

## Review Article

# Artificial intelligence in foreign language learning: A bibliometric analysis

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Artificial intelligence [AI] has significant potential in foreign language learning and teaching, and various scientific studies that monitor, investigate, and examine developments in this field have been conducted for many years. In fact, with the increasing importance and popularity of AI, there has been an observed growth in the number of scientific studies in this area. However, this rapid development and expanding literature have created a wealth of information, making access to knowledge challenging for researchers and educators. Thus, this article reveals the use of AI in foreign language learning field with a detailed bibliometric analysis of the relevant research studies conducted between 2010-2023 in the Web of Science. Initially, the distribution of publications by year, citation counts, publication languages, and countries/regions was examined. Subsequently, information about the most cited articles, journals, authors, and countries related to the topic was presented. Furthermore, collaborations among authors, countries, and institutions involved in publications related to the topic were discussed. Finally, the frequency of keyword usage was examined, and a network structure was established to depict relationships between these keywords.

Keywords: Artificial intelligence; Language learning; Second language; FLE; Bibliometric analysis

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## 1. Introduction

Artificial intelligence [AI] is the science and engineering of creating intelligent machines and computer programs capable of learning and problem-solving in ways that typically require human intelligence (Siebel, 2019). AI represents the culmination of advancements in computers, computer-related technologies, machinery, and innovations in information communication technology. These developments empower computers and embedded systems like robots and facilities to carry out tasks that closely mimic or approach human capabilities, encompassing aspects such as cognition, learning, flexibility, and decision-making functionalities (Chen et al., 2020). The idea that a machine can think as humans do dates back to 1950, when Alan Turing expounded upon it in his article, in which he proposes an “imitation game” like test in order to determine whether a computer or a machine can behave indistinguishably from a human. Then in 1955 McCarthy and his colleagues used the term AI for the first time in their proposal for a summer workshop:

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We propose that a 2 month, 10 man study of AI be carried out during the summer of 1956 at Dartmouth College in Hanover, New Hampshire. The study is to proceed on the basis of the conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it. An attempt will be made to find how to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans and improve themselves.

This workshop served as a framework for the creation of AI as a study-field. Ever since then, the term AI has evolved exponentially. This evolution has been realized from the use of symbolic logic and expert systems in the 1970s and 1980s to machine learning systems in the 2000s and neural networks and deep learning systems in the 2010s (Siebel, 2019). AI, which has the potentials to revolutionize various domains of human lives (Bozkurt, 2023; Molenaar, 2022), has also received a significant interest in education research over the last two decades (Chen et al., 2020; Holmes & Tuomi, 2022; Ouyang & Jiao, 2021; Roll & Wylie, 2016). AI in education manifested, in the beginning, through computer and computer-related technologies. It then evolved into web-based and online intelligent educational systems. Eventually, it advanced further by incorporating embedded computer systems, alongside other technologies, to employ humanoid robots and web-based chatbots, capable of independently performing instructors' tasks and functions or assisting them in doing so (Chen et al., 2020). As it is emphasized in the relevant literature, the recent advancements in digitalization have given rise to a novel breed of smart learning technologies, employing AI to assist with particular tasks (Molenaar, 2022). For instance, AI-based technologies can evaluate a student's understanding and adapt the learning materials based on the student's performance, advancement, or level of knowledge (Kulik & Fletcher, 2016). It is further articulated that AI has the capability to identify and assess various aspects of a learner's profile and their progression during the learning process, including self-regulated learning abilities, motivation, emotional state, engagement levels, and collaborative efforts (Asio & Gadia, 2024; Azevedo & Gašević, 2019; Molenaar, 2022; Pedro et al., 2013).

Among the most AI-affected learning areas, foreign language education has been facilitated more in a sense with each advancement in AI technologies. The widespread adoption of AI technology in language education has introduced an improved framework within the school environment. This framework aims to enhance teaching and learning by considering the unique learning statuses and requirements of individual students, ultimately fostering increased student engagement in the learning process. AI now has the potential to enhance language instruction and learning through the delivery of tailored, engaging, and genuine language learning environments, which can be delivered via web-based platforms, virtual reality systems, or chatbots (Liang et al., 2023). There are more merits claimed to be provided by AI technologies for foreign language learning within the relevant research. It is purported that since the first computer-assisted language learning [CALL] practices, the field of foreign language teaching-learning has been greatly greatly influenced by such AI-based learning systems as Intelligent Tutoring Systems (ITSs) (Slavuj et al., 2015; Swartz & Yazdani, 2012), natural language processing (NLP) (Almelhes, 2023; Meurers, 2021), automated language assessment (Leacock et al., 2014), speech recognition and pronunciation assessment systems (Mahdi & Al Khateeb, 2019; Neri et al., 2008; Oluwafemi Ayotunde et al., 2023), and language learning analytics (Reinders, 2018).

Intelligent tutoring systems [ITS] possess the ability to imitate customized one-to-one tutoring by using learner models, algorithms, and neural networks. These systems are able to analyze information about an individual student, specify the learning that suits them best, select appropriate content, provide cognitive support, and engage the student in meaningful dialogues (Zawacki-Richter et al., 2019). Intelligent tutoring systems developed with AI offer tailored and flexible language education, furnishing learners with personalized feedback and guidance. These systems utilize natural language processing [NLP] methods to evaluate student input, identify errors, and offer specific feedback (Slavuj et al., 2015). Indeed, several studies show that ITSs are effective in learning environments (du Boulay, 2016; Wang et al., 2023) with an average effect size of moderate to large (Kulik & Fletcher, 2016). When it comes to the natural language processing in

foreign language learning, it focuses on automating the handling of human language, encompassing the examination and creation of both written and spoken forms of communication. NLP has applications in examining learner language, which encompasses words, sentences, or texts created by language learners. This application involves creating NLP methods for scrutinizing learner language within intelligent computer-assisted language learning [ICALL] systems, automated scoring for language assessments, and the scrutiny and annotation of learner corpora. Intelligent language tutoring systems [ILTSs] utilize NLP to offer personalized feedback to learners as they engage in activities, typically presented in the format of workbook-style exercises (Meurers, 2021). The early efforts on NLP were centered on automating the assessment of student-written texts and creating text-based interactive tutoring systems. Subsequently, the research expanded to encompass spoken language technologies as well (Litman, 2016). AI methods are also utilized to examine extensive datasets generated by language learning platforms. Language learning analytics make use of data mining and machine learning algorithms to extract valuable information regarding how learners behave, their performance trends, and their strategies for learning. These findings can be applied to create adaptive learning settings, pinpoint areas that need improvement, and customize language learning experiences for each learner (Banihashem et al., 2018; Reinders, 2018).

Studies published in recent years have shown that AI tools and applications have made significant progress in language learning processes, especially because they are more practical, user-friendly and accessible. It can be stated that these tools can make students more motivated to learn a language (Wang et al., 2024), accelerate learning and have the potential to improve personal learning experiences (de la Vall & Araya, 2023). It can also be stated that these tools provide a large number of language materials and application opportunities (Liu, 2023), and offer users the opportunity to receive feedback anytime, anywhere and as much as they want (Creely, 2024).

However, in addition to these potentials of AI, current studies also draw attention to its limitations, difficulties and ethical issues in language learning. Despite the considerable advancements and potential benefits of AI in foreign language learning, there are notable challenges and limitations that warrant discussion. As AI technologies become increasingly integrated into educational contexts, understanding these drawbacks is essential for their effective implementation. For example, AI language learning tools have notable limitations such as the need for human interaction, difficulties in recreating cultural and contextual language subtleties, students' inability to adequately understand some content and make corrections, and the need for large amounts of data (de la Vall & Araya, 2023; Liu, 2023; Taşkıran, 2022). One significant limitation of AI in language learning is the reliance on human interaction. While AI tools can provide instant feedback and personalized learning experiences, they often lack the emotional intelligence and nuanced understanding that human instructors possess. Language learning inherently involves cultural and contextual subtleties that AI may struggle to accurately convey or interpret. For instance, idiomatic expressions, humor, and non-verbal cues can be challenging for AI systems to grasp fully, which may hinder learners' ability to engage with the language in a meaningful way. The absence of human touch in the learning process can lead to superficial understanding and a lack of deeper conversational skills. Moreover, many AI systems require vast amounts of data to function effectively. This dependence on extensive datasets poses challenges, especially in contexts where language resources are limited or underrepresented. For instance, less commonly taught languages may not have enough data for AI systems to learn from, resulting in inadequate support for learners. Additionally, the quality of AI's performance is highly contingent upon the data it processes. If the data is biased or lacks diversity, it can lead to skewed outcomes and reinforce existing inequalities in language education. In addition, concerns such as data security, privacy and ethical issues in AI systems are among the factors that limit the effectiveness of these technologies in education (Creely, 2024; Liu, 2023). As AI systems often collect and analyze personal data to customize learning experiences, there are significant risks regarding the

confidentiality of learners' information. Users may be reluctant to engage with AI language learning tools if they fear their data may be misused or inadequately protected. This highlights the need for transparent policies and robust security measures to build trust in AI technologies among educators and students.

Again, among the significant challenges faced by AI technologies in language learning, technological disruptions, the inability to completely replace teachers, standardization of language, and concerns about the use of these technologies stand out (Crompton et al., 2024; Liu, 2023). The integration of AI in language education raises questions about the standardization of language learning. While AI tools can provide consistency in instruction, they may inadvertently promote a one-size-fits-all approach that does not account for individual learner differences. Language learning is inherently a personalized experience, and an over-reliance on standardized AI-driven programs could stifle creativity and critical thinking among students. Additionally, the perception that AI can entirely replace human teachers may lead to a devaluation of the teaching profession. While AI can augment educational practices, it cannot fully replicate the role of an experienced educator who not only imparts knowledge but also fosters motivation, addresses individual learner needs, and creates an engaging classroom environment. This misunderstanding may result in the reduced demand for qualified language teachers, leading to long-term negative consequences for the educational landscape. Finally, as highlighted by recent studies, technological disruptions can pose significant barriers to the effective implementation of AI in language learning. Inadequate infrastructure, insufficient training for educators on how to utilize AI tools, and resistance to change among traditional teaching practices can all hinder the potential benefits that AI offers. For instance, if educators are not adequately trained to incorporate AI tools into their teaching strategies, the effectiveness of these technologies may be compromised, ultimately impacting student outcomes.

In light of these challenges and limitations, it is crucial to critically evaluate the role of AI in language learning. Recognizing and addressing these issues will help maximize the potential benefits of AI technologies while ensuring that they serve to enhance, rather than replace, traditional language learning experiences. By fostering a balanced approach that combines the strengths of AI with the irreplaceable value of human instruction, educators and researchers can work towards a more effective and equitable language learning environment. Therefore, in order to maximize the potential of AI in language learning, these limitations and challenges need to be addressed and solutions developed.

It can be understood from the ever-growing relevant literature that AI technologies present numerous promises in terms of foreign language education. Thus, in order to reveal the state of the art and direct future research, a comprehensive bibliometric analysis was deemed imperative in this study.

### **1.1. Purpose and Significance of the Research**

AI has significant potential in foreign language learning and teaching, and various scientific studies that monitor, investigate, and examine developments in this field have been conducted for many years. In fact, with the increasing importance and popularity of AI, there has been an observed growth in the number of scientific studies in this area. However, this rapid development and expanding literature have created a wealth of information, making access to knowledge challenging for researchers and educators. This situation underscores the need for comprehending and summarizing the obtained knowledge. Furthermore, there is an increasing demand for bibliometric analyses in this field. Therefore, bibliometric analyses have become an important tool for understanding the advancements, trends, and research focuses in AI for foreign language learning and teaching. While previous studies have explored specific applications of AI in language learning—such as adaptive learning systems, AI-driven language assessment tools, and the use of virtual tutors—the majority of these studies are focused on narrow applications or isolated experiments within the context of individual case studies or small-scale implementations.

There has been less focus on systematically mapping the larger research landscape and identifying overarching trends and research gaps in AI's role in language learning and teaching. This study, therefore, offers a broader, more comprehensive perspective by employing bibliometric analysis to cover a twenty-year period (2010–2023), something not extensively done in previous research.

Bibliometric analysis helps researchers track and improve developments in a subject by evaluating the effectiveness and growth of scientific publications. The bibliometric analysis of scientific publications provides the opportunity to numerically analyze general trends, research focuses, and relationships among publications in a given field. However, while bibliometric analysis studies using visual maps have become widespread in many fields, it is observed that there is limited research on the use of AI in foreign language learning and teaching (Huang et al., 2023). This study specifically fills this gap by offering one of the few extensive bibliometric studies focused on the use of AI in this domain, highlighting not just general trends but also identifying the key authors, influential publications, and emerging topics that shape the field. This indicates that the use of AI in foreign language learning and teaching is still in its developmental stages and requires further academic research. By mapping the connections between different studies, this research provides a much-needed macro-level view of the discipline, offering insights that are often missed in case-study-focused analyses. Therefore, this field demonstrates the need for broader research and studies to explore the potential opportunities. Through this broader scope, this study contributes by identifying underexplored areas, such as the pedagogical implications of AI in language teaching or the comparative effectiveness of AI across different learning environments (e.g., formal classroom settings vs. informal, self-guided learning). This stands in contrast to many earlier works that tended to focus on the technical aspects of AI tools rather than examining their broader educational impact. Hence, this study aims to examine the bibliometric indicators of scientific publications related to the use of AI technology in foreign language learning and teaching over a twenty-year period (2010–2023), identify gaps in the literature, provide recommendations, and present a detailed overview of the subject.

This study will assist researchers in keeping track of developments in this field, summarizing the results of current scientific publications, and making them more visible. This enables researchers to stay informed about the latest findings and approaches in the field. Furthermore, it will be possible to analyze relationships between publications, and important publications and authors related to the subject can be examined in more detail. Additionally, this research will guide domain experts in identifying different research topics, preventing duplicate research, and providing the opportunity to identify priority publications and effective researchers. By doing so, this study addresses a key gap in the literature, which is the lack of an integrated and comprehensive summary of AI's role in foreign language learning that can be used as a reference point for future research. Most prior studies tend to focus on specific AI applications (such as machine translation or chatbot usage) without offering a unified view of the research field as a whole. This research thus contributes uniquely by providing a holistic analysis of the literature. Furthermore, the study's recommendations for future research, such as the need for more empirical work in assessing AI's impact on specific language skills (e.g., speaking or writing), present an actionable roadmap for researchers and educators looking to explore the untapped potential of AI in this area. Previous research often focused on isolated AI tools, whereas this study not only summarizes existing tools but also suggests directions for developing and integrating AI across diverse language learning contexts, filling a notable gap in strategic guidance for researchers.

This study, conducted to monitor developments in the use of AI in foreign language learning, provides an opportunity to effectively track progress in the field. Furthermore, this research outlines the current state of the field and identifies priority research areas by summarizing scientific publications related to the topic. As a result, researchers and educators can better understand the impact of AI technology on foreign language learning and teaching and make more informed decisions in this area. Additionally, this study highlights significant contributions

in the literature by identifying important publications and influential researchers. Through bibliometric analyses, it becomes clearer which publications contribute significantly to the field's development and which researchers play a pioneering role. This encourages greater appreciation for research and contributes to the advancement of the field.

Moreover, this study plays an important role in guiding future research. Bibliometric analyses guide domain experts in identifying areas that require further research and more focus. This helps in using time and resources more effectively and prevents redundant research. For these reasons, a bibliometric study like this one on the use of AI technology in foreign language learning and teaching is of great importance. It helps monitor developments in the field, summarize scientific publications, identify important publications and researchers, and guide future research. Therefore, this study will contribute to the advancement of the field, provide a more comprehensive understanding of the research conducted, and enhance our understanding of the impact of AI technology on foreign language learning and teaching. By addressing gaps not covered in earlier research and offering a clear picture of current trends, this study serves as a valuable reference point for future explorations, helping to map the field's future trajectory in a way that earlier, narrower studies could not. In line with this, the research questions guiding this study are as follows:

RQ 1) What are the increasing and decreasing trends in the number of scientific publications on the use of AI in foreign language learning?

RQ 2) What are the trends observed in the distribution of scientific publications on the use of AI in foreign language learning in different languages?

RQ 3) In which countries are scientific publications on the use of AI in foreign language learning concentrated and what are the changing trends in the number of publications in these countries?

RQ 4) What are the trends in the number of publications in the journals with the most publications on the use of AI in foreign language learning?

RQ 5) Which journals, publications, authors, and countries have the most citations (are the most influential)?

RQ 6) What types of collaborations exist among authors, countries, and institutions?

RQ 7) What are the most studied topics or concepts in publications based on their keywords?

## 2. Method

In this study, the bibliometric analysis method has been used. Bibliometrics, commonly used in various disciplines, is a quantitative analysis method utilized to measure and analyze scientific publications obtained from various databases employing mathematical and statistical techniques (Çiçek Korkmaz & Altuntaş, 2022; Pritchard, 1969). Bibliometrics, which has gained significant importance in recent years in scientific research, is often used to analyze citations and provide a general assessment of publication performance. Key terms in this field include citation analysis, co-citation analysis, bibliographical coupling, co-author analysis, and co-word analysis (Talan, 2021). In this current study, co-author analysis, citation analysis, and co-word analysis techniques have been employed.

Co-author analysis is a method that examines social relationships and scientific collaboration among authors based on joint work. In this context, co-author analysis analyzes the social network created by two or more authors working together (Çiçek Korkmaz & Altuntaş, 2022). Citation analysis, on the other hand, focuses on the number of citations to evaluate the scientific production performance of a publication, author, institution, or country (Çiçek Korkmaz & Altuntaş, 2022).

On the other hand, co-word analysis indicates that if certain words are frequently used in the examined publication, these words are closely related to each other. Co-word analysis examines the relationship between concepts or words found in the titles, abstracts, or keywords of publications to study the conceptual structure of a research field (Çiçek Korkmaz & Altuntaş, 2022).

## 2.1. Data Collection

In this study, Web of Science [WoS] database has been utilized as the data source. WoS is one of the world's leading academic databases that covers reputable citation indexes and allows for extensive literature research. This database provides access to a large part of international, peer-reviewed studies on foreign language education and AI. The scope of interdisciplinary and high-quality studies offered by WoS was found to be suitable for the focus of our study. Therefore, this database has been chosen for this study. In the current research, an advanced search query and filtering options provided by WoS were used to access relevant publications. Table 1 presents the codes used in the database.

Table 1

*Search Query in Web of Science*

Topic	"English as a foreign language" OR "English as a second language" OR "foreign language learn*" OR "EFL learn*" OR "second language learn*" OR "foreign language teach*" OR "second language teach*" AND "artificial intelligence" OR "artificial neural network*" OR "machine learn*" OR "deep learn*" OR "genetic algorithm*"
Document types	Article, Early Access, Review Article
Timespan	2010-2023 (October)
Indexes	SSCI, SCI-EXPANDED, A&HCI

In the WoS database, an attempt was made to access relevant publications by searching for the keywords mentioned in Table 1 in the title, abstract, and keyword sections. The research time frame was determined to be from January 1, 2010, to October 12, 2023. The years 2010 and onwards stand out as a period in which modern AI techniques, especially machine learning, deep learning and natural language processing, have developed and the applications of these technologies in educational systems have increased. Therefore, it was deemed appropriate to conduct an analysis starting from 2010 in order to provide a more up-to-date and representative picture of the development of the field.

Only articles indexed in the SSCI, SCI-EXPANDED, and A&HCI indexes were included in the analysis, while publications such as conference papers and book chapters were excluded from the dataset. There was no language filter applied. In accordance with these criteria, a total of 95 publications were accessed. However, 16 of them were unrelated studies. After these studies were excluded, 79 studies were included in the analysis. All bibliographic data were transferred from the WoS database to an electronic spreadsheet.

## 2.2. Data Analysis

The research data obtained was analyzed using descriptive content analysis and bibliometric content analysis methods. The WoS (Web of Science) database system was used for descriptive content analysis. In this analysis, publications related to the topic were examined in terms of years, citation counts, publication languages, and country/region distributions. Bibliometric analysis, on the other hand, was carried out using the visual mapping program VOSviewer to create relationships and density maps for various variables. The VOSviewer program was used in the bibliometric analysis process to visualize citation analysis (articles, journals, authors, and countries), co-authorship analysis (authors, countries), and the frequency of common keywords related to the topic.

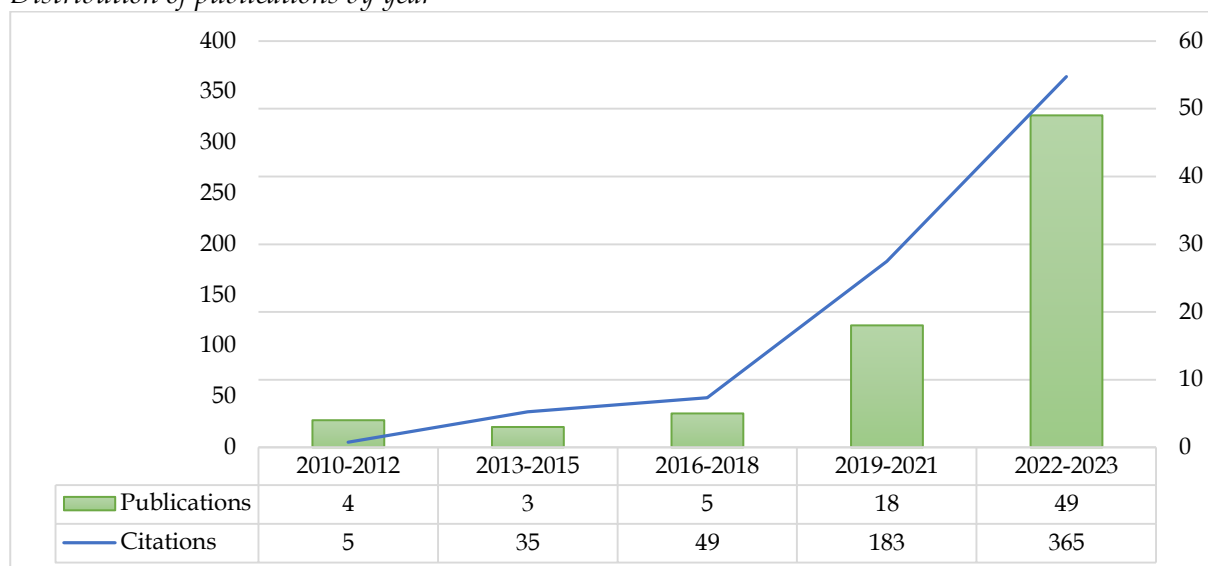
### 3. Findings

#### 3.1. Descriptive Findings

Figure 1 displays the number of publications related to the subject over the years and their citation counts in the WoS database.

Figure 1

*Distribution of publications by year*



When we analyze the distribution of publications related to the subject over the years, we observe that there was relatively little interest in the topic during the initial years, and the number of publications was low. However, over time, there has been a significant increase in this number. Especially in the last five years, the studies published make up 85% of the total publications. Additionally, as the years have progressed, there has been an increase in citation numbers. The highest number of publications has been recorded in the last two years. This period stands out as a process in which AI tools and applications such as machine learning and natural language processing began to be integrated into language teaching, learning and evaluation processes. In addition, this increase may be related to the transformation in the field of education and the spread of distance learning methods. These findings provide an important foundation for future research, allowing for a more in-depth examination of the role of AI in education. However, since this study was conducted in October 2023, publications and citation numbers for this year have not yet been indexed in the WoS database.

Table 2 presents the distribution of published works related to the subject by publication languages.

Table 2

*Distribution of studies by publication languages*

Language	<i>f</i>
English	77
Spanish	1
German	1
Total	79

When Table 2 is analyzed, it is determined that the majority of studies related to the subject available in the WoS database were published in English. Based on these findings, it can be said that academic research on the subject generally focuses on the English language. The reason why academic publications are largely made in English may be that this language is accepted as the international language of communication in the scientific world. Spanish and German are another



publication language used in three studies. This finding suggests that research opportunities in languages other than English are limited and that academic communities in these languages are not sufficiently benefiting from the knowledge base on AI and foreign language learning. It also suggests that research in languages other than English should be encouraged, otherwise it may be difficult to further adopt AI applications globally. In this context, it is important for future studies to develop strategies to ensure parity across languages.

Figure 2 shows the distribution of publications related to the subject in 12 countries on a world map. Darker colors on the map indicate a higher number of publications. Furthermore, Table 3 displays the distribution of publications related to the subject according to the top 10 most productive countries/regions. The publications were evaluated using the following four indicators commonly used in bibliometric analyses and ranked based on the number of publications.

Figure 2  
Geographic Distribution of Studies



Table 3  
Top 10 Most Productive Countries/Regions

Rank	Country/Region	TC	TP	TC/TP	%TP
1	USA	172	7	24.57	4.55
2	China	141	31	4.55	20.13
3	Taiwan	131	10	13.10	6.49
4	South Korea	44	7	6.29	4.55
5	England	31	6	5.17	3.90
6	Chile	30	2	15.00	1.30
7	India	28	2	14.00	1.30
8	Germany	27	4	6.75	2.60
9	Norway	22	2	11.00	1.30
10	Czech Republic	19	2	9.50	1.30

Note. TC: total number of citations; TP: total number of publications; TC/TP: the average number of citations per publication; %TP: the percent of TP accounting for total publications.

Research findings reveal important trends in the geographical distribution of publications on the use of AI in foreign language learning. When examining Table 3, among the top 10 most productive countries/regions, the China stands out with the highest number of publications, totaling 31 publications. While this situation reflects China's intense interest and investment in

research in the field of artificial intelligence, it can also be considered as an indicator of its academic activity in this field. In addition to this, the increase in the number of publications in China in recent years can be attributed to the country's research-development investments, increasing collaborations between research institutions and universities, and making scientific production a strategic priority. Following closely behind is Taiwan, making a significant contribution to the subject with 10 publications. Taiwan's high publication count may indicate increased attention and academic collaboration in the region toward the development of AI research. United States [USA] and South Korea is in third place with seven publications. The countries with the highest average citation per publication [TC/TP] are the USA, Chile, India, and Taiwan, respectively. These findings reveal that research in the field of AI is concentrated in certain geographical regions, especially strengthening China's leading role in this field, and that other countries should make more efforts in response to this trend. In addition, increasing cooperation between different countries can contribute to the enrichment of knowledge in this field and increasing international competition.

### 3.2. Bibliometric Findings

#### 3.2.1. Citation analysis (article, journal, author and country)

Within the scope of the research, the first step of bibliometric analysis is the citation analysis of publications accessed on the subject in the WoS database. The total number of citations for the publications related to the subject is 629, with an average citation count of 7.04 and an H-index of 14. Out of the 79 publications examined, 24 have received at least 10 citations. The total number of citations for the top 10 most cited publications is 360. Table 4 provides information about the top 10 most cited publications.

In Table 4, it can be observed that the most cited article on the subject was authored by Sun et al. (2019), which has received a total of 76 citations. This shows that the study of Sun et al. (2019) has an important place in the literature on the subject and has created a remarkable impact in the academic community. Following this, there are articles written by Petersen and Ostendorf (2009; 67 citations) and Wang and Liao (2011; 46 citations). This suggests that these articles have had a significant impact on the relevant topic and have a wide citation network within the academic community. Additionally, the articles by Sun et al. (2019) and Jeon (2024) have emerged as the most successful publications in terms of total citations per year. This indicates that these articles have gained extensive recognition and citation since their publication. Therefore, these findings show that studies on foreign language learning with artificial intelligence are strongly supported in terms of academic impact and prevalence.

Within the scope of this study, the aim was also to identify the most cited authors on the subject. A total of 230 different authors were identified in the examined publications. The study focused on 64 authors who had at least one publication and 10 citations. Figure 3 presents the network of the most cited authors. The network structure presented in Figure 3 represents different clusters. There are a total of three different clusters, with highly cited authors grouped in the same clusters. Each circular shape represents an author, and if there is a line connecting two authors, it indicates that those authors have collaborated together. As a result of examining the figure 3, it is seen that Zheng, C., Chen, M., Shen X., Chai, C.S., Zhou, Y., Li, Y. and An, X. work together. It also appears that Jeon, J., Tan, S.C., Wallace, M.P., Liu, Q., Wang, X., Lei, J. and Li, L. are in cooperation with each other. These collaborations enable more comprehensive and innovative results to be achieved by combining knowledge and skills from various areas of expertise. Such collaborations increase the quality of studies in the academic literature and provide the opportunity to conduct in-depth research on complex topics such as AI and foreign language learning. By bringing together different areas of expertise, co-authors broaden the scope of research and contribute to the development of innovative solutions in this field. Therefore, these collaborations play a critical role in the development of the field.

Table 4  
Most cited articles

Rank	Title	Citation	Journal	TC	TC/Y
1	DREAM: A challenge data set and models for dialogue-based reading comprehension	Sun et al. (2019)	Transactions of the Association for Computational Linguistics	76	19
2	A machine learning approach to reading level assessment	Petersen and Ostendorf (2009)	Computer Speech and Language	67	4.8
3	Data mining for adaptive learning in a TESL-based e-learning system	Wang and Liao, (2011)	Expert Systems with Applications	46	3.8
4	Emotion recognition and communication for reducing second-language speaking anxiety in a web-based one-to-one synchronous learning environment	Chen and Lee (2011)	British Journal of Educational Technology	34	2.8
5	The affordances of AI-enabled automatic scoring applications on learners' continuous learning intention: An empirical study in China	Fu et al. (2020)	British Journal of Educational Technology	25	8.3
6	Adaptive feedback selection for intelligent tutoring systems	Gutierrez and Atkinson (2011)	Expert Systems with Applications	25	2.08
7	Exploring AI chatbot affordances in the EFL classroom: young learners' experiences and perspectives	Jeon (2024)	Computer Assisted Language Learning	24	12
8	New Trends in Second Language Learning and Teaching through the lens of ICT, Networked Learning, and Artificial Intelligence	Kannan and Munday (2018)	Circulo De Linguistica Aplicada A La Comunicacion	24	4.8
9	Towards automatic assessment of spontaneous spoken English	Wang et al. (2018)	Speech Communication	20	4
10	A review of tools and techniques for computer aided pronunciation training (CAPT) in English	Agarwal and Chakraborty (2019)	Education and Information Technologies	19	4.75

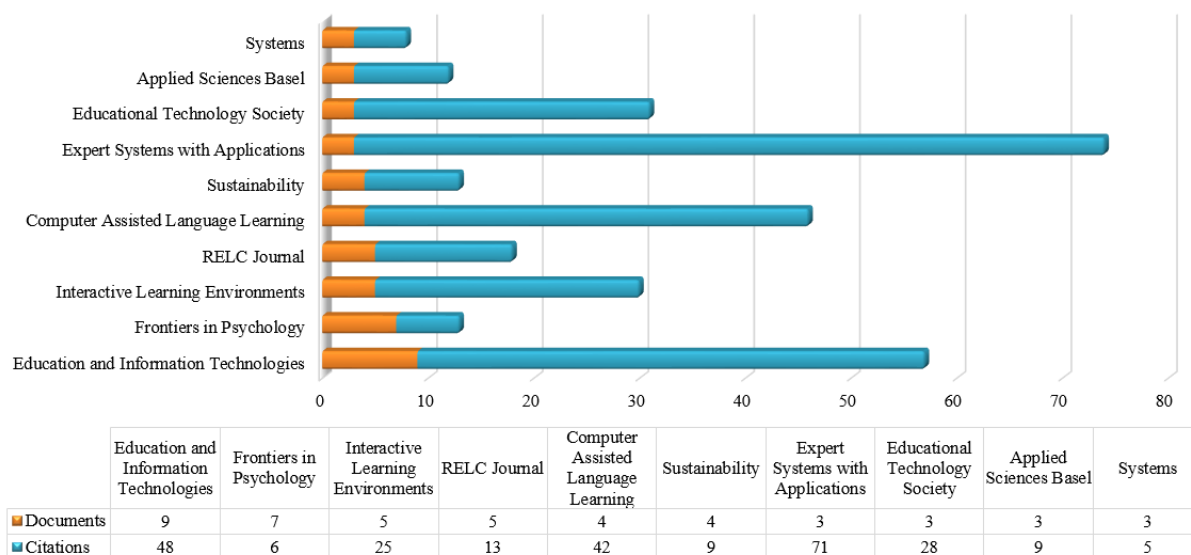
Note. TC: total number of citations; TC/Y: the average number of citations per year.

Figure 3  
Network of the Most Cited Authors



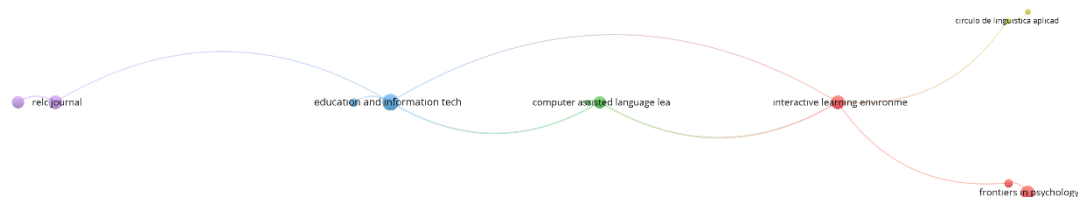
Citation analysis is a common method for assessing the impact and significance of research conducted in the academic world. This analysis can assist researchers in identifying prominent journals and articles in their respective fields. Within the scope of this study, research was also conducted on the top 10 journals with the most citations to perform a citation analysis. This study provides a perspective on which journals researchers should focus on. The findings are presented in Figure 4a and Figure 4b.

Figure 4a  
Journal Publication and Citation Counts



Through the analysis, it was determined that the 79 articles were published in 43 different journals. Among these journals, 16 were found to have published at least two articles on the subject. It was also observed that 18 journals received at least 10 citations. When Figure 4a and Figure 4b are considered together, it is evident that the journal with the highest number of publications is 'Education and Information Technologies' (9 publications), followed by 'Frontiers in Psychology' (7 publications), 'Interactive Learning Environments' (5 publications), and 'RELC Journal' (5 publications). These findings can be considered as an important indicator of journals contributing significantly to the subject. This shows that these journals provide important

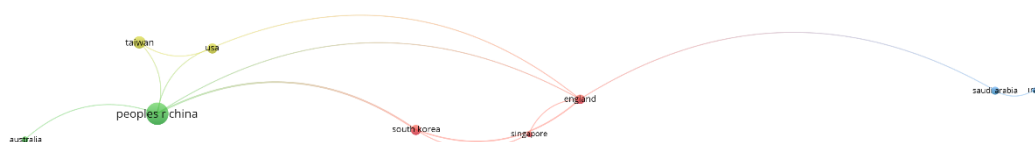
Figure 4b  
Journal Citation Network



resources for research examining the relationship between AI and foreign language teaching. It is also thought that these journals, where research is concentrated, can contribute to the development of a deeper understanding of the role of AI in language learning within the academic community. On the other hand, 'Expert Systems with Applications' also stands out as the most cited journal for articles in this field. Therefore, this journal has made notable publications and has been frequently cited by researchers.

In the study, a visual network map was created to examine the collaboration relationships among the most cited countries/regions. The findings related to this are presented in Figure 5.

Figure 5  
Network of the most cited countries/regions



In 17 of the countries/regions publishing on the subject, there are at least 10 citations. Among the countries, the United States has the highest number of citations (173 citations). China (141 citations) and Taiwan (131 citations) follow this country. Additionally, the visual network map has four clusters in different colors, showing the connections (relationships) between countries. If two countries or regions are closer to each other, it can be said that there is a strong connection between them. Moreover, the thicker the connections, the greater the collaboration between these countries or regions. Accordingly, the countries or regions with the highest collaboration are China (7 connections), the England (6 connections), South Korea (6 connections), and United States (3 connections). In conclusion, China is the most collaborative country among the others.

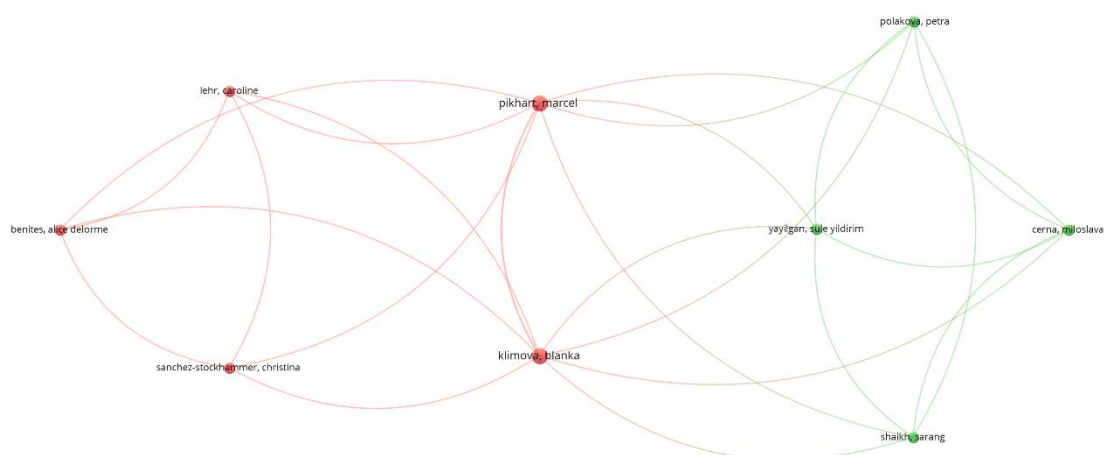
### 3.2.2. Co-author analysis (author, country, institution)

In order to analyze in detail the collaboration relationships among authors who have published on the use of AI technology in foreign language teaching and learning, a collaboration network

among the authors has been established. The relevant visual network map depicting the structure of this collaboration network is presented in Figure 6.

Figure 6

*Co-authorship network (authors)*



The study includes 101 authors, each with a minimum of five citations. In the co-citation network, authors who have published together form the same cluster, and the presence of a line between two authors indicates that they have collaborated. When examining this network, it is observed that there are two clusters. This situation demonstrates that there is a certain level of collaboration and knowledge sharing among different groups of authors. The author collaboration network emphasizes the importance of collaboration and focus in conducting academic research on the subject.

Figure 7

*International Collaboration Network*

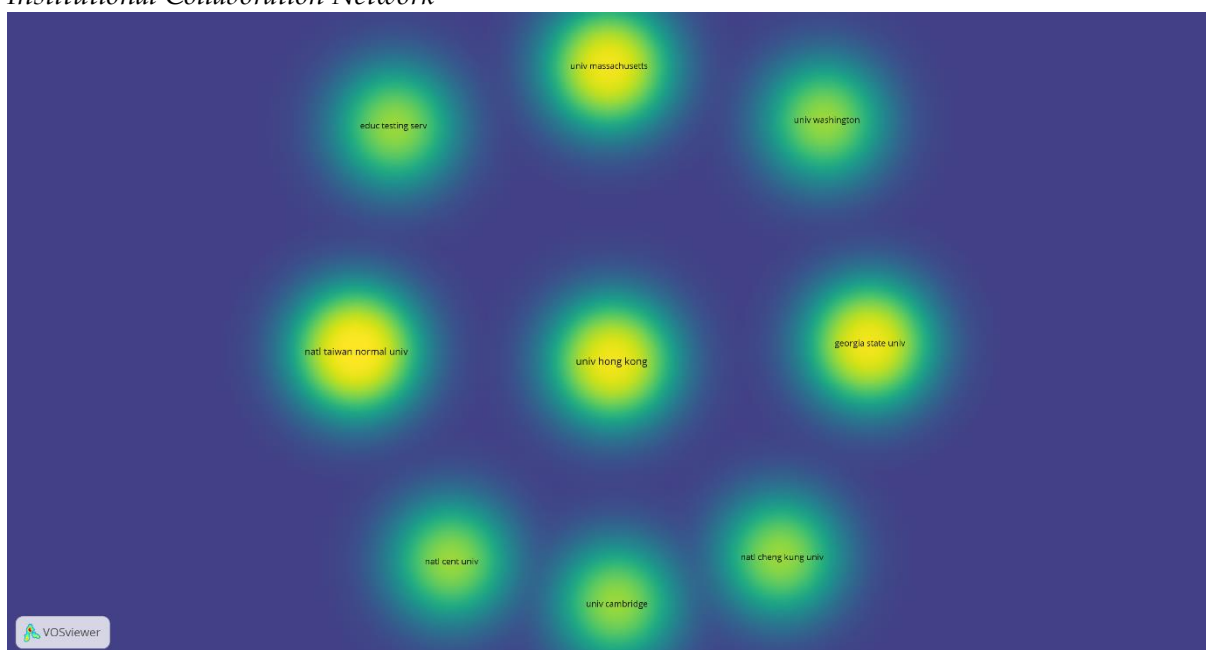


Figure 7 presents the network map of co-author analysis representing international collaboration among publications related to the subject. The map consists of four different colored clusters. When two countries are in the same cluster, their relationship is stronger and tighter. In Figure 7, it can be seen that a large number of Chinese authors (11 countries) collaborate with other countries.

For evaluations regarding the institutions of co-authors, a heat map has been utilized. Figure 8 presents co-author analysis for inter-institutional collaboration (at least two publications).

Figure 8

*Institutional Collaboration Network*



In the analysis of co-author institutions, it is observed that institutions such as "University of Hong Kong (China)," "Georgia State University (USA)," "University of Washington (USA)," "University of Massachusetts (USA)," "National Taiwan Normal University (Taiwan)," "National Cheng Kung University (China)," and "University of Cambridge (England)" are located at the center of the map. Three of these institutions are located in the United States. This situation shows that these universities are important actors in the field of language learning with AI and that their research outputs are influential at the international level. In particular, the leadership of universities based in China and the USA highlights the potential of academic resources and research infrastructure in these countries in the development of AI applications and their integration into foreign language education.

### 3.2.3. Co-word analysis

Figure 9a presents a network map visually representing the relationship between keywords used in the analyzed publications. The size of the circles indicates the most researched topics, while the yellow regions represent current topics. Additionally, the proximity between two words indicates that these words are used more frequently in the publications. The lines between them represent words that are used together in the same publication.

At the center of the map, there are keywords such as 'artificial intelligence', 'machine learning', 'chatbots', 'English as a foreign language', 'intelligent tutoring systems', 'natural language processing', EFL, and 'deep learning'. These keywords represent the concepts analyzed together with other clusters. These keywords draw more attention and are used more frequently in the analyzed publications. These keywords reflect the focal points of language education and AI research. This shows that AI plays a decisive role in language teaching, especially in foreign language learning and the integration of intelligent systems, and that there is intense academic interest in these areas.







related to the topic were analyzed from various perspectives. The VOSviewer software was used to visualize this information. Initially, the distribution of publications by year, citation counts, publication languages, and countries/regions was examined. Subsequently, information about the most cited articles, journals, authors, and countries related to the topic was presented. Furthermore, collaborations among authors, countries, and institutions involved in publications related to the topic were discussed. Finally, the frequency of keyword usage was examined, and a network structure was established to depict relationships between these keywords. When reviewing the literature, it is noted that there are a limited number of bibliometric studies and content analysis studies related to the topic (Huang et al., 2023; Liang et al., 2023). While this study provides a detailed overview of AI-related research in foreign language education, the current findings largely describe trends without delving deeply into why certain works stand out. The surge in publications on AI since 2010 reflects not only technological advancements but also the growing recognition of AI's potential to reshape language learning methodologies. However, it's important to critically assess why certain works and regions lead the field.

#### *4.1.1. Distribution of publications by year and citation counts*

There has been a significant increase in the number of publications related to the topic over the years, and countries worldwide have participated in this research community. This indicates a growing interest in the topic and strengthening impact in the academic literature. Furthermore, as the years have progressed, an increase in the number of citations to publications related to the topic has also been observed. This significant increase could be related to advancements in information and communication technologies and the positive effects of AI on learning performance and outcomes, especially in recent years. Based on these findings, it can be said that research related to the topic receives more citations from other studies and has a greater impact in the scientific community. Therefore, it can be concluded that the number of publications and citations related to the topic has the potential to increase. Studies in the literature also generally indicate that the number of publications related to the topic has been increasing year by year (Chen et al., 2022; Du, 2021; Huang et al., 2023; Liang et al., 2023; Zawacki-Richter et al., 2019), and these results appear to be consistent with the findings of our study. The steady increase in the number of publications and citations can be attributed to the rapid development of AI technologies such as machine learning and natural language processing (NLP). These technologies directly address the needs of adaptive learning and personalized education—key trends in modern pedagogy. The citations reflect how AI applications are being seen as more than just technological tools but as pivotal in shifting pedagogical paradigms toward more data-driven, learner-centered approaches. Researchers from technologically advanced countries like the United States and China are early adopters, pushing AI's boundaries in education. Yet, it's not just the number of publications that matters, but the quality of their insights into how AI transforms learning outcomes. This shift suggests that more publications are likely to focus on empirical evidence demonstrating AI's efficacy in personalized learning and improving learner autonomy.

#### *4.1.2. Distribution of publications by publication languages*

Within the scope of the research, it has been determined that the majority of studies related to the topic are published in the English language. The dominance of English as the language of publication underscores a broader trend in academic discourse. English has long been the *lingua franca* of scientific communication, which may limit contributions from non-English speaking regions. This raises concerns about the underrepresentation of AI advancements in non-Western countries that might be published in other languages. It is also crucial to consider how this dominance might perpetuate inequalities in the global knowledge economy. A more inclusive approach that incorporates research published in languages other than English could offer fresh perspectives and lead to innovations grounded in different cultural contexts.

#### 4.1.3. Geographical distribution of the studies

The geographical concentration of AI-related research in the United States, China, Taiwan, and South Korea suggests these nations are shaping the discourse on AI in foreign language education. But why are these countries leading? In the U.S. and China, significant government funding and strong tech industries foster innovation. AI is also central to educational reforms in countries like South Korea, which sees technology-enhanced learning as crucial for staying competitive in a globalized world. The dominance of these regions hints at broader geopolitical trends where countries invest in AI to maintain technological leadership. While this concentration is natural, it also reveals the need for greater collaboration with emerging economies, which may have unique challenges and solutions that are underrepresented in the literature.

### 4.2. Citation Analysis

Citation analysis is seen as an effective method for evaluating the most cited or influential documents, authors, countries, or journals on a specific topic (Çiçek Korkmaz & Altuntaş, 2022). This analysis plays a significant role in assessing the impact and importance of studies in a research field. Consequently, it helps identify the most influential sources and contributors in a research area. In this particular study, the focus has been on the most cited publications, authors, countries, and journals. These results can provide valuable information for identifying prominent sources and significant contributors in a research field. Citation analysis, while a useful tool, can sometimes mask deeper complexities. High citation counts, for instance, often reflect broader trends and influences in the academic community, but they may not always signify quality or innovative breakthroughs. Therefore, it's important to consider why certain articles and authors receive high citations.

#### 4.2.1. Citation analysis (article)

According to the research results, the H-index of publications related to the topic has been determined as 14, and nearly 24 publications have received at least 10 citations. These findings indicate a significant level of interest and active citation of the study. The data obtained reveal that the examined publications have a broad citation network and exert a significant influence on other researchers in the field. On the other hand, the study conducted by Sun et al. (2019) stands out as one of the most cited research papers on this topic. Additionally, articles authored by Petersen and Ostendorf (2009) and Wang and Liao (2011) are recognized as extensive reference sources and important works. The prominence of Sun et al. (2019) and works by Petersen and Ostendorf (2009) and Wang and Liao (2011) may be attributed to the pioneering nature of their research. These works were likely foundational in incorporating AI tools like chatbots and intelligent tutoring systems into language education. Their high citation counts reflect the growing importance of these technologies in enabling individualized, scalable language learning. Moreover, these articles likely resonated with researchers because they offered empirical evidence and concrete frameworks that were directly applicable in educational settings. Their influence indicates broader academic and pedagogical trends towards evidence-based teaching methods where AI provides measurable learning improvements.

#### 4.2.2. Citation analysis (journal)

In addition, the research also focused on prominent and most-cited journals in the relevant field to assess the impact and importance of the studies related to the topic. This examination can provide guidance for researchers in selecting journals when publishing their work and serve as a guide in journal selection. As a result of the reviews, it was determined that 18 journals related to the topic received at least 10 citations. On the other hand, the 'Education and Information Technologies' journal stands out due to its significant number of publications on the topic and frequent citations by researchers. Following this journal, others like 'Frontiers in Psychology', 'Interactive Learning Environments', and 'RELC Journal' are also notable. Furthermore, some studies in the literature

have identified the journals 'International Journal of Artificial Intelligence in Education,' 'Computers & Education,' 'Computer Assisted Language Learning,' and 'Educational Technology & Society' as the most influential academic journals in terms of publications on the relevant topic (Chen et al., 2022; Huang et al., 2023; Liang et al., 2023; Zawacki-Richter et al., 2019). These journals are considered leading interdisciplinary journals in the field (Chen et al., 2022). The journals that have the most influence in this area, such as *Education and Information Technologies* and *Computers & Education*, are often at the intersection of educational technology and pedagogy. Their prominence signifies a trend where interdisciplinary approaches—linking AI, cognitive psychology, and education—are gaining traction. This also highlights the broader trend of "edtech" being seen not just as a tool for language instruction but as a fundamental shift in how language education is approached. The sustained influence of these journals suggests that the academic community is increasingly prioritizing research that explores how AI can not just assist in learning but transform the learning process entirely. The results obtained through citation analysis provide a valuable resource for researchers who wish to deepen their research on the topic and contribute to the literature. However, citation numbers alone may not fully reflect the quality and impact of a study. Therefore, researchers should use these results with caution and conduct a comprehensive literature review.

#### 4.2.3. Citation analysis (author)

The most cited authors, such as Cardie, Chen, and Choi, reflect a trend where researchers with expertise in AI and machine learning cross over into educational applications. Their prominence underscores a broader shift where interdisciplinary research is not only welcomed but essential. As AI continues to expand its role in education, this trend indicates a movement towards cross-pollination between computer science and education—an area that will likely grow as more educational institutions adopt AI-driven tools. This could also indicate a potential divide between purely educational research and tech-driven innovations, signaling a need for deeper collaboration across disciplines.

#### 4.2.3. Citation Analysis (country)

The study also examined the collaboration relationships among the countries/regions that are most cited in the field. The findings indicate that the United States is the most cited country among others. Furthermore, some studies show that the United States has the highest publication and citation rate in AI in language education compared to other countries (Chen et al., 2020, 2022; Liang et al., 2023). This result highlights the central role of the United States in research related to the topic, its significant global influence, and strong connections with other countries. Additionally, China and Taiwan have also been identified as having significant citation numbers in the field. These countries are also influential and make substantial contributions in the field. Moreover, these countries have strong collaboration networks with other countries and contribute significantly to scientific advancements. This study provides a valuable reference point for academic communities and international collaboration and can guide future research directions.

### 4.3. Co-author Analysis

#### 4.3.1. Co-author analysis (author)

The research has also revealed the existence of a specific collaboration network among different authors and emphasized the importance of collaboration and focus in conducting academic research. The collaboration network among authors indicates that different groups come together to work towards a common goal. This collaboration network enables authors with similar or different expertise in the research field to achieve more comprehensive and effective results by working together. This reflects a process that contributes to the development of scientific knowledge. Additionally, the importance of collaboration and knowledge sharing in academic research is evident in these results. Collaboration among different groups of authors provides

access to a broader knowledge base and brings together different perspectives to facilitate in-depth analysis. This, in turn, ensures that research results are more reliable and robust. These findings encourage researchers from different fields of expertise to come together in scientific studies, promoting knowledge sharing and the development of scientific knowledge.

#### 4.3.2. *Co-author analysis (country)*

According to the research results, China stands out as the leading country in publications related to the subject and places importance on international collaboration. This indicates that universities in China are in a leading position in international research and engage in extensive collaborations. Particularly, it is evident that the collaboration network in this country is widespread on a global scale, and there are strong connections between universities in different countries. However, in a study conducted by Talan (2021), when the countries of co-authors were analyzed, it was found that the United States, Taiwan, and the United Kingdom collaborate with various countries. Furthermore, Chen et al. (2022) identified the United States, the United Kingdom, Canada, Spain, and Australia as the most collaborative countries. These findings emphasize the importance of international collaboration in academic research and highlight how crucial it is to share and develop scientific knowledge on a global scale. Additionally, these findings can help us better understand the relationships between the areas of expertise and research topics of different universities, shaping future collaborations. Such analyses can be used to promote more collaboration in the academic field, encourage joint projects, and increase knowledge exchange.

#### 4.3.3. *Co-author analysis (institution)*

The research results indicate strong relationships among the institutions of co-authors and highlight the central role of specific universities in this network. The study identifies institutions such as the University of Hong Kong, Georgia State University, University of Washington, University of Massachusetts, and the University of Cambridge as playing a leading role in international collaboration and having close relationships with other institutions. However, Huang et al. (2023) found that Arizona State University, Georgia State University, and Carnegie Mellon University were the institutions that contributed the most to the research. In the literature, Carnegie Mellon University, University of Memphis, University of California System, and Arizona State University are highlighted as influential institutions in AI in education (Chen et al., 2020, 2022; Talan, 2021). These institutions are noted for their successful projects in this field. This suggests that higher education institutions in the United States are effective in global scientific collaborations. Similarly, universities in other countries such as Australia, the United Kingdom, Iran, China, Taiwan, and Germany are also recognized as significant players in this network and are effective in global scientific collaborations. These findings demonstrate that the institutional collaboration network among co-authors is widespread on a global scale, and there are strong connections among universities in different countries. Such collaborations can enhance the quality of scientific research, promote knowledge sharing across disciplines, and advance global scientific discoveries. Additionally, these findings emphasize the importance of international collaboration in academic research and highlight how crucial it is to share and develop scientific knowledge on a global scale. They also underscore the significance of encouraging more collaboration among universities for planning and conducting future research projects, emphasizing the importance of university collaborations.

The strong collaboration networks revealed in the co-author and institutional analyses highlight the global nature of AI research in language learning. Countries like China and the U.S. often lead collaborations, and universities such as Carnegie Mellon and the University of Hong Kong are hubs of activity. However, the prominence of these collaborations raises questions about accessibility. Many of these collaborations are between elite institutions, which may exclude smaller or less technologically advanced universities from contributing meaningfully to the field. This trend signifies a potential "elite capture" of AI research in education, which could stifle innovation from more diverse perspectives.

#### 4.4. Co-word

The research has also examined the relationships among the keywords used in publications related to the topic. Among the most frequently used keywords in the research are 'artificial intelligence', 'machine learning', 'chatbots', 'English as a foreign language', 'intelligent tutoring systems', 'natural language processing', EFL, and 'deep learning'. These keywords draw more attention and are used more frequently in the analyzed publications. Liang et al. (2023) identified the most commonly used concepts related to the role of AI in language education as 'Intelligent tutoring system,' 'assessment and evaluation,' and 'adaptive systems and personalization.' These keywords reflect the focal points and development trends of research in this field. These results provide valuable insights that can be used to determine the main topics and priorities in language education and AI research. Additionally, visually representing the relationships and frequencies among keywords in the analyzed publications can guide researchers in sharing knowledge and identifying similar studies. Such analyses can be an important tool for promoting interdisciplinary collaboration and contributing to the development of the field. There are studies in the literature that support our research findings (Chen et al., 2020; Talan, 2021).

The most frequently used keywords, such as 'artificial intelligence,' 'machine learning,' and 'natural language processing,' suggest that the research focus remains on technological tools rather than pedagogical outcomes. While these keywords highlight the central role of AI technologies, they also suggest a gap in research related to the long-term efficacy and human-centered aspects of AI in language learning. As the field matures, future research should shift from a tool-centric perspective to one that explores AI's broader implications for learner autonomy, teacher-student interaction, and the socio-cultural dynamics of language learning. This shift could align the research with broader trends in education that emphasize holistic and learner-centered approaches.

#### 5. Limitations and Recommendations

The use of AI technologies in foreign language learning and teaching processes has significant potential. These technologies can offer innovative solutions in various aspects of language instruction and enhance individuals' language learning experiences. The primary aim and contribution of this study were to assess the current state of research in the field of AI in foreign language learning and to summarize key topics in the relevant literature. Additionally, the study aimed to propose potential future research topics. However, this study has certain limitations that should be noted. Firstly, the study focused on AI in foreign language learning, excluding sources related to other topics or disciplines. Therefore, further research may be needed to explore different aspects of the subject and assess the effectiveness and progress of scientific publications in fields adjacent to foreign language learning, such as AI in general education, adaptive learning systems, or AI-driven personalized learning. Moreover, interdisciplinary approaches that examine the intersection of AI with cognitive science, educational psychology, or sociolinguistics could enrich the understanding of AI's impact on language learning from multiple perspectives. Secondly, data analysis in this study was conducted using the VOSviewer program. Consequently, the accuracy of this analysis method largely depends on the accuracy of the software used as well as the data provided by the indexed sources. As with any software-driven bibliometric analysis, the potential for bias or error exists, particularly in how terms and citation relationships are categorized. Future research could explore complementary tools or validate results through manual review to enhance the reliability of bibliometric analysis in this field.

Thirdly, the study provided a general overview of developments in research on the topic based on the documents indexed in the Web of Science database. Performing bibliometric analyses by examining academic studies from other databases such as PubMed, ERIC, Scopus, among others, could provide a broader perspective. A comparative analysis across databases could reveal different research trends and offer a more global understanding of the topic, as not all significant research may be captured by a single database. Including databases that index interdisciplinary or

open-access publications may further diversify the research landscape. Additionally, the document types focused on in this study included original articles, early access publications, and review articles. Other document types or sources were excluded from the analysis. These other sources may contain emerging research, practical insights, or methodological innovations that are not always captured in peer-reviewed journal articles but are critical to the development of AI in foreign language learning. To broaden the scope of research and contribute to the development of the relevant literature, sources like book chapters, conference papers, or doctoral theses could be included in the analysis.

Fourthly, the study's time frame was set from 2010 to 2023 (October). This time frame aimed to focus on the topics and recent developments, but it excluded important studies or data from earlier years. Including information from previous years could provide a more comprehensive picture of the evolution of AI in foreign language learning, as earlier studies may have laid the groundwork for later developments. Historical analyses could also reveal long-term trends in research interests, technological advancements, and pedagogical shifts, thereby offering deeper insights into the maturation of AI-based approaches in education.

Finally, the indexes used in this study represent a specific scope. Access to sources based on the SSCI, SCI-EXPANDED, and A&HCI indexes was provided. Using other indexes could yield a broader source pool. Indexes such as Google Scholar, which includes a wider array of sources, or interdisciplinary databases like JSTOR, could provide access to a more diverse set of publications. This would also allow for the inclusion of non-English studies, expanding the global perspective on AI applications in language learning.

In conclusion, this research can be considered an important resource that could contribute to guiding future studies. The findings and recommendations presented in the research are believed to serve as a guide in designing and developing further studies on the subject. Furthermore, it is thought that this research could assist in the discovery and implementation of new ideas in the field. Researchers may particularly benefit from exploring less-examined areas, such as the ethical implications of AI in language learning, the impact of AI on learner autonomy, or the integration of AI into culturally diverse learning environments.

In this context, the study is seen as potentially guiding researchers interested in examining the impact of AI on foreign language learning to identify different research topics. Understanding the role of AI in education requires further research. Future studies may encompass various bibliometric and systematic review methods and incorporate different types of studies. Longitudinal studies, experimental research, and case studies focusing on specific AI tools or learner populations could also add depth to the field's understanding of AI's effectiveness and limitations in different educational contexts.

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