Unraveling Learning Motivation in AI-Mediated Learning Environments: A Systematic Review of Research (2014-2024)

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Abstract
This systematic review aims to identify the current situation, developmental trends, theoretical and practical insights into research on learning motivation in AI-mediated learning environments by exploring the overview and evolutionary path of research, learners' attitudes and perceptions in AI-based learning settings, and pedagogical applications. Totally, 108 relevant peer-reviewed articles (2014-2024) were selected based on Web of Science (WoS) for further analysis. The findings show that a) an overall upward trend in research publications from 2014-2024 and the radial connections between the keywords of 'AI' and 'language learning' implies a growing emphasis on student-centered, game-based learning in virtual reality environments for language education; b) the evolutionary path of learning motivation in AI-driven contexts have evolved through three distinct periods; c) the attitudes and perceptions of learners towards AI-influenced learning are positive, with intrinsic value and continuance intention emerging as key factors; and d) in pedagogical applications, AI has made significant strides in enhancing writing skills and optimizing teaching practices. Therefore, the research on the integration of AI with learning motivation is a burgeoning field, which is of significance to theory and pedagogy in the future.

Keywords
learning motivation, artificial intelligence (AI), AI-mediated learning environment, systematic review, implications

Introduction

The rapid advancement of artificial intelligence (AI) has led to a rise in the use of AI-powered learning tools and applications. AI has played a pivotal role across diverse educational domains, exerting a profound influence on learning motivation, which is critical to the educational process. AI-powered tools have significantly enhanced learning experiences in fields such as mathematics, humanities, and education. AI is increasingly transforming education across disciplines by enhancing both cognitive and affective learning outcomes. In mathematics, Intelligent Tutoring Systems (ITS) have proven effective in developing problem-solving skills through step-by-step guidance and scaffolding that closely simulates human tutoring (VanLehn, 2011). In the humanities, AI-driven natural language processing tools facilitate critical thinking and textual interpretation, enabling students to engage more deeply with complex content (Zawacki-Richter et al., 2019). In the field of teacher education and instructional design, AI supports educators by identifying learning trends, evaluating student progress, and informing personalized pedagogical strategies (Holmes et al., 2019). As AI technologies continue to advance, their educational applications are not only strengthening learners' cognitive development but also promoting affective dimensions (motivation, enjoyment and self-esteem)

and self-regulation (Mohebbi, 2025; Yang et al., 2025; Jin et al., 2023). Furthermore, AI-powered conversational agents have been shown to increase learners' motivation to communicate in foreign language contexts, contributing to more active language acquisition (Ayedoun et al., 2019). Consequently, a deeper understanding of how AI shapes learning motivation across academic domains is vital for harnessing its full potential in future educational innovations.

Motivation is a crucial topic in educational research. It is delineated as the impetus and intensity that govern human conduct (Dörnyei & Ushioda, 2009). It has a close relationship with students' learning outcomes (Fang et al., 2024). The multifaceted nature of motivation must be meticulously considered within the ambit of every educational milieu to bolster academic attainment among learners (Li, 2023; Toste et al., 2020). Researchers have made significant efforts to identify effective motivational strategies that stimulate students' motivation to learn and enhance their learning performances (Ng & Chu, 2021). Therefore, in this digital era, AI-driven learning environment is much needed in educational research.

Studies on the possibility of using AI for language learning are emerging. The practice of students employing AI tools to master a second language highlights their self-directed learning capabilities. Digital apps empower students with the ability to make choices and pursue self-directed L2 learning. Students are allowed to choose topics, exercises, and activities based on their interests and goals. By promoting autonomy, these apps enhance motivation, engagement, and overall satisfaction in the learning process (Annamalai et al., 2023). Leveraging AI in educational AI applications is instrumental in nurturing the capacity for self-directed learning and the adept employment of a spectrum of learning strategies. This empowerment, in turn, facilitates the independent acquisition of new knowledge beyond the confines of traditional classroom settings (Wang et al., 2024; Doo & Zhu, 2024; Jin et al., 2023).

In comparison, conventional foreign language instruction, which is text-bound, often leads to waning enthusiasm and a decline in student engagement. Consequently, to sustain and invigorate students' curiosity and zeal in the acquisition of foreign languages, it is imperative to construct an educational milieu that stimulates and resonates with their multi-sensory experiences (Azamatova et al., 2023). Naturally, there is growing interest in the ways that AI can be implemented to facilitate students second Language learning for Motivation (Deng & Yu, 2022). However, TASLL (technology-assisted second language learning) environments will encounter numerous challenges that must be tackled. Challenges pertaining to accessibility, deficiencies in digital proficiency, and the absence of holistic, flexible instructional frameworks and methodologies significantly impede the incorporation of motivational factors into TALL environments (Bahari, 2023).

To provide an objective portrayal of the evolution of AI-mediated learning motivation and to precisely apprehend the trajectory of research in this domain, this study employs the visualization software CiteSpace and the PRISMA (Preferred Reporting Items for Systematic reviews and Meta Analyses) methodology to examine the development of research on motivation to learn in AI contexts from 2014 to 2024. By identifying gaps in prior research, this study formulates its research questions. The knowledge maps generated by Citespace then serve to offer a visual representation of the pivotal terms, dynamic progression, and cutting-edge focal points of research in this study. This method enables a more objective, holistic, and scientific approach to addressing these research questions.

