's nested architecture was designed to surface — studies in technologically advanced contexts often employ experimental or quasi-experimental designs while studies from emerging contexts more often use descriptive surveys or case studies — a pattern corroborated by Choubasaz, Jalilifar, and Boulton's four-CALL-journal longitudinal analysis (24.6% quantitative, 21.3% eclectic, 20.6% qualitative, 5.1% mixed, 28.1% unspecified) and by Meihami's applied-linguistics review ([Choubasaz et al., 2023](#)), ([Meihami, 2020](#)). The discussion's principal cross-pillar contribution is therefore to integrate the evidence base the four pillar-specific and determinant-specific subsections have already mapped so that future scholarship can position new digital-ELT studies within a cumulative, methodologically transparent, geographically attentive, theoretically grounded, and ethically governed research programme whose four dimensions cohere through a shared structural backbone rather than fragment into parallel research concerns ([Wang et al., 2024](#)), ([Bang, 2024](#)), ([Sahayu et al., 2025](#)).

4. CONCLUSION

This bibliometric review of 866 Scopus-indexed publications retrieved on 7 July 2026 across the 2015–2025 publication window integrates Blended Learning in ELT, Learning Management Systems in ELT, and Advanced Technologies in ELT within a single tripartite framework, with Institutional Readiness & Teacher Competence positioned as the cross-cutting determinant whose presence or absence conditions the three operational pillars' implementation at scale. Distinct from previous bibliometric studies on CALL, AI in L2 teaching, LMS in developing countries, and other focused syntheses that each address a narrower slice of digital pedagogy, the present study delivers a unified structural map that treats the three pillars as mutually integrated rather than as parallel research conversations, with the cross-cutting determinant read jointly rather than as a fourth independent pillar. The VOSviewer country co-authorship map anchors the picture in an Asian and Gulf axis of high-output research ecosystems — China (134 documents; 48 link strength), Saudi Arabia (114; 37), Indonesia (106; 27), and Malaysia (75; 42) —

alongside a structural under-representation of Global South classrooms and under-resourced linguistically diverse contexts where the cross-cutting determinant is most acutely experienced. The three-phase trajectory — technological foundations 2016–2020, learner-centred investigations 2021–2023, and data-driven optimisation 2024–2025 — surfaces across all three pillars but at differentiated pacing, with Advanced Technologies reaching data-driven consolidation earliest, Blended Learning occupying the longest stabilisation arc, and Learning Management Systems concentrating around the data-driven optimisation phase, while the Institutional Readiness & Teacher Competence dimension follows its own infrastructure-and-access, capability-and-professional-development, and equity-and-cognitive-integration trajectory. The bibliometric evidence identifies four cross-cutting structural gaps — assessment redesign, equity and access, teacher cognition, and methodological transparency — as the forward research agenda the cross-pillar framework now consolidates, because each registers weak keyword link-strength and limited connective density even where individual studies treat these dimensions substantively, supplying an empirical pathway toward a cumulative, methodologically transparent, geographically attentive, theoretically grounded, framework-conscious, and equity-anchored research programme. The review's principal contribution is therefore to render this integrative architecture legible so that future scholarship can position new digital-ELT studies within an evidence base that is structurally held together by Blended Learning's load-bearing connective vocabulary, the LMS pillar's platform-and-infrastructure delivery layer, the Advanced Technologies pillar's emerging operational layer, and the Institutional Readiness & Teacher Competence cross-cutting determinant — rather than perpetuating the fragmentation of the field into three separate research conversations whose evidence bases cannot be cross-read.

