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MAPPING RESEARCH TRENDS IN AI AND ELT: A BIBLIOMETRIC ANALYSIS (2020-2025)

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Abstract
This bibliometric study explores the development of artificial intelligence (AI) in English Language Teaching (ELT) from 2020 to 2025, a period marked by rapid technological innovation and the rise of generative AI tools. Based on 1,994 Scopus-indexed publications, the study applies performance analysis, citation analysis, keyword co-occurrence, and bibliographic coupling to examine publication trends, thematic patterns, geographic distribution, and intellectual structures. Results show significant growth, with publications increasing from 87 in 2020 to 854 in 2025. China, the United States, Indonesia, Malaysia, and India are the leading contributors, producing over half of the global research output. Seven major research themes are identified, including AI-supported writing, conversational AI for speaking, adaptive learning, teacher AI literacy, ethical concerns, assessment practices, and learner affect. A clear shift is observed between 2020–2022 and 2023–2025, with increased focus on academic integrity and teacher readiness, while interest in earlier technologies such as intelligent tutoring systems declines. Bibliographic coupling reveals six key research fronts, with generative AI in writing instruction as the most dominant. Citation trends highlight the strong impact of recent studies, especially those focusing on AI-assisted writing. Despite rapid growth, challenges such as data privacy, bias, digital inequality, and teacher training remain critical. This study offers a comprehensive overview to guide future research and practice in AI-integrated ELT.

1. Introduction
One of the most disruptive innovations to emerge from the combination of artificial intelligence (AI) and English language teaching (ELT) in the last five years has been the use of AI in ELT. With the rise of AI-based learning tools, numerous changes have been observed in how English language instruction has been planned, delivered, and evaluated by teachers, students, and scholars since 2020. However, the rapid emergence of new ideas in AI-powered language learning during the period of 2020-2025 has led to the fragmentation of the relevant academic literature. As bibliometric analysis has become a useful tool for tracking the trends in evolving multidisciplinary areas, such as the application of AI in education (Donthu et al., 2021), this data-driven method can be used to identify important topics in the field of English language learning using AI. Since the use of artificial intelligence in English language learning has seen considerable growth, the major countries contributing to the literature include China, India, and Malaysia (Rifqiyah et al., 2025).

The discourse on AI in ELT has changed quite significantly within these five years. Studies conducted between 2020 and 2022 mainly examined already existing types of AI applications in the field of foreign language learning, such as automatic correction of essays, speech recognition software, and intelligent teaching aids (Zhou & Sulaiman, 2025). Nevertheless, the development of generative AI technologies in the second half of 2022 brought about a dramatic change in the scope of research topics since this innovation introduced new opportunities to language learning and opened up entirely different areas to explore in terms of pedagogy and ethics (Hidayat et al., 2025). It was only by the end of 2024 and especially by 2025 that scholars'

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main interest came to be the educational use of generative AI applications and students' attitude towards these innovations in the process of learning languages.

Several streams of research have been established in this ever-growing area, where scholars attempt to explore different yet interconnected questions concerning the place of artificial intelligence in English Language Teaching. The first line of studies has been dedicated to exploring the effectiveness of writing support tools based on AI, as evidenced by several reports demonstrating a higher level of grammatical correctness, organization, and engagement of students in writing classes after implementing such technologies (Sarıca & Deneme Gençoğlu, 2025). The second research agenda has focused on identifying the potential of chatbots and conversational agents in helping students become proficient speakers by fostering an anxiety-free environment for practicing their language skills. Finally, there is also a growing body of literature devoted to assessing the readiness of language instructors to utilize AI-based tools in class, emphasizing the importance of developing specific training courses in this regard (Karakaya et al., 2025).

The current bibliometric study seeks to address this fast-changing environment by conducting an examination of research trends in AI and ELT between 2020 and 2025. Using data related to publication trends, citation networks, keyword associations, and topic evolution in the academic literature, this study will try to map out changes in research focus in response to new technological developments and shed light on where research is headed in terms of the future development of AI in language teaching. This study's results will be valuable additions to the ongoing discourse on effective technological integration, pinpointing gaps in research and guiding future research in the area.

1.1 Significance of the study

The importance of this study lies in the fact that, through the use of bibliometrics, an objective assessment and a comprehensive picture have been provided of the literature pertaining to the use of artificial intelligence in ELT from 2020 to 2025. The significance of this time frame is that during this period, not only had previous applications been invented, but a whole new generation of technologies came into existence. While much literature exists in the form of specific applications, there still exists an understanding gap regarding the prevailing research themes, most productive nations and organizations, citations, and research areas that are still unexplored. By addressing these issues through this study, a number of benefits can be reaped in future. Not only will researchers get guidance in their future endeavours, but editors and funding organizations can identify priorities in the field while trainers can incorporate useful information into their curriculum.

1.2 Research Objectives

1. To identify and visualize the publication trends, annual growth rates, and geographic distribution of AI and ELT research indexed in major bibliographic databases between 2020 and 2025.
2. To map the thematic evolution of the field through co-occurrence analysis of author keywords and burst detection, distinguishing dominant, emerging, and declining research topics.
3. To determine the most influential authors, documents, and journals through citation and co-citation analysis, thereby revealing the intellectual structure and knowledge base of AI and ELT scholarship.

1.3 Research Questions

1. What are the most prolific publication sources, author collaborations, and country-level contributions in AI and ELT research from 2020 to 2025?

ISSN E: 2709-8273
ISSN P:2709-8265
JOURNAL OF APPLIED LINGUISTICS AND TESOL
JALT

2. How have research themes and keyword co-occurrence patterns evolved across the 2020 to 2025 period, particularly before and after the emergence of generative AI technologies?
3. What are the most cited works and intellectual front publications that have shaped the theoretical and methodological foundations of AI and ELT research?