Literature Review

In contemporary language education, the integration of AI into the teaching and learning process has become indispensable (Tulasi & Rao, 2023). While recent investigations highlight the promise of AI technologies (intelligent tutoring systems, chatbots, and adaptive feedback) in enhancing learners' motivation through personalization and real-time support (Ayeni et al., 2024; Bahari, 2023), some existing research might only treat motivation as a secondary outcome rather than as a central theoretical construct, with limited attention given to its intersections with other key instructs (Sharma et al., 2020). Nowadays, the intricate interplay between motivation and other instructs is still popular, such as affective factors, learner autonomy as well as cognitive-emotion regulation (Yang et al., 2025). Despite the growing integration of AI in education, relatively few review studies have systematically explored overarching research trends related to learning motivation within AI-enhanced contexts. Considering this research gap, there is an increasing imperative to undertake a systematic investigation into the overarching patterns and evolving trajectories of learning motivation within AI-enhanced language education. Thus, the authors propose the following two research questions:

RQ1: What is the current status of research on learning motivation in AI-driven learning contexts?

RQ2: What are the evolutionary paths of research on learning motivation in AI-driven educational scenarios?

To further delve into this inquiry, it is essential to also consider the learners' internal states, as these factors can significantly influence their learning experiences (Xin & Derakhshan, 2025). Examining a range of unobservable attributes, that of learners' attitudes, perceptions, and beliefs regarding language acquisition, is necessary to comprehend how they learn with AI assistance. It is focused on the learner as the agent and how their attitudes, perceptions, and beliefs relate to their studies of languages and involved more on learners' attitudes, perceptions, and beliefs as affected by their learning context, that is, AI-driven learning environment (Wesely, 2012). Building upon the foundational insight that learners' internal states, including their attitudes, perceptions, and beliefs, are pivotal in shaping their engagement with AI-assisted language learning contexts (Wesely, 2012), recent studies have delved deeper into how these cognitive and emotional factors influence their learning motivation and overall learning outcomes.

Emerging research underscores the pivotal role of learners' attitudes toward AI tools in shaping their motivation and sustained engagement. Learners' positive attitudes towards AI will significantly amplify their favorable perception and emotional engagement with the technology. Specifically, learners who exhibit a favorable attitude towards AI are more likely to engage in proactive exploration and deeper comprehension of its functionalities.This proactive engagement not only augments their understanding of the capabilities of AI but also cultivates a more enriching and positive emotional experience throughout its utilization (Katsantonis & Katsantonis, 2024). Studies have demonstrated that AI literacy, coupled with positive perceptions of AI-assisted English as a Foreign Language (EFL) learning, is a significant predictor of learners' intention to persist in using such technologies. Notably, foreign language enjoyment serves as a critical mediating factor in this relationship, further highlighting the interplay between cognitive and emotional dimensions in the adoption of AI tools for language learning (Fan & Zhang, 2024).

There is growing interest in the enhanced education facilitated by AI, and it is believed that AI can empower the education sector, existing research has already highlighted the potential of AI tools. A supportive learning environment is what AI-assisted assessments strive to create. In doing so, they act as a buffer against anxiety. Meanwhile, they serve as catalysts for enhancing attitudes and boosting motivation, thereby generating useful information (Biju et al., 2024). The incorporation of AI-assisted data analysis tools into education not only serves to enhance students' motivation but also effectively alleviates their academic pressure. Consequently, it fosters a more conducive and supportive learning environment (Deckker & Sumanasekara, 2025). Nevertheless, anxiety is an important variable in AI-mediated educational settings (Teng & Yang, 2023). AI tools have also brought anxiety to some educational levels, such as higher education. The impact of AI anxiety on motivated learning has been examined (Chen et al., 2024). Notwithstanding, the current research has been limited to examining the short-term impact of AI tools on learners' emotional attitudes, motivation, and various aspects of foreign language learning skills (Biju et al., 2024). Hence, it usually miss gradual cognitive and emotional effects (Deckker & Sumanasekara, 2025). To comprehensively capture these impacts, future research endeavors ought to prioritize longitudinal studies that meticulously track learners' progression and attitudes across prolonged time spans, thereby enabling a more precise determination of the enduring influence of AI on emotional development and academic achievements within AI-mediated educational settings. Additionally, a review of prior research revealed that studies investigating learners' attitudes toward AI interaction have consistently demonstrated substantial variability and dispersion in their viewpoints.

To delve into this phenomenon and better understand learners' major attitudes and perceptions towards language learning in AI-mediated contexts, this study undertakes a comprehensive analysis. This review carefully examines the selected literature using Citespace and systematically arranges learners' attitudes and viewpoints throughout their learning process, particularly as they are influenced by AI. Therefore, the following research question (RQ3) is put forward: What attitudes have an impact on learning motivation in AI-driven contexts?

Given the transformative potential of AI in education, understanding these attitudes and perceptions is crucial for harnessing its benefits effectively. AI has been hailed for its potential to transform conventional teaching and learning practices (Adiguzel et al., 2023). Intrinsic motivation and competence to learn with the AI depended on teacher support, which includes innovative teaching methods or strategies (Chiu et al., 2024). As AI continues to shape these aspects, it is vital to explore how AI teachers and educators work together to design appropriate and engaging teaching tools and pedagogies through personalized and adaptive learning experiences, thus fostering learners' learning outcomes (Collie et al., 2024).