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6. REFERENCES

1. Alam, S., Albozeidi, H. F., Al-Hawamdeh, B. O. S., & Ahmad, F. (2022). *Practice and Principle of Blended Learning in ESL/EFL Pedagogy: Strategies, Techniques and Challenges*. <https://doi.org/10.3991/ijet.v17i11.29901>
2. Alnakeeb, S. S., Hossam, E., Aldallal, R., Unogwu, O. J., & Milat, G. (2025). *The Global Landscape of Technology-assisted English Language Teaching Research: A Bibliometric Analysis*. <https://doi.org/10.58496/bjml/2025/005>
3. Arruda, H., Silva, É. R., Lessa, M., Júnior, D. P., & Bartholo, R. (2022). VOSviewer and Bibliometrix. *Journal of the Medical Library Association JMLA*, 110(3), 392–395. <https://doi.org/10.5195/jmla.2022.1434>
4. BAKHADURALIYEVNA, K. D., & G.K., K. (2025). *PEDAGOGICAL EFFECTIVENESS OF LEARNING MANAGEMENT SYSTEMS IN ENGLISH LANGUAGE LEARNING*. <https://doi.org/10.5281/zenodo.17722950>
5. Bang, T. C. (2024). *Technology Integration in English Language Education*. <https://doi.org/10.4018/979-8-3693-3294-8.ch007>
6. Bond, M., Buntins, K., Bedenlier, S., Zawacki-Richter, O., & Kerres, M. (2020). Mapping research in student engagement and educational technology in higher education: a systematic evidence

- map. *International Journal of Educational Technology in Higher Education*, 17(1). <https://doi.org/10.1186/s41239-019-0176-8>
7. BÜYÜKKIDIK, S. (2022). A Bibliometric Analysis: A Tutorial for the Bibliometrix Package in R Using IRT Literature. *Eğitimde ve Psikolojide Ölçme ve Değerlendirme Dergisi*, 13(3), 164–193. <https://doi.org/10.21031/epod.1069307>
8. Çelik, F., & Duran, V. (2025). *The Role of VR and AR in Immersive Language Education* (pp. 245–284). <https://doi.org/10.4018/979-8-3373-3366-3.ch009>
9. Chano, J., Bonk, C. J., & Mohamad, B. (2025). *Mapping the Evolution of Blended Learning in Higher Education: A Bibliometric Analysis of English Language Proficiency Research*. <https://doi.org/10.26858/ijole.v1i1.77392>
10. Chen, Y., & Jumaat, N. F. (2023). *Blended Learning Design of English Language Course in Higher Education: A Systematic Review*. <https://doi.org/10.18178/ijiet.2023.13.2.1815>
11. Chengheben, Shi, L., & Wang, X. (2026). *Immersive technology in language education: a bibliometric analysis from 2014 to 2024*. https://doi.org/10.35542/osf.io/fp54z_v1
12. Choubasaz, Y., Jalilifar, A., & Boulton, A. (2023). A longitudinal analysis of highly cited papers in four CALL journals. *ReCALL*, 36(1), 40–57. <https://doi.org/10.1017/s0958344023000137>
13. Göksu, I., Özkaya, E., & Gündüz, A. (2022). The content analysis and bibliometric mapping of CALL journal. *Computer Assisted Language Learning*. <https://doi.org/10.1080/09588221.2020.1857409>
14. Hamid, S. M., Mannong, A. B. M., Muhsin, Muh. A., & Harun, J. (2025). Global Trends in ICT-Enhanced English Instruction: Insights from a Bibliometric Analysis (2000–2025). *International Journal of Learning Teaching and Educational Research*, 24(12), 344–365. <https://doi.org/10.26803/ijlter.24.12.15>
15. Hashmi, U. M., Rajab, H., & Shah, S. R. (2020). ELT During Lockdown: A New Frontier in Online Learning in the Saudi Context. *International Journal of English Linguistics*, 11(1), 44–44. <https://doi.org/10.5539/ijel.v11n1p44>
16. Hasumi, T., & Chiu, M.-S. (2024). *Technology-enhanced language learning in English language education: Performance analysis, core publications, and emerging trends*. <https://doi.org/10.1080/2331186x.2024.2346044>
17. Hrastinski, S. (2019). What Do We Mean by Blended Learning? *TechTrends*, 63(5), 564–569. <https://doi.org/10.1007/s11528-019-00375-5>
18. Kartal, G., & Yeşilyurt, Y. E. (2024). A bibliometric analysis of artificial intelligence in L2 teaching and applied linguistics between 1995 and 2022. *ReCALL*, 36(3), 359–375. <http://doi.org/10.1017/s0958344024000077>
19. Kizi, E. D. R., & kizi, E. D. R. (2025). Barriers and future prospects of technology integration in english language education. *American Journal Of Philological Sciences*, 5(1), 36–42. <https://doi.org/10.37547/ajps/volume05issue01-10>
20. Kraus, S., Breier, M., Lim, W. M., Dabić, M., Kumar, S., Kanbach, D. K., Mukherjee, D., Corvello, V., Chousa, J. P., Liguori, E. W., Palacios-Marqués, D., Schiavone, F., Ferraris, A., Fernandes, C., & Ferreira, J. J. (2022). *Literature reviews as independent studies: guidelines for academic practice*. <https://doi.org/10.1007/s11846-022-00588-8>
21. Li, P., & Lan, Y. (2021). *Digital Language Learning (DLL): Insights from Behavior, Cognition, and the Brain*. <https://doi.org/10.1017/s1366728921000353>