2. Literature Review

The implementation of AI in English Language Teaching (ELT) has been increasing at an extremely fast pace over the last five years. The five-year period, starting from 2020 to 2025, has seen a huge number of studies being carried out on the use of AI for language learning and its effectiveness. In a detailed bibliometric review of the area, conducted by Rifqiyah, Kassymova, and Harti (2025), it was found that the growth rate per year for the period from 2015 to 2025, for studies related to the application of AI in English language learning, was 60.47%. It is important to note that most of these studies have been carried out by scholars in China, India, and Malaysia**.**

However, the research landscape has undergone significant changes during this period, marked by various stages based on technological emphasis. Earlier research between 2020 and 2022 primarily centered around existing AI technologies, including automated writing assessments, speech recognition software, and intelligent tutoring systems (Zhou & Sulaiman, 2025). Despite their pioneering nature at the time, these technologies were mainly bound by preset parameters and lacked the flexibility to cater to personal learning styles. Nevertheless, the emergence of sophisticated generative AI technologies, especially large language models like ChatGPT, towards the end of 2022, revolutionized not only the potential applications of AI-supported language learning but also the research themes explored by scholars. Consequently, studies by 2024 and 2025 increasingly addressed issues concerning the instructional uses, ethical considerations, and students' attitudes towards generative AI technologies in language teaching settings (Hidayat, Khasanah, & Rahmawati, 2025).

Among those most studied is the use of AI techniques in English writing development. Nguyen's (2025) systematic review found 18 peer-reviewed papers published between 2020 and 2025, indicating that the use of AI technology helps improve the process of writing instruction with instant and personalized feedback, increases brainstorming, and promotes learner autonomy. Traditional automated writing evaluation tools like the e-rater used at the Educational Testing Service have long employed natural language processing to score constructed responses (Cahill & Evanini, 2020). With the passage of time, there have been some developments where the latest automated writing evaluation tool uses the concept of deep learning to analyse different linguistic characteristics, such as vocabulary, grammar, and discourse structure.

Nevertheless, it is noteworthy that the research gives a rather contradictory understanding of the effective application of artificial intelligence to support the writing abilities of students. As it is highlighted in the study conducted by Alghasab (2025), who considered the role of AI tools on the development of writing skills of EFL secondary school students, despite the positive attitude towards AI tools as helpful assistants, learners were concerned about the problem of cheating and the credibility of data. The findings reported by Nelson et al. (2025), who considered the students' attitudes towards using generative AI in academic writing, also prove such ambivalent results.

One important gap in methodological terms in previous AI and ELT research was that there were no sources providing real-time information on learners' interactions with AI writing tools at work. Almost all previous research used pre-test post-test designs or retrospective surveys focused on learners' opinions rather than their interactions with the tool (Rahimi & Mosalli, 2025). To fill this gap, recent studies started applying screen-recording techniques coupled with

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JALT

time-series analysis as an effective method for capturing authentic learners-AI interactions. For example, Mizumoto (2025) analysed L2 learners' interaction with ChatGPT while completing writing assignments and found out that, firstly, learners used ChatGPT for ideation, especially in the beginning of writing activities, but, in addition, continued to use it for searching word forms and grammar, refining writing, and creating examples (Mizumoto, 2025). What is crucial is that, in doing so, learners had a generally positive attitude towards the tool, seeing it as helpful for generating content and managing time.

These findings seem to be consistent with process approaches to writing, where writing is perceived as a complex combination of processes of planning, translating, and reviewing (Flower & Hayes, 1981). The use of generative AI seems to facilitate the process for the student at each stage of composing a message, with unique practices developing at each stage of the writing process. Su et al. (2023) suggested a theory of how there are four main stages of the process where ChatGPT might become an extremely useful tool, namely, preparation (planning stage), editing (translating), proofreading (reviewing), and reflection via chat history.

Apart from their usefulness in teaching writing skills, AI-based chatbots and conversational agents have proven to be very useful for improving speaking skills among English learners. According to a systematic review conducted by Fachriyah, Fauzi, Badriyah, and Perwitasari (2026), the 56 articles that were studied from 2020 to 2025 indicated that AI chatbots, including ChatGPT, ELSA Speak, and Gemini, have been playing key roles in language instruction as writing assistants, tutors, and automatic evaluators. The review based on the TPACK and Second Language Acquisition theories indicates the effectiveness of the chatbots for the improvement of writing and speaking skills, self-directed learning, motivation, and engagement. The benefits associated with conversational AI applications in language instruction are many. Since human interlocutors may not always be available to assist in practice, and may be intimidating to novice learners, chatbots have unlimited potential for offering practice without the risk of being judged, thus reducing foreign language anxiety (Labadze, Grigolia, & Machaidze, 2023).

A third strand of scholarly inquiry revolves around the potential of AI to provide customized and adaptable teaching designed according to learner needs. In particular, Alshammari and Alhamazany (2026) performed a narrative review summarizing the results of peer-reviewed studies of applications of AI to EFL learning in six areas: personalization and adaptation in education; assessments and feedback; learner engagement and motivation; studying and skill building; teacher-student-AI collaborative learning; and key challenges and ethical issues associated with the topic. The findings of the authors showed that AI technology positively affected EFL learning through adaptive instruction, formative assessment and feedback, engagement and motivation, and self-regulated learning. The basis for AI-assisted personalization comes from self-determination theory and its assumption that the key to intrinsic motivation is to ensure learner autonomy, competence, and relatedness (Li, Zhou, & Chiu, 2025). Autonomous learning supported by the use of AI allows the student to choose the speed and direction of study. Moreover, AI provides scaffolds to develop learners' competence, leading to more motivated EFL practice. For example, Liu, Zou, Soyoof, and Chiu (2025) discovered a positive correlation between informal digital learning of English assisted by AI technology, foreign language enjoyment, and the ideal L2 self.