The application of AI in education is examined in previous research, with particular attention paid to virtual mentors, adaptive learning systems, and intelligent tutoring programs (Ray & Sikdar, 2024). Virtual mentors, an e-mentoring in a smart education system, was used to provide guidance, instruction, encouragement, role modelling, and emotional support to youngsters to foster the learners' skills in the higher education sector (Nguyen et al., 2024). Adaptive learning technologies constitute educational systems that employ data analytics and AI methodologies to tailor and personalize the learning experience for individual learners (Strielkowski et al., 2025). Through AI-powered adaptive learning environments, it evaluates how students engage with the materials and modify the presentation and level of difficulty of

the information to suit each student's unique learning path (Zheng et al., 2024). Harnessing these technologies, the presentation of educational content is dynamically and intelligently adapted to align with each individual student's academic performance, learning pace, and personal preferences, thereby fostering a more personalized and effective learning experience (Gligorea et al., 2023). Holmes et al. (2019) explored how AI-driven adaptive technologies can personalize learning experiences and thereby sustain student motivation. Moreover, Chen et al. (2024) underscored the role of intelligent tutoring systems in fostering students' intrinsic motivation by dynamically adjusting instructional approaches based on individual learning behaviors.

Nonetheless, most studies focus on technological affordances without sufficiently addressing pedagogical frameworks that underpin effective AI integration. The gap underscores the need for a more focused examination of pedagogical applications that leverage AI specifically to enhance learning motivation. Thus, the authors propose the fourth research question (RQ4): What pedagogical implications have been reported in research on learning motivation in AI-driven contexts?

Method

This systematic review was conducted using the PRISMA (Preferred Reporting Items for Systematic reviews and Meta Analyses) method developed to provide a systematic way for authors to conduct and report on systematic reviews and meta-analyses. Meta-analysis is the use of statistical methods to synthesize and combine the results of independent studies. It uses explicit, thorough methods that are selected to minimize bias, thus providing reliable findings from which conclusions can be drawn and decisions made. PRISMA is frequently employed in the field of health care (Crawford et al., 2015). However, the review has not been registered yet. We did follow the PRISMA statement guidelines to complete our review (Moher et al., 2015). Initially, the researchers initiated a comprehensive literature review on the Web of Science (WoS), guided by the research questions at hand. Subsequently, they meticulously assessed the identified studies, applying strict inclusion and exclusion criteria to ensure the relevance and quality of the selected research. Finally, the researchers conducted a thorough analysis and provided a synthesized overview of the literature, distilling key findings and insights. Figure 1 shows the selection process of the retrieved studies.

Literature search

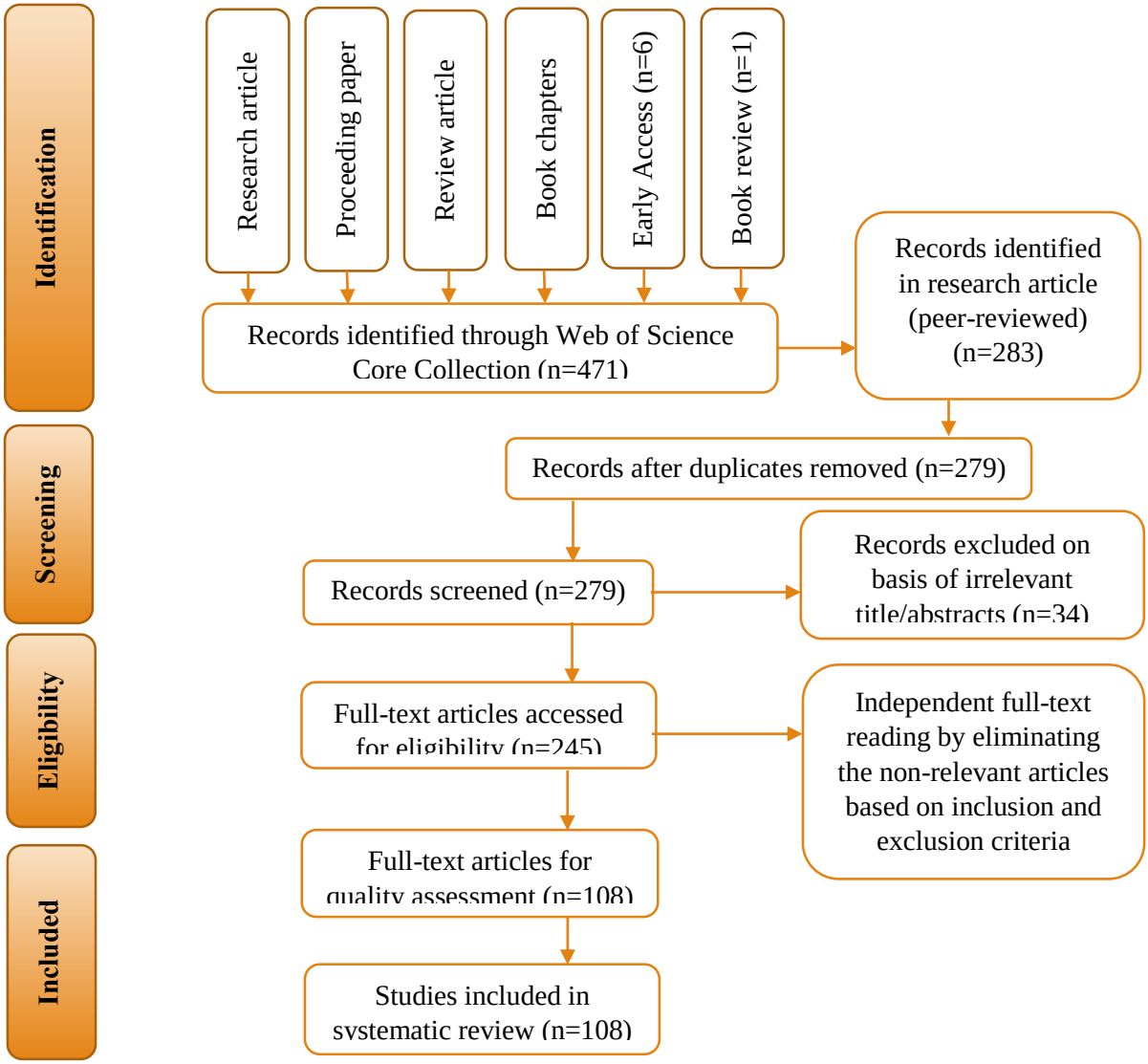
As Figure 1 illustrates, we initiated the process by conducting a literature search of the WoS Core Collection database. On 10 Nov. 2024, 283 results were retrieved from the WoS Core Collection by utilizing the "All fields search" option. This feature allowed us to search across all fields, such as titles, topics, abstracts, as well as keywords, etc. It's my first top priority to choose this digital database because WoS ensures the inclusion of the most significant journals (Bartolacci et al., 2020). The date ranged from January 2014 to January 2024.