22. Li, R. (2022). Research trends of blended language learning: A bibliometric synthesis of SSCI-indexed journal articles during 2000–2019. *ReCALL*. <https://doi.org/10.1017/S0958344021000343>
23. Lo, C. K., Yu, P. L. H., Xu, S., Ng, D. T. K., & Jong, M. S. (2024). Exploring the application of ChatGPT in ESL/EFL education and related research issues: a systematic review of empirical studies. *Smart Learning Environments*, 11(1). <https://doi.org/10.1186/s40561-024-00342-5>
24. Malang, U. N., Gozali, I., Basthomi, Y., Surabaya, U. K. W. M. S., Syahid, A., & <https://orcid.org/0000-0001-7284-4665>. (2023). Painting the ELT Research Landscape during the Pandemic: A Bibliometric Study. *Mextesol Journal*., 47(3), 1–18. <https://doi.org/10.61871/mj.v47n3-2>
25. Martins, J., Gonçalves, R., & Branco, F. (2022). A bibliometric analysis and visualization of e-learning adoption using VOSviewer. <https://doi.org/10.1007/s10209-022-00953-0>
26. Meihami, H. (2020). Research Methodology and Orientation of Papers Published from 1980 to 2019 in Applied Linguistics Journals. *SHILAP Revista de Lepidopterología*. <https://doi.org/10.22054/ilt.2020.53506.518>
27. Mestan, K. (2018). *Create a fine blend: An examination of institutional transition to blended learning*. <https://doi.org/10.14742/ajet.3216>
28. Metaria, M., & Cahyono, B. Y. (2024). EFL students' engagement in the post-pandemic teaching: Does technology matter? <https://doi.org/10.23971/jefl.v14i1.6503>
29. Miati, S., Siregar, E., & Kustandi, C. (2023). Analyzing Trends in Blended Learning for Professional Growth: A Scopus Bibliometric Review. <https://doi.org/10.24235/al.ibtida.snj.v10i2.14984>
30. Moral-Muñoz, J. A., Herrera-Viedma, E., Santisteban-Espejo, A., & Cobo, M. J. (2020). Software tools for conducting bibliometric analysis in science: An up-to-date review. *RISalud Institutional Health Repository of Andalucía*, 29(1). <https://doi.org/10.3145/epi.2020.ene.03>
31. Nadtayay, N., Wongsaphan, M., & Wu, C. (2025). The application of CEFR standard framework in enhancing communicative English competencies: The bibliometric analysis and its support to Sustainable Development Goals (SDGs). *International Journal of Language Education*. <https://doi.org/10.26858/ijole.v1i2.82101>
32. Ng, W. L., Sulaiman, N. A., & Yunus, M. M. (2026). *Blended Learning in English Language Education from Inception to 2025: A Global Bibliometric Analysis of Trend Topics, Research Themes, Gaps, and Future Directions*. <https://doi.org/10.26803/ijlter.25.2.41>
33. Ninkov, A., Frank, J. R., & Maggio, L. A. (2021). *Bibliometrics: Methods for studying academic publishing*. <https://doi.org/10.1007/s40037-021-00695-4>
34. Omer, A. A. A., Issa, I. I. M., Abuker, Y. Y. A., & Asad, S. (2025). Evaluating the Use of VOSviewer in Bibliometric and Science-Mapping Studies: Trends, Current State and Future Directions. *International Journal of Current Research in Science Engineering & Technology*, 8(4), 483–497. <https://doi.org/10.30967/ijcrset/altyeb-ali-abaker-omer/208>
35. Ortega, C. P. C., Torre, A. J. V. de la, Novillo, A. C. M., & López, E. R. R. (2023). *BLENDED LEARNING IN ENGLISH LANGUAGE TEACHING*. <https://doi.org/10.59670/jns.v33i.892>
36. Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T., Mulrow, C. D., Shamseer, L., Tetzlaff, J., Akl, E. A., Brennan, S., Chou, R., Glanville, J., Grimshaw, J., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *PLoS Medicine*, 18(3). <https://doi.org/10.1371/journal.pmed.1003583>