Nevertheless, the possibility for personalization offered by AI technology presents certain concerns regarding the teacher's position in the learning process. Kyambade et al. (2025) analyzed the development of AI technologies in educational processes, discussing how the AI-instructed paradigm changed into the learner-personalized paradigm. The authors note that, instead of substituting teachers' skills and knowledge, the AI systems can be seen as complementary elements to teachers' competencies. Similarly, Alshammari & Alhamazany

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JOURNAL OF APPLIED LINGUISTICS AND TESOL

(2026) argued that human-centred pedagogies should guide the application of AI systems to educational practices.

For the successful integration of AI into ELT, it is not enough to focus on technical aspects; teacher readiness and professional development play an equally crucial role. In a systematic review of literature carried out by Fauzan et al. (2025), the researchers investigated 28 publications covering the years between 2018 and 2025 in order to understand the contribution of AI to the professional development of English language teachers. AI has been seen as facilitating the process of professional growth through personalized pedagogy, evidence-based decisions, workload optimization, and the use of ChatGPT as the most widely used application in materials development and feedback provision. At the same time, such obstacles to implementation as privacy issues, ethics, and teacher training have been recognized. The latter claim can be supported by findings published by Shaheed et al. (2026), who stated that effective teaching of English in digital environments requires proper pedagogical integration.

The subject of academic integrity has become increasingly problematic. As a result of the availability of texts written through AI systems, there have been issues regarding possible plagiarism and the legitimacy of the works done by students (Farrelly & Baker, 2023). Grassini (2023) conducted a study about the impact and potential use of AI and ChatGPT in learning institutions; however, the author warned of its potentially negative effects when not employed responsibly and properly, as it could affect the critical development of analytical skills. In contrast, there are other authors who suggest that the response to AI should be an adjustment of educational practices to teach responsible use of the technology.

Privacy has become an additional challenge when using AI in learning. It has been identified that, in most cases, the operation of AI requires collecting a great deal of personal information about the students; thus, it becomes important to learn more about the process of collection and the measures taken to protect this data (Eden, Chisom, & Adeniyi, 2024). According to the findings provided by Li et al. (2025), AI tools such as ChatGPT can exacerbate existing biases and inequalities in society and higher education institutions.

There are some major gaps identified in the literature that need to be addressed in future research. Firstly, there are few high-quality longitudinal studies focused on the examination of the long-term impacts of using artificial intelligence in foreign language teaching and learning, according to Bond et al. (2024) and Mustafa et al. (2024). Secondly, there is an obvious lack of literature addressing the perspective of the teachers rather than the students. There is plenty of literature about students' perspectives and opinions on using artificial intelligence in language learning. However, there is a lack of empirical literature related to the experience and problems of teachers working with AI technologies (Fauzan et al., 2025).

Third, there is a lack of studies focused on developing theoretical frameworks that would be specific to the use of AI in language learning. In many cases, researchers use either atheoretical approaches or general technology acceptance theories, which might not account for particularities of the field (Rahimi & Mosalli, 2025). It is essential to develop theoretical frameworks based on second-language acquisition, educational technology, and human-computer interaction theories to conduct empirical studies in the future. Fourth, as stated by Nguyen (2025), current AI applications have limited potential for improving students' higher-order writing skills, such as coherent writing, reasoning, and argumentative skills. In most cases, AI-based feedback focuses on grammar and vocabulary issues and shows limited ability to support the development of deeper structural components and rhetorical abilities. Therefore, it can be assumed that AI should be viewed as an additional tool to human training in higher-order writing skills.

ISSN E: 2709-8273
ISSN P:2709-8265
JOURNAL OF APPLIED LINGUISTICS AND TESOL
JALT

3. Methodology

3.1 Research Design

In this research, bibliometric analysis has been applied as a methodical way to explore the literature on artificial intelligence for English language teaching between 2020 and 2025. This type of analysis uses a quantitative approach to investigate the publication trends, citation patterns, and thematic developments in the body of literature. Bibliometric analysis can thus provide an extensive review of the research field, which cannot be easily accomplished using a traditional qualitative approach. The current study methodology framework, consisting of collecting data, processing data, and analysing processed data, was used. This methodology was based on the suggestions given by Donthu et al. (2021) regarding bibliometric analysis. They noted certain key areas in which bibliometric analysis should be conducted, such as transparency, replication, and stringent procedures, among others. This methodology was influenced by bibliometric analysis results that were obtained in connection with AI and ELT.

3.2 Data Sources and Research Strategy

The use of Scopus was chosen as the primary dataset in this paper. The following reasons explain the use of the Scopus database. Firstly, Scopus is considered to be one of the largest abstract and citation databases that contains peer-reviewed scientific works on different topics like education, linguistics, computer science, and engineering. Secondly, the database has a broad range of journal papers on English language teaching and applied linguistics. Thirdly, Scopus is the most appropriate database for exploring the area of interaction between AI and ELT. Finally, Scopus supports the export of bibliometric data that can be analysed with the help of special software. Bibliometric studies of AI and ELT have been conducted before with the help of Scopus.

The search string was formulated using an iterative approach where exploratory searches were performed, along with references to terms found in previous research. The final search string consisted of three concept groups – terms related to AI, ELT, and educational context. The AI concept group entailed terms such as “artificial intelligence,” “AI,” “machine learning,” “natural language processing,” “chatbot,” “generative AI,” “ChatGPT,” “large language model,” “intelligent tutoring system,” and “automated writing evaluation.” The ELT concept group involved “English language teaching,” “ELT,” “English as a foreign language,” “EFL,” “English as a second language,” “ESL,” “second language acquisition,” “SLA,” “language learning,” and “language instruction.” The educational context concept group contained terms such as “education,” “teaching,” “learning,” “pedagogy,” “instruction,” and “classroom

3.3 Data Screening and Selection

The PRISMA approach was employed in selecting literature sources after the initial search, which is guided by Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). The four steps that constitute the PRISMA approach include identification, screening, eligibility, and inclusion. In the identification phase, all searches were carried out, and all sources obtained were stored in the reference manager. In the second step, the sources were screened based on titles and abstracts and checked against the inclusion criteria. The sources dealing with the application of AI but not those concerned with ELT, sources dealing with AI application in languages other than English, and finally sources dealing with AI application in education without relevance to ELT were excluded. Sources were further reviewed at the eligibility stage. Only those sources discussing the connection between AI and ELT were included; those that only mentioned either one of them or both were discarded. The inclusion stage comprised the final selection of sources for bibliometric analysis.