Eligibility criteria

Our article selection process adheres to specific criteria, which we have conveniently summarized in Table 1. Only the articles that met the following selection criteria for inclusion/exclusion were included to ensure the eligibility criteria as a fundamental prerequisite for the systematic reviews. Thus, (a) studies conducted in motivational effect with the help of digital tools; (b) Research articles (peer-reviewed); and (c) English language articles were included. The studies were excluded if they (a) were out of the educational scope; (b) did not focus on the learning motivation with AI empowerment; (c) involved the integration of AI-empowered technologies application with other fields like medicine, socioeconomic

development, cross-culture, etc; (d) were relevant to meta-analyses of learning motivation; (e) were proceeding paper, review article, book chapters, early access, book review; and (f) were not written in English.

Figure 1
A PRISMA Flow Diagram of Literature Selection



Quality assessment

To ensure the quality and reliability of the finalized studies, a quality assessment was carried out based on the University of West England Framework. They assessed each study using a specific questionnaire as follows:

(a) The study was informative in statements for this review study. The options were "Yes (2)", "Limited (1)", and "No (0)".

(b) The study was meticulously designed, with a research design that was clearly and concisely articulated. The possible answers were "Yes (2)", "Limited (1)", and "No (0)".

(c) The presentation of the results was clear and unambiguous. The potential responses were clearly defined as "Yes (2)," "Limited (1)," and "No (0)."

(d) The study reached definitive and persuasive conclusions. The options were "Yes (2)", "Limited (1)", and "No (0)".

Consequently, the assessment scores of the selected articles varied from 0 to 8 based on these measurements. Three authorities (In the field of foreign applied linguistics from the School of Foreign Languages, Hubei University of Technology) carefully scored the literature in an objective form. In the finalized studies, the researchers incorporated 108 studies (Appendix A) that had scores of seven or higher.

Table 1
Article Selection Criteria

No.	Criteria	Including	Excluding
1.	Type of Database	Web of Science (WoS) Core Collection	
2.	Papers type	Research article(peer-reviewed)	Proceeding paper, Review article, Book chapters, Early Access, Book review
3.	Language	English	
4.	Date range	2014-2024	
5.	Scope	Only articles with learning motivation in AI-driven contexts are considered.	1. Only involving one topic related to AI but no learning motivation 2. Only involving one topic related to language motivation without AI. 3. Focusing on the combination between AI and its synonyms and language learning but neglecting motivation 4. Focusing on the integration of AI application with other fields like medicine, socioeconomic development, cross-culture, environment, industrial engineering 5. Meta-analyses regarding learning motivation
6.	Search strings	The keywords chosen are associated with the notion of artificial intelligence and its synonyms (‘‘AI’’ OR ‘‘artificial intelligence’’ OR “Chat GPT” or “AI technologies”) AND the definition of learning motivation and its synonyms (‘‘motivation’’ OR ‘‘motivational system’’ OR “L2 motivation” OR “foreign language motivation)	

Data analysis

The process began with a meticulous screening of the dataset to validate the abstracts and titles, yielding a curated list of 245 articles. Further evaluation against the established inclusion

criteria narrowed down the selection to 108 articles that were integral to the study. Once the database searching was conducted, a rigorous assessment was applied to each article, ensuring that only those that met the stringent criteria were incorporated into the systematic review. The initial phase of screening excluded 4 articles due to duplication. Subsequently, 34 articles were discarded for containing abstracts and titles that were not pertinent to the study's focus. Additionally, 137 articles were omitted as they failed to explore the aspect of learning motivation within AI-empowered educational contexts. This systematic approach ensured the study's findings were based on a robust and relevant literature base. A total of 108 articles met the inclusion/exclusion criteria that are displayed in the PRISMA flow diagram (Figure 1).

Results

Current situation of research of learning motivation in AI-driven contexts (2014-2024)

This session presents the temporal distribution by publication year, spatial distribution of co-cited journal frequency, of co-cited author, and of keyword co-occurrence, in combination with statistics and text forms to elucidate learning motivation driven by AI.