37. Park, Y., & Doo, M. Y. (2024). *Role of AI in Blended Learning: A Systematic Literature Review*. <https://doi.org/10.19173/irrodl.v25i1.7566>
38. Rahman, N. A., Rosli, R., Rambely, A. S., & Halim, L. (2021). Mathematics Teachers' Practices of STEM Education: A Systematic Literature Review. *European Journal of Educational Research*, 1541–1559. <https://doi.org/10.12973/eu-jer.10.3.1541>
39. Ramalingam, S., Yunus, M. M., & Hashim, H. (2022). *Blended Learning Strategies for Sustainable English as a Second Language Education: A Systematic Review*. <https://doi.org/10.3390/su14138051>
40. Rawat, S., Tiwari, S., Sharma, M., & Singh, N. C. (2023). The Digital Pedagogy Competence Scale (DiPeCoS): development and validation. *Research and Practice in Technology Enhanced Learning*, 19, 18–18. <https://doi.org/10.58459/rptel.2024.19018>
41. Sahayu, W., Triyono, S., & Ungu, N. K. (2025). *Digital Technology in Differentiated English Language Teaching: A Systematic Review with Bibliometric Insights*. <https://doi.org/10.17509/ijost.v11i2.89685>
42. Sheerah, H. A. H. (2020). *Using Blended Learning to Support the Teaching of English as a Foreign Language*. <https://doi.org/10.24093/awej/call6.13>
43. Son, J., Ružić, N. K., & Philpott, A. (2023). Artificial intelligence technologies and applications for language learning and teaching. *Journal of China Computer-Assisted Language Learning*, 5(1), 94–112. <https://doi.org/10.1515/jccall-2023-0015>
44. Suriaman, A., Manurung, K., Mukrim, M., Apridayani, A., & Agussatriana, A. (2023). *Effective or Impractical? Discussing Students' Perceptions toward Learning Management Systems in English Language Learning*. <https://doi.org/10.26858/ijole.v7i2.43495>
45. Tong, T. P. (2025). Artificial Intelligence And The Transformation Of English Language Studies: A Bibliometric Perspective (2018–2025). *International Journal of Scientific Research and Management (IJSRM)*, 13(10), 4426–4433. <https://doi.org/10.18535/ijssrm/v13i10.e105>
46. Vaishnav, P. (2026). *English Language Teaching in Transition: Historical Developments, Contemporary Trends, and Future Directions*. <https://doi.org/10.9734/ajess/2026/v52i32915>
47. Wang, C., Chen, X., Yu, T., Liu, Y., & Jing, Y. (2024). Education reform and change driven by digital technology: a bibliometric study from a global perspective. *Humanities and Social Sciences Communications*, 11(1). <https://doi.org/10.1057/s41599-024-02717-y>
48. Yang, L., Li, Q., Chang, S., Chi, Y., & Liu, Q. (2025). Global research landscape in English language teacher education: Insight from bibliometrics analysis. *Language Teaching Research*. <https://doi.org/10.1177/13621688251394629>
49. Zhang, X., & Umeanowai, K. O. (2024). Exploring the transformative influence of artificial intelligence in EFL context: A comprehensive bibliometric analysis. *Education and Information Technologies*, 30(3), 3183–3198. <https://doi.org/10.1007/s10639-024-12937-z>