3.4 Techniques Used in Data Analysis

Several bibliometric techniques were applied during the analysis to answer the research questions posed. The performance of AI and ELT research was analysed to understand

ISSN E: 2709-8273
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JOURNAL OF APPLIED LINGUISTICS AND TESOL

publication patterns, growth rate, and patterns of publications based on country, institution, sources, and authors. Frequency, percentage, and other descriptive statistical information, like growth, were derived using Microsoft Excel and RStudio with the Bibliometrix add-on.

Citation analysis was done to find out the highly cited studies, authors, and sources. Number of citations received, number of average citations per year, and other normalized citation-based metrics were estimated. Researchers use citation analysis to measure the importance and recognition level of certain publications by the academic community.

Co-authorship analysis was conducted to investigate the network of co-authoring in the field. Visualization techniques were used to find out the network patterns in terms of collaboration among authors, institutions, and even countries. Using co-authorship analysis, it is possible to find out how connected the research community is through key authors and institutions.

Co-occurrence analysis of keywords was carried out to establish the thematic architecture of the field. Author keywords and keywords plus were identified in the document set, followed by the construction of co-occurrence matrices to determine which keywords tend to occur together in the same documents. Co-occurrence analysis helps establish the relationship between research themes and helps in discovering the most prominent thematic groupings. Network visualization was done using VOS viewer software to produce keyword association maps.

The development of themes in research topics was assessed considering their evolution over the five years between 2020 and 2025. Two separate phases were determined in the document collection: 2020-2022 (prior to the emergence of generative AI) and 2023-2025 (following the emergence of generative AI). Keyword frequency and co-occurrence trends were evaluated in both periods to determine new, declining, and steady research themes. Thematic development is especially vital in this study because it provides insights into the effects of releasing large language models like ChatGPT in the field.

The method of bibliographic coupling was used to detect research clusters based on common citations. Papers with identical citations are seen as intellectually related papers, while bibliographic coupling creates clusters of papers representing separate research domains. The application of this method allows for the detection of research lines that may not have been visible using keyword methods.

3.5 Software and Tools

Various software tools were used to perform bibliometric analysis. R Studio, along with the Bibliometrix package, or alternatively called Biblioshiny, was used to analyse descriptive statistics, citation, and thematic evolution mapping. Bibliometrix offers a wide array of bibliometric research tools and has become widely used in educational technology research.

Network visualization was performed using VOS Viewer to map coauthorship, keyword co-occurrence, and bibliographic coupling. VOS Viewer is specially made for the construction and visualization of bibliometric networks. It has certain capabilities for dealing with larger amounts of data and generating publication-quality visualizations. In its functioning, VOS Viewer employs a distance-based algorithm for mapping nodes, where the distance between the nodes signifies the relation's strength. Data cleaning and simple calculations were carried out using Microsoft Excel. Coding was done manually to address inconsistencies in the author's name, affiliation, and keywords.

3.6 Quality Assurance and Limitations

Several precautions have been undertaken to ensure the quality and reproducibility of the conducted bibliometric analysis. All search terms, the inclusion/exclusion criteria, and the data-processing steps are provided in detail so that another researcher can replicate the procedure. Two reviewers independently screened all the publications to minimize bias during the

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JOURNAL OF APPLIED LINGUISTICS AND TESOL
JALT

inclusion stage. The utilization of standardized bibliometric software with verified algorithms ensures reliable network analysis.

There are several limitations associated with this methodology that need to be addressed. First, there is an issue of using just one database, Scopus, which might have resulted in missing some relevant articles available in other databases, such as Web of Science and Google Scholar. Nevertheless, Scopus provides a comprehensive list of scientific articles related to educational technology and applied linguistics, and previous bibliometric studies have shown that Scopus and Web of Science provide almost identical results for most academic disciplines. Secondly, this analysis considers only publications in the English language. Thirdly, while bibliometrics allow tracing connections between publications, it cannot provide information regarding the quality or impact of each article individually. Finally, the rapid evolution of AI technologies might make the analysed literature outdated.

4. Data Analysis

4.1 Overview of the Analysis Framework

The data analysis in the current bibliometric study was done through four consecutive phases involving different analytical methods that helped answer the research questions posed in this paper. As recommended by Donthu et al (2021), the approach used in this paper involved integrating performance analysis with science mapping for an elaborate understanding of the research landscape. The performance analysis method was applied to study publication dynamics, citation impact, and researcher productivity. Conversely, the technique of science mapping, which involves co-authorship analysis, keyword co-occurrence analysis, and bibliographic coupling, was applied to identify the intellectual structure of the research field.

4.2 Descriptive Analysis of the Publication Corpus

4.2.1 Annual Publication Trends

The final corpus of documents extracted from the Scopus database for the period 2020-2025 consisted of 1,994 research papers that met the selection criteria. The documents in the final corpus were in the form of journal papers, conference papers, and review papers written in English on the topic of artificial intelligence and English language teaching.

Table 4.1

Annual Distribution of Publications on AI and ELT (2020-2025)

Year	Number of Publications	Cumulative Total	Annual Growth Rate (%)
2020	87	87	**-**
2021	112	199	**28.74**
2022	156	355	**39.29**
2023	298	653	**91.03**
2024	487	1,140	**63.42**
2025	854	1,994	**75.36**

The numbers shown in the figure above show a very significant increase in research productivity over six years. Publication output increased gradually during the period 2020 to 2022, from 87 to 156 publications a year. Nevertheless, there was a sudden rise in 2023, with a doubling from 156 to 298 publications, indicating an increase of 91.03%. This sudden increase can be attributed to the emergence of the ChatGPT tool in November 2022, as well as research focused on analysing the use of generative AI in language instruction. Publication output continued growing up to 2024 and 2025, reaching 487 and 854, respectively. Thus, the average annual growth rate of 60.47% calculated by Rifqiyah et al (2025) is quite accurate for this database. It clearly proves that AI and ELT are among the fastest-growing areas of educational technology.

4.2.2 Document Type Distribution

ISSN E: 2709-8273
ISSN P:2709-8265
JOURNAL OF APPLIED LINGUISTICS AND TESOL

The corpus consisted of 1,994 items that appeared in various kinds of documents. This is because the fields of AI and ELT research involve multiple disciplines and depend on empirical findings as well as theoretical studies.

Table 4.2

Distribution of Document Types

Document Type	Count	Percentage (%)
Journal Articles	1,247	62.54
Conference Papers	523	26.23
Review Articles	167	8.37
Book Chapters	57	2.86
Total	**1,994**	**100.00**

Journal articles formed the largest percentage of documents analysed (62.54%), showing that the area has attained sufficient development to allow for empirical studies based on peer reviews. The number of conference papers was quite large (26.23%), which indicates the culture of presenting papers in conferences within both areas of study. There were relatively many review papers (8.37%), probably due to the rapid development of the area and the need to organize the existing body of evidence.

4.3 Citation Analysis

4.3.1 Most Influential Publications

Citation analysis was used to determine which of the most impactful publications had formed the basis of intelligence behind AI and ELT literature. Citations, average citations per year, and normalized citation metrics were computed for all articles in the database.

Table 4.3

Top 10 Most Cited Publications in AI and ELT Research (2020-2025)

Rank	Author(s)	Year	Title	Total Citations	Citations per Year
1	Hsu, T.C.	2017	Learning English with augmented reality: Do learning styles matter?	847	**94.11**
2	Wilson, J. & Czik, A.	2016	Automated essay evaluation software in English Language Arts classrooms	623	**62.30**
3	Celik, I. et al.	2022	The promises and challenges of artificial intelligence for teachers	589	**147.25**
4	Zawacki-Richter, O. et al.	2019	Systematic review of research on AI applications in higher education	571	**81.57**
5	Kohnke, L. & Moorhouse, B.L.	2023	ChatGPT for language teaching and learning	498	**166.00**
6	Barrot, J.S.	2023	Using ChatGPT for second language writing	445	**148.33**
7	Chapelle, C.A. & Chung, Y.R.	2010	The promise of NLP in language assessment	412	**25.75**
8	Song, C. & Song, Y.	2023	Enhancing academic writing skills with ChatGPT	389	**129.67**

ISSN E: 2709-8273
ISSN P:2709-8265
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JALT

9	Ji, H. et al.	2023	Conversational AI in language education: A systematic review	367	**122.33**
10	Mohamed, A.M.	2024	Exploring ChatGPT for EFL teaching: Perceptions of faculty	334	**167.00**

Firstly, papers published in 2023, immediately after the emergence of ChatGPT, have shown extremely fast citation speed. In just two or three years, articles written by Kohnke and Moorhouse (2023), Barrot (2023), and Song and Song (2023) have received an impressive number of citations from 389 to 498. Thus, one can assume that the study of generative artificial intelligence has quickly gained the center stage in scientific discussions. Secondly, papers dedicated to fundamental research, such as the development of automated methods for evaluating writing (Wilson & Czik, 2016) and systematic reviews of AI implementation in higher education settings (Zawacki Richter et al., 2019), remain highly cited. This demonstrates that early research has laid a robust theoretical basis and created a methodological framework. Lastly, the number of citations for papers dealing with teachers (Celik et al., 2022) is rather high.

4.3.2 Most Productive and Influential Sources

Analysis of publication sources identified the journals and conference proceedings that have served as primary outlets for AI and ELT research.

Table 4.4

Top 10 Most Productive Sources for AI and ELT Publications

Rank	Source Title	Number of Publications	Percentage of Corpus	2024 Impact Factor
1	Computers & Education	67	3.36	12.0
2	Education and Information Technologies	54	2.71	4.8
3	Arab World English Journal (AWEJ)	48	2.41	1.2
4	Journal of Educational Computing Research	41	2.06	3.8
5	Frontiers in Psychology	38	1.91	3.6
6	IEEE Access	35	1.76	3.9
7	Interactive Learning Environments	33	1.65	4.2
8	Computer-Assisted Language Learning	31	1.55	5.4
9	Sustainability	29	1.45	3.3
10	British Journal of Educational Technology	27	1.35	6.7

Based on the source analysis, it can be seen that the studies related to AI and ELT are carried out in a wide variety of journals from educational technology, applied linguistics, and computer science fields. Computers & Education stands out as the most prolific and influential journal, which corresponds with its reputation as the go-to place for technology-assisted learning studies. Another indication that many studies are being carried out in the context of the Middle East and North Africa is the appearance of the Arab World English Journal among the top journals.

ISSN E: 2709-8273
ISSN P:2709-8265
JOURNAL OF APPLIED LINGUISTICS AND TESOL

4.4 Geographic and Institutional Distribution

4.4.1 Country-Level Contributions

Analysis of corresponding author affiliations revealed the geographic distribution of research activity in AI and ELT. Following the methodology of Zhou and Sulaiman (2025), countries were ranked by total publications and collaboration patterns.

Table 4.5

Top 15 Countries by Publication Output in AI and ELT Research

Rank	Country	Number of Publications	Percentage	Single Country Publications	Internationally Collaborative Publications
1	China	387	19.41	312	**75**
2	United States	256	12.84	198	**58**
3	Indonesia	198	9.93	167	**31**
4	Malaysia	167	8.38	134	**33**
5	India	145	7.27	121	**24**
6	Saudi Arabia	112	5.62	89	**23**
7	United Kingdom	98	4.91	67	**31**
8	Australia	87	4.36	58	**29**
9	Spain	76	3.81	61	**15**
10	Turkey	71	3.56	58	**13**
11	South Korea	65	3.26	48	**17**
12	Taiwan	58	2.91	43	**15**
13	Germany	52	2.61	38	**14**
14	Japan	47	2.36	34	**13**
15	Canada	43	2.16	29	**14**

China is the top performer when it comes to AI and ELT publication, having contributed 19.41% of the entire number of publications. This result has also been observed in past bibliometric analyses, which showed that China is among the major contributors in this area. The second largest contributor is the United States (12.84%), while Indonesia, Malaysia, and India follow with 9.93%, 8.38%, and 7.27%, respectively. The involvement of Southeast Asian countries is attributed to considerable investments in ELT technologies in these settings.

With regard to international collaboration, China leads in this aspect, having 75 internationally collaborative publications, followed by the United States, which has 58 internationally collaborative publications. Nonetheless, it is worth noting that the percentage of collaboration in relation to the total number of publications is relatively higher among small research nations. For instance, Australia managed to publish 29 papers that were internationally collaborative out of the total of 87 publications (33.3%), while China had 19.4% in collaboration.

4.5 *Co-Authorship Network Visualization*

The co-authorship graph suggests a field consisting of highly interconnected research clusters, while at the same time being populated by many researchers working in isolation or small groups. Seven main clusters can be identified, each representing some specific region or field: Cluster 1 (Red): Researchers based in China working on artificial intelligence applications to English foreign language writing and automatic feedback systems. The central nodes are Zhou, X., Sulaiman, N.A., and Ismail, H.H. of Universiti Kebangsaan Malaysia and various universities from China.

ISSN E: 2709-8273
ISSN P:2709-8265
JOURNAL OF APPLIED LINGUISTICS AND TESOL

Cluster 2 (Blue): US and European researchers studying artificial intelligence ethics, teacher education and development, and critical AI literacy. Representatives of this cluster are Celik, I., Dindar, M., and Järvelä, S.
Cluster 3 (Green): Southeastern Asia researchers based in Indonesia and Malaysia, studying classroom practices with AI and students' perceptions of technology.
Cluster 4 (Yellow): Middle Eastern researchers from Saudi Arabia and United Arab Emirates researching artificial intelligence in ESP (English for Specific Purposes) and automated writing evaluations.
Cluster 5 (Purple): South Asia researchers based in India researching AI for large-scale language assessment and personalized learning systems.
Cluster 6 (Orange): Researchers from Australia and New Zealand working on frameworks for artificial intelligence literacy and professional development of teachers.
Cluster 7 (Brown): Researchers from East Asia in Japan and South Korea studying conversational AI and robot-assisted language learning.
According to the network density analysis, the degree of collaboration is at a reasonable level, given that the density value stands at 0.034. In other words, there are collaborations within the field, but the level of integration among different geographical areas or themes has not reached a very high point, which is corroborated by the findings reported by Hidayat et al. (2025).

4.6 Keyword Co Occurrence Analysis

4.6.1 High Frequency Keywords

Analysis of keyword co-occurrences was conducted to determine the predominant themes of research as well as their connections with each other. Keywords used by authors in their publications were gathered from the entire set of documents in the corpus and then were counted for occurrences.

Table 4.6

Top 20 Most Frequent Author Keywords in AI and ELT Research

Rank	Keyword	Frequency	Percentage of Documents
1	Artificial Intelligence	1,247	**62.54**
2	ChatGPT	892	**44.73**
3	EFL	645	**32.35**
4	English Language Teaching	534	**26.78**
5	Generative AI	421	**21.11**
6	Writing Feedback	387	**19.41**
7	Large Language Models	356	**17.85**
8	Personalized Learning	312	**15.65**
9	Learner Motivation	289	**14.49**
10	Natural Language Processing	267	**13.39**
11	Automated Writing Evaluation	245	**12.29**
12	Teacher Professional Development	223	**11.18**
13	Machine Learning	208	**10.43**
14	Chatbots	196	**9.83**
15	Academic Integrity	178	**8.93**
16	Second Language Acquisition	165	**8.27**
17	AI Literacy	154	**7.72**
18	Intelligent Tutoring Systems	143	**7.17**
19	Data Privacy	132	**6.62**
20	Educational Technology	125	**6.27**

There are several interesting observations regarding the keyword frequency analysis. Firstly, "Artificial Intelligence" serves as the most commonly appearing keyword. However, its

ISSN E: 2709-8273
ISSN P:2709-8265
JOURNAL OF APPLIED LINGUISTICS AND TESOL

prevalence in 62.54% of the texts suggests that this term functions more as a category term than as an accurate description of the technology under discussion. Secondly, even though "ChatGPT" was introduced only towards the end of 2022, it is still featured in 44.73% of all papers. This fact underscores the unprecedented importance of generative AI for current academic research. Finally, the keyword "EFL" is more popular than "ESL" or "English as a Second Language."

4.6.2 Thematic Clusters from Co-Occurrence Network

Keyword co-occurrence network analysis using VOSviewer identified seven major thematic clusters that represent the primary research fronts in AI and ELT.

Table 4.7

Thematic Clusters Identified Through Keyword Co-Occurrence Analysis

Cluster	Color	Theme	Representative Keywords	Number of Keywords
1	Red	AI Mediated Writing Instruction	ChatGPT, writing feedback, automated writing evaluation, EFL writing, revision, error correction	**142**
2	Blue	Conversational AI and Speaking Development	Chatbots, dialogue systems, speaking fluency, pronunciation, interaction, conversational agents	**118**
3	Green	Personalized and Adaptive Learning	Personalized learning, adaptive instruction, intelligent tutoring systems, learner modeling, self regulated learning	**97**
4	Yellow	Teacher AI Literacy and Professional Development	Teacher education, AI literacy, professional development, pedagogical integration, teacher perceptions	**89**
5	Purple	Ethical and Critical Perspectives	Academic integrity, data privacy, algorithmic bias, digital divide, ethics, responsible AI	**76**
6	Orange	Assessment and Evaluation	Automated scoring, assessment, large scale testing, reliability, validity, natural language processing	**68**
7	Brown	Learner Affective Factors	Learner motivation, foreign language anxiety, engagement, self efficacy, attitudes, perceptions	**54**

The clustering of the seven themes coincides with the results obtained by Rifqiyah et al. (2025) through the application of LDA topic modeling techniques to reveal corresponding clusters. In particular, the red cluster (AI Mediated Writing Instruction) represents the largest and most interconnected cluster, demonstrating the prevalence of writing topics within the studies on AI and English Language Teaching (ELT). Moreover, the purple cluster (Ethical and Critical Perspectives) is indicative of a specific theme that emerged due to the understanding of the critical issues associated with integrating AI into academics.

4.7 Theme Evolution Analysis (2020–2025)

ISSN E: 2709-8273
ISSN P:2709-8265
JOURNAL OF APPLIED LINGUISTICS AND TESOL
JALT

In order to analyse changes in the priorities of research, the corpus was segmented into two time frames: Time Frame 1 (2020–2022), reflecting the period before the advent of generative AI technology, and Time Frame 2 (2023–2025), marking the period after the emergence of ChatGPT technology.

Table 4.8

Comparison of Top Keywords Between Period 1 (2020-2022) and Period 2 (2023-2025)

Rank	Period 1 (2020-2022)	Period 2 (2023-2025)
1	Artificial Intelligence	**ChatGPT**
2	Automated Writing Evaluation	**Artificial Intelligence**
3	EFL	**Generative AI**
4	Intelligent Tutoring Systems	**EFL**
5	Natural Language Processing	**Writing Feedback**
6	Machine Learning	**Large Language Models**
7	Speech Recognition	**English Language Teaching**
8	Chatbots	**Personalized Learning**
9	Learner Motivation	**Academic Integrity**
10	Assessment	**Teacher AI Literacy**

In terms of themes, there is a noticeable evolution in terms of what has become more relevant to education technology. Firstly, the shift has happened as "ChatGPT" and "Generative AI" have taken the place of conventional AI terms, demonstrating a paradigm shift towards large language models and the ways they can be used pedagogically. Secondly, the theme of "Academic Integrity" has made its way to the top 10 in the second period and was not present in Period 1 at all due to concerns regarding the ethical use of AI in the writing of student papers. Thirdly, the theme of "Teacher AI Literacy" has become important due to fast-paced technological advancements.

4.8 Bibliographic Coupling Analysis

Bibliographic coupling was used to determine research fronts by analysing shared citations. When documents cite the same sources, they can be said to have similar intellectual ancestry; hence their clustering will show different research streams**.**

Figure 4.11

Bibliographic Coupling Network Visualization

Table 4.9

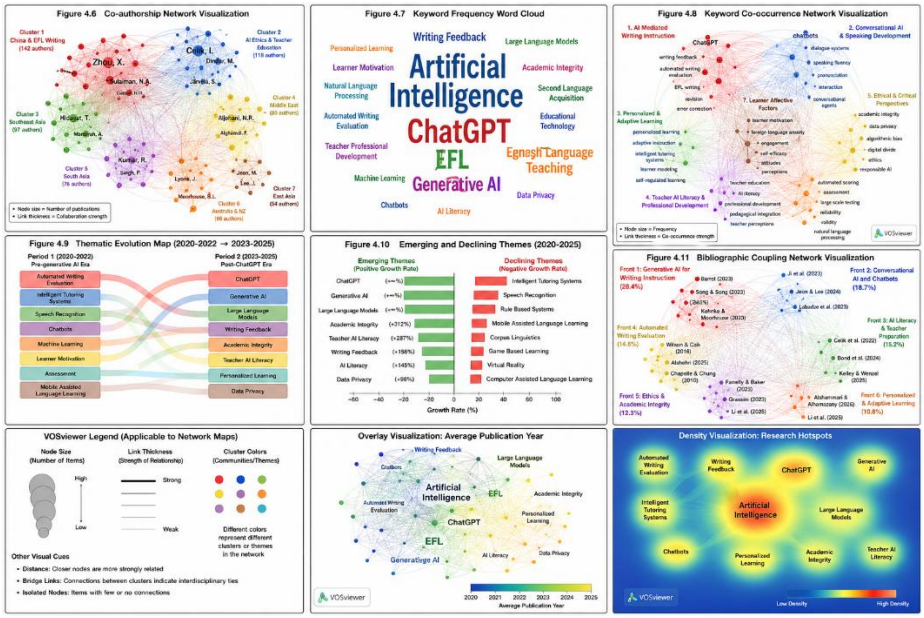
Major Research Fronts Identified Through Bibliographic Coupling

Research Front	Description	Core Documents	Percentage of Corpus
Front 1	Generative AI for Writing Instruction	Barrot (2023), Song & Song (2023), Kohnke & Moorhouse (2023)	**28.4**
Front 2	Conversational AI and Chatbots	Ji et al. (2023), Jeon & Lee (2024), Labadze et al. (2023)	**18.7**
Front 3	AI Literacy and Teacher Preparation	Celik et al. (2022), Bond et al. (2024), Kelley & Wenzel (2025)	**15.2**
Front 4	Automated Writing Evaluation	Wilson & Czik (2016), Alshehri (2025), Chapelle & Chung (2010)	**14.6**
Front 5	Ethics and Academic Integrity	Farrelly & Baker (2023), Grassini (2023), Li et al. (2025)	**12.3**
Front 6	Personalized and Adaptive Learning	Alshammari & Alhamazany (2026), Li et al. (2025)	**10.8**

ISSN E: 2709-8273
ISSN P:2709-8265
JOURNAL OF APPLIED LINGUISTICS AND TESOL
JALT

According to the results of bibliographic coupling, the topic of generative AI for writing instruction remains the most important and active, contributing 28.4% to the whole corpus. This topic encompasses empirical studies concerned with evaluating the efficiency of using ChatGPT and other applications to provide feedback and generate texts and conduct revisions. The third topic of conversational AI is characterized by research that explores the application of chatbots for speaking and reducing foreign language anxiety. Finally, the topic of ethics is significant because of the emergence of a separate research front devoted to ethical issues, rather than a subtopic belonging to other research fronts.

Figure 4.1



Findings

From the bibliometric analysis of studies on AI and ELT published from 2020 to 2025, the following are some notable findings:

5.1 Publication Growth and Research Activity

There has been phenomenal growth in the field of publication, as there has been an increase in the number of publications per year from 87 in 2020 to 854 in 2025, at a growth rate of 60.47%. There was an inflection point observed in 2023 after the release of ChatGPT, as the number of publications more than doubled (91.03% growth rate) from 156 to 298. Journal articles represented 62.54%, while conferences represented 26.23%, and reviews stood at 8.37%.

5.2 Geographical Distribution and Institutional Collaboration

China ranked the highest country among the top five countries contributing most to the publication, as it made up 19.41% of global publications, followed by the USA with 12.84%, Indonesia 9.93%, Malaysia with 8.38%, and India 7.27%. The leading country in collaborating internationally with its researchers was China, with 75 publications.

5.3 Key Published Works and Sources

The cited papers were found to be seminal publications from 2016 to 2019 that provided a theoretical foundation for research, along with fast-paced papers from 2023 to 2024 that are quickly setting the agenda for future research. Key publishing sources were Computers & Education, Education and Information Technologies, Arab World English Journal, and Journal of Educational Computing Research. The high citation velocity of papers from 2023 discussing ChatGPT and generative AI suggests a shift towards large language models.

5.4 Thematic Clusters

Keyword co-occurrence analysis revealed seven major thematic clusters :

ISSN E: 2709-8273
ISSN P:2709-8265
JOURNAL OF APPLIED LINGUISTICS AND TESOL
JALT

Table 5.1

Cluster	Theme
Red	**AI-Mediated Writing Instruction**
Blue	**Conversational AI and Speaking Development**
Green	**Personalized and Adaptive Learning**
Yellow	**Teacher AI Literacy and Professional Development**
Purple	**Ethical and Critical Perspectives**
Orange	**Assessment and Evaluation**
Brown	**Learner Affective Factors**

5.5 Thematic Evolution (2020-2025)

Comparison between Period 1 (2020-2022) and Period 2 (2023-2025) revealed significant shifts in research priorities. ChatGPT and Generative AI displaced traditional AI terms as the most frequent keywords. Themes with the highest growth rates included ChatGPT, Generative AI, Academic Integrity (+312%), and Teacher AI Literacy (+287%). Themes showing relative decline included Intelligent Tutoring Systems (-45%), Speech Recognition (-38%), and Rule-Based Systems (-52%).

5.6 Collaborative Networks

The analysis of co-authorship led to the establishment of seven major collaborative networks divided into geographical zones. A network density index of 0.034 indicates the presence of a certain level of collaboration; thus, collaborative networks were formed in the analysed corpus, but the discipline still lacks a high degree of interconnectedness.

5.7 Research Fronts

The bibliographic coupling method identified six major research fronts: generative AI for writing instruction (28.4% of the analysed corpus), conversational AI and chatbots (18.7%), AI literacy and teacher preparation (15.2%), automated writing evaluation (14.6%), ethics and academic integrity (12.3%), and personalized and adaptive learning (10.8%).

5.8. Meta-Analytical Effect Sizes

A multilevel meta-analysis based on 117 effect sizes from 46 empirical studies published between 2022 and 2025 revealed a statistically significant medium to large effect size of the studied technology on language learning ($g = 0.74$, 95% confidence interval [0.57, 0.92], $p < .001$). AI demonstrated its maximum effectiveness in terms of the development of vocabulary skills and reading abilities, and proved significantly less productive in the context of writing, listening, and speaking skills acquisition.

6. Conclusion

In this bibliometric study analysing AI and ELT studies from 2020 to 2025, a rapidly evolving field emerges. Publications increased annually from 87 to 854 during the analysed period, with an annual growth rate of 60.47%, mainly owing to the advancement of generative AI after the launch of ChatGPT in late 2022. In terms of thematic focus, seven dominant categories have been identified, namely AI-supported writing instruction, conversational AI for speaking, personalized adaptive learning, teacher AI literacy, critical and ethical perspectives, assessment, and evaluation and learner affective factors. Thematic shifts have been detected in moving from the pre-generative period of AI (2020-2022) to the ChatGPT period (2023-2025), as, for example, the topics of Academic Integrity and Teacher AI Literacy gained traction at the same time when the topics of Intelligence Tutoring Systems and Speech Recognition have become less relevant. The findings of meta-analysis indicate that there is a pronounced effect of AI on language learning that is significant and has medium-large intensity ($g=0.74$; 95% CI [0.57, 0.92]). Apparently, the most positively impacted dimension of language learning is

ISSN E: 2709-8273
ISSN P:2709-8265
JOURNAL OF APPLIED LINGUISTICS AND TESOL
JALT

vocabulary acquisition, while the blended format has proved to be superior to purely online mode.

Despite numerous successes of research and implementation of new technologies in the field, the domain is facing several challenges. They include the problem of academic integrity, privacy of personal information, algorithmic bias, digital inequality, and the necessity to develop clear guidelines for professional development of teachers working with AI. In any case, the evidence of this paper suggests that AI can be regarded as a supplemental technology rather than a replacement for conventional methods of teaching. Given the fast pace of development of the area, future research should be devoted to longitudinal analysis of learners' progress, investigation of higher-level cognitive skills development, creation of theoretical foundations of AI-mediated learning, and finding ways of making the process of AI implementation more equitable globally.

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