Temporal distribution by publication year

The timeline and volume of academic publications offer a clear perspective on the foundational state and developmental trends of a specific area of research. As depicted in Figure 2, the publication trends for papers on learning motivation facilitated by AI-enabled advancements, as documented in the WoS database, exhibit an overall upward trajectory from 2014 to 2024, with some annual variations. In the year of 2023, it stands out as a pinnacle in terms of publication output. This suggests a growing and sustained interest in this field of study over an extended period.

Figure 2

Trends in the Publication of Papers on Learning Motivation Enabled by AI Technologies

From 2014 until 2017, it marked the initial growth phase of research on learning motivation driven by AI, with a modest number of publications that nevertheless showed an upward trend. This indicates that researchers began to explore the application of AI in learning motivation studies and to recognize its role in learning motivation, albeit with a relatively low level of attention.

In 2018, there was a slight decline to four articles published, but the years 2018-2020 witnessed a sharp upward trend in research. This could signify that the importance of AI in the study of learning motivation has gained recognition, leading to an increase in research activities.

Between 2020 and 2023, it was characterized by a rapid growth with a significant surge in the number of papers to 16 in 2020, a slight decrease to 14 in 2021, followed by a rise to 17 in 2022, and peaking at 21 in 2023. This surge may correlate with the rapid development of AI in the field of education, These AI technologies are likely to have a significant impact on enhancing learning motivation, offering new perspectives and methodologies for the development of research in this technological and educational domain.

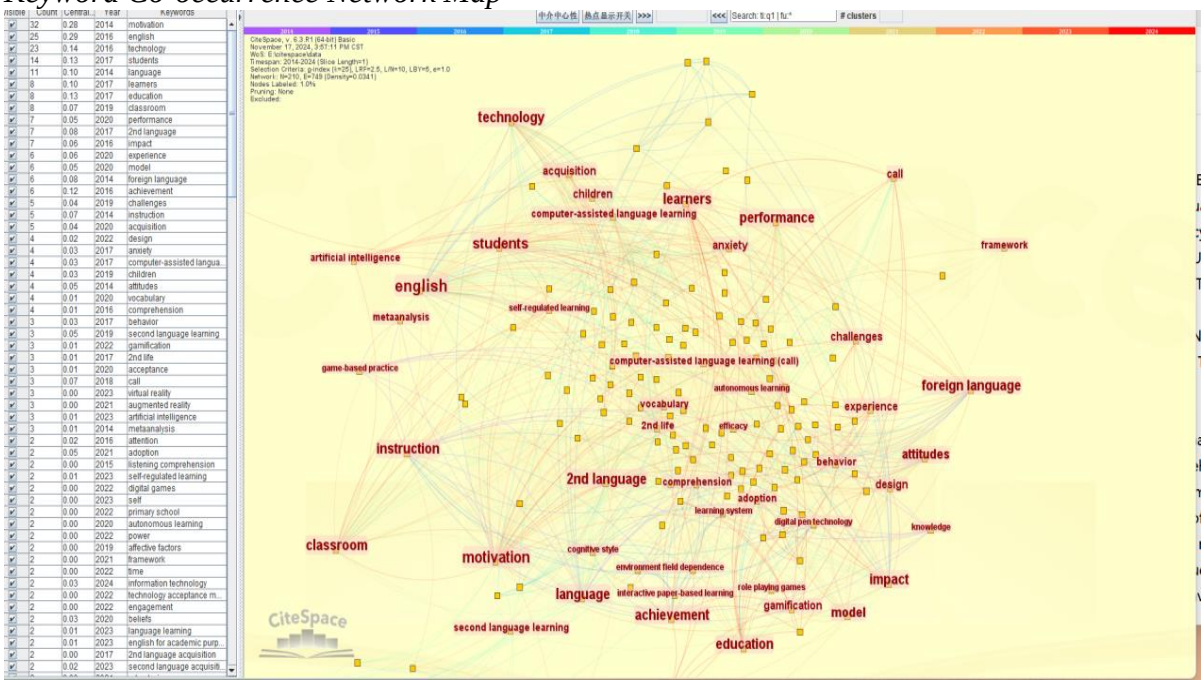
In 2024, the number of publications decreased to eight. This could be attributed to the maturation of research in the field of artificial intelligence, or it may suggest that researchers are shifting their focus to other related areas such as multilingual learning and cross-cultural communication.

Spatial distribution of keyword co-occurrence

A "keyword co-occurrence network map" is shown by CiteSpace. Keywords serve as a concise and comprehensive representation of the themes within academic literature. They can illustrate the interrelationships among various keywords within the corpus of scholarly articles, as well as highlighting the focal points and trends within the field of study (Figure 3).

Figure 3

Keyword Co-occurrence Network Map



CiteSpace software was utilized to conduct high-frequency keyword analysis based on selected academic literature. The node density (d=0.0341) keyword co-occurrence map for the field of AI-empowered second language motivation research from 2014 to 2024 is depicted in Figure 2. Nodes represent keywords. Lines between nodes indicate the frequency with which keywords appear together in the same literature. Colors represent different time periods, showcasing the temporal trends of research hotspots (As shown in Figure 3). It can be observed that from 2014 to 2024, the frequency of keywords such as "virtual reality" and "gamification" has increased in recent years (after 2020), which may reflect the latest developments and research interests in the field of education with AI technologies. "Motivation," "English," "technology," "students," and "language" are the five key nodes, occupying an absolute central position in the literature collection. They also generate a wide range of radial connections,

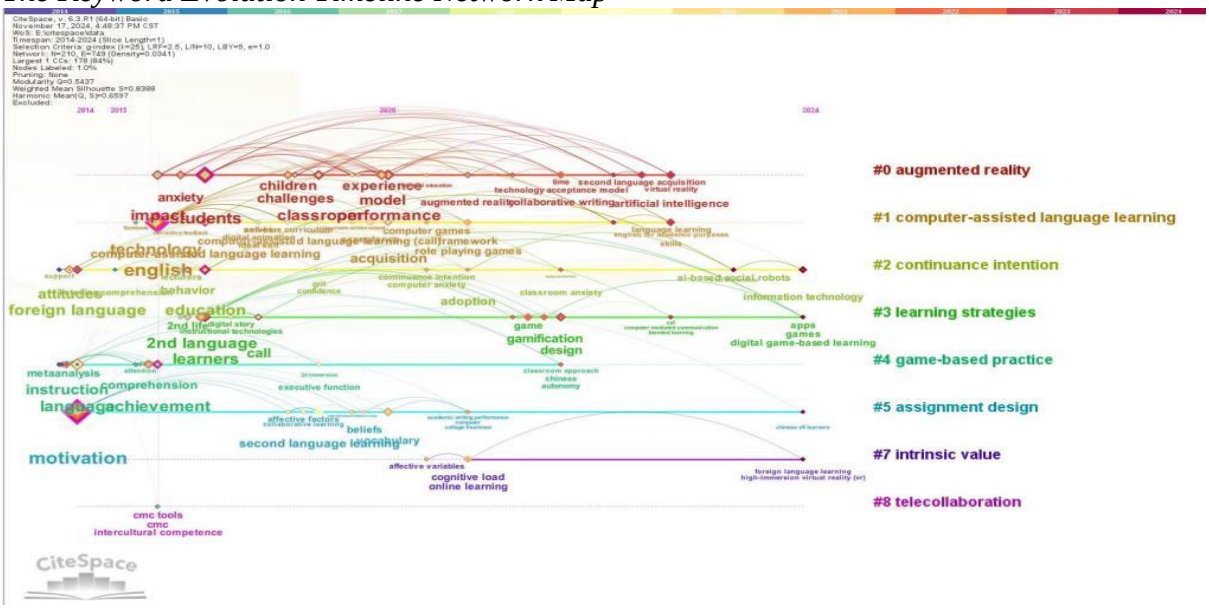
forming a complex structural network. This suggests a growing focus on student-centered, game-based learning within virtual reality environments in language education.

Evolutionary path of learning motivation research in AI-driven contexts (2014-2024)

A timeline map from CiteSpace shows how different clusters within a subject have changed and evolved over time, emphasizing the areas of study that were most active throughout different times. A timeline map based on keyword co-occurrences in the field of AI-enabled learning motivation research from 2014 to 2024 is shown in Figure 4. On the right side, the clusters are identified by labels and serial numbers (marked by "#") that match the keyword clusters in Table 2 and Figure 5.

Figure 4

The Keyword Evolution Timeline Network Map



The initial exploration phase (2014-2016)

The impact of augmented reality on learners' learning experiences and negative emotions is the focus of academic research, with terms like "anxiety" being particularly prevalent. At the same time, scholars are increasingly investigating the connection between students' language achievement and AI. Consequently, early scientific interest in the psychological states of students, the learning environment, and the efficacy of language acquisition in the digital age is shown in this.

The rapid transformation phase (2017-2020)

Multiple articles have reified AI in electronic game-based learning platforms, with keywords such as "gamification," "game-based learning," and "digital game-based learning" emerging. The process from "gamification" to "game-based learning" and then to "digital game-based learning" indicates that researchers, while continuing to investigate students' emotions and learning experiences, have begun to focus on the application of gamified learning in teaching. The research has shifted from traditional gamified learning to digital gamified learning methods.

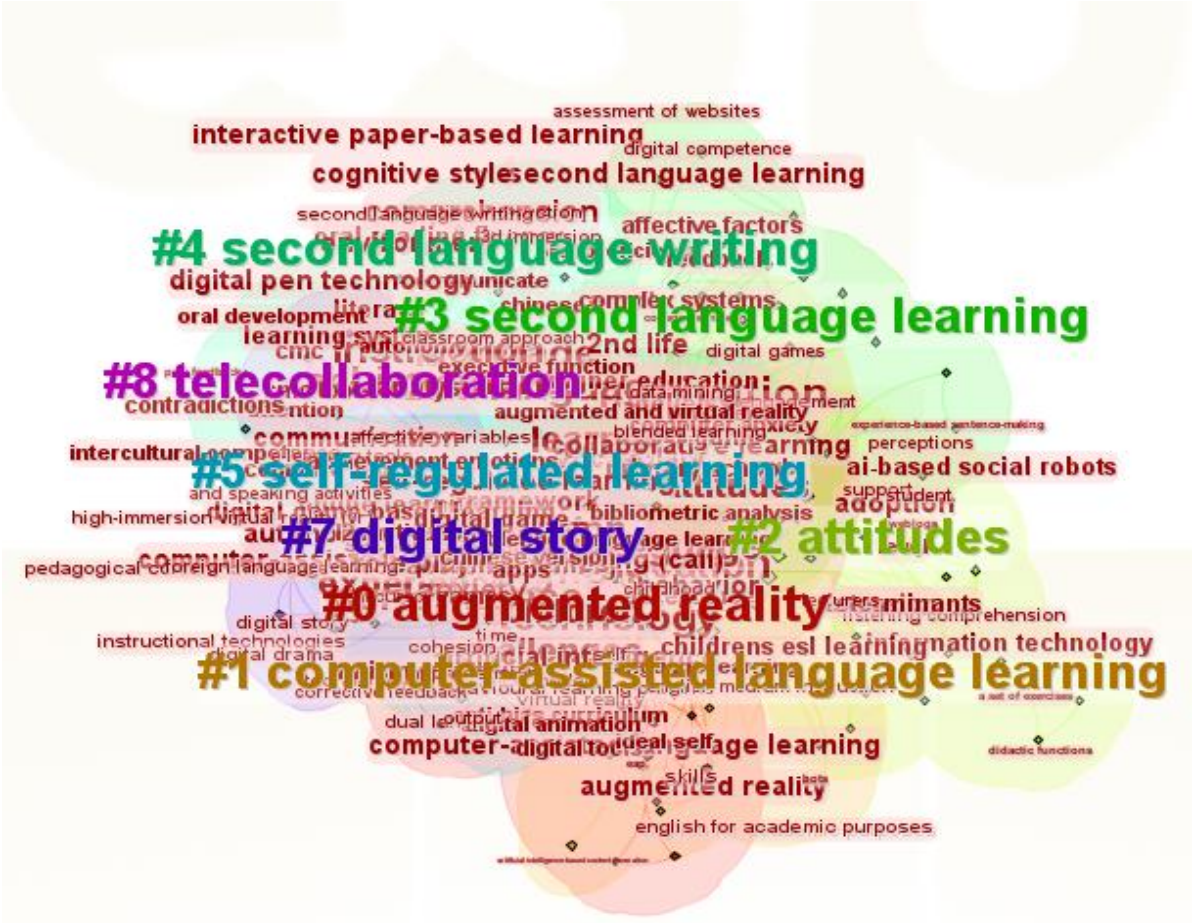
The flourishing development phase (2021-2024)

This period marks a rapid and thriving development in the field of AI, with keywords such as "augmented reality," "artificial intelligence," "information technology," "apps," and "digital

tools" becoming more prominent, indicating the increasing importance of AI in education, particularly in the language field. This significant growth reflects that research on learning motivation, driven by the wave of AI, has become a hot topic in academia, with both depth and breadth of research continuously expanding. This may also indicate the research trends for the future after 2024.

Research Topics of learning motivation in AI-driven learning environment (2014 to 2024)
This session presents keyword clusters, keyword cluster label, keyword evolution timeline using Citespace, in combination with statistics and text forms to elucidate learning motivation driven by AI. Based on these insights, the analysis and organization of the research themes from the selected 108 articles are conducted. Drawing from the identified themes and the gaps of previous studies, the relevant questions will be proposed.

Figure 5
The Keyword Clusters Network Map



Keywords serve as a concise encapsulation of the themes within academic literature. Analyzing the frequency of these keywords can unveil the focal points, trends, and interconnections among various research topics within a field. Within CiteSpace, by configuring the node type (NodeTypes) to "Keyword" and applying the Pathfinder pruning method to both "Pruning sliced networks" and "Pruning the merged network," a "keyword clusters network map" (As shown in Figure 5) can be generated. The system employs the default Log Likelihood Ratio (LLR) algorithm for extracting cluster labels, which is instrumental in identifying significant terms within the dataset. This process not only highlights the central themes but also clarifies the evolving landscape of the field.

In Figure 5, nodes represent keywords, signifying the emergence or rise of a particular theme or research focus. The size of a node corresponds to the frequency of co-occurrence of the keyword; larger nodes indicate a higher frequency of co-occurrence and, consequently, greater attention within the field. Figure 5 illustrates a modularity value (Q=0.5771) and an average silhouette value (S=0.8724). These metrics serve as criteria for assessing the clustering effectiveness of the network map. They (Q >0.5 and S >0.7) suggest that the clustering structure within the map is robust, with high homogeneity among members of each cluster, making the clustering results convincing.

Table 2 presents the clusters (marked with "#") in AI-enabled learning motivation research. The cluster serial number is inversely proportional to the size of the cluster: the smaller the serial number is, the larger the cluster size is, and vice versa. This visualization aids in understanding the distribution and significance of various research themes within the field.

Table 2
Keyword cluster label (LLR)

Cluster ID	Size	Silhouette	mean (Year)	Representative Terms
#0	40	0.868	2020	augmented reality; educational technology; artificial intelligence; out-of-class language learning
#1	35	0.853	2020	computer-assisted language; computer-assisted language learning; assignment design; ideal self; intention
#2	32	0.878	2019	attitudes; student; foreign language; level; perceptions; continuance intention
#3	31	0.825	2019	learning strategies; deep learning; language education; second language learning; collaborative learning; modality
#4	28	0.893	2016	second language; game-based practice; second language writing
#5	17	0.857	2021	self-regulated learning; learning analytics; intrinsic value; efl learning; foreign language learning; assignment design
#7	10	0.953	2020	intrinsic value; digital game-based learning; self-determination; digital story; instructional technologies
#8	6	0.977	2016	telecollaboration; teacher training; cmc tools; intercultural communications

The keyword cluster labels (LLR) are extracted from the CiteSpace "Cluster Explorer." (As shown in Table 2) The "cluster serial numbers" and their corresponding clusters in the table are aligned with those depicted in Figure 5. Upon systematic analysis, research on learning motivation empowered by AI can be categorized into the following three research topics: (a) the ways and behaviors of learning; (b) learning attitudes and perceptions; and (c) the study of AI-enabled language pedagogy. Based on them and combined with the current research status mentioned in the literature review, the following two questions will be primarily involved:

The first regards RQ3 that explores the attitudes that might have an impact on learning motivation in AI-driven contexts. As indicated by Table 2, the key concepts of learning attitudes and theoretical research have been consolidated into the major themes of 'intention, continuance intention, intrinsic value, and self-determination.'

Intrinsic value was conceptualized as the sense of satisfaction and accomplishment that learners gain from the learning experience itself. It pertains to the learner's desire to continue utilizing electronic means for learning after their initial engagement. For instance, "digital game-based learning" and "digital story" indicate a research focus on employing technologies such as digital games and stories to craft meaningful learning experiences that, in turn, foster learning. The intention of learners, which is one of the driving forces behind learning, has a direct impact on learning outcomes. Expectancy-value motivation theory (Wigfield & Eccles, 2000) underscores the role of intrinsic value in predicting motivational behaviors in second language learning. This suggests that AI-enabled learning environments can offer personalized and interactive experiences that enhance learners' intrinsic value, thereby potentially boosting their motivation to learn a second language. The use of diverse AI tools, such as ChatGPT, by second language (L2) learners significantly influences their perceptions of the L2 learning process and outcomes. Results unvailed that ChatGPT did not simplify the writing process. Instead, it transforms students' learning experiences, eliciting varied responses. Participants found ChatGPT valuable for L2 learning and reported increased comfort with its ethical implications and beneficial applications after use. This indicates that integrating ChatGPT into L2 learning reshapes the process and affects learners'attitudes toward the ethical aspects of AI-assisted learning (Tossell et al., 2024).

Continuance intention denotes the willingness of learners to persist in learning when faced with challenges or obstacles. Research highlights the significance of perceived usefulness, intrinsic motivation, and satisfaction in encouraging college students to continue using AI tools for self-directed learning. Satisfaction acts as a pivotal mediator, linking perceived usefulness, intrinsic motivation, and continuance intention.

Drawing on the framework of Self Determination Theory (SDT), which highlights how important student autonomy is (Ryan & Deci, 2000). It is pertinent to acknowledge the substantial influence that the intricate interplay between internal and external motivations exerts on educational attainments (Ryan & Deci, 2020). The use of reward and punishment schemes is the main way that external incentive encourages student learning. Although these strategies can increase a learner's drive to succeed, they don't always result in pleasure of the educational process (Ryan & Deci, 2020). Internal motivation, on the other hand, first increases students' desire to engage in an activity or enjoy an experience before it develops drive for learning. People's views and actions regarding the use of technology are influenced by internal motivation, which is demonstrated by perceived enjoyment (Ryan & Deci, 2020). AI tools, such as language learning apps and chatbots, can enhance both external and internal motivation. For instance, these tools often use reward systems, like points or badges, to motivate learners externally by providing tangible incentives for completing tasks or reaching milestones (Yuan & Liu, 2025). This aligns with the concept of external motivation, where learners are driven by the promise of rewards or the avoidance of penalties. On the other hand, AI can also foster internal motivation by creating engaging and interactive learning experiences. For instance, AI-driven language apps can offer personalized learning paths that adapt to a learner's interests and proficiency levels, making the learning process more enjoyable and meaningful (Strielkowski et al., 2025).

This aligns with internal motivation, where learners are motivated by the inherent enjoyment and interest, they find in the learning activity itself. By providing a dynamic and tailored learning environment, AI tools can increase learners' intrinsic motivation, leading to more sustained engagement and better learning outcomes, which helps them feel more in control of their education and therefore more motivated to learn. The significance of implementing self-determination theory in the educational field is further shown by research showing a substantial association between intrinsic motivation and satisfaction and perceived autonomy and competence.

The second pertains to RQ4 that explores the pedagogical implications as reported in the research on learning motivation in AI-driven contexts. Foreign language teaching permeates every cluster of Learning motivation research, serving as the core and pillar of AI-driven learning motivation studies. AI plays a significant role in second language instruction, particularly in the fields of L2 writing, as indicated by the keywords "second language" and "second language writing." It is widely acknowledged that AI also benefits in the realms of second language education, such as speaking, listening, translation, and reading, with the language skills improving. It lends credence to the idea that AI-empowered language instruction holds promise in revolutionizing language learning (Li, 2023). However, according to Table 3, research on these additional areas of language learning is scarce, presenting a significant area of focus for studies post-2022. Furthermore, keywords like "foreign language," "language education," and "EFL learning" suggest that research may encompass foreign language teaching methods and practices. Research on second language teaching mediated by AI primarily unfolds along two dimensions: the perspective of AI in foreign language teaching and foreign language teacher training. There is an increasing inclination to embrace AI from educational settings, with AI in education projected to grow by 43% from 2018 to 2022. Clusters #0 and #1 emerged as the top two from 2018 to 2022, respectively (size=40, size=35), as indicated in Table 3. The prominence of terms such as "augmented reality," "educational technology," and "artificial intelligence" within the 2020 clusters (Clusters#0 and #1) can be attributed to the surge in online learning platforms prompted by the pandemic in 2020, further highlighting the potential of AI technologies in the educational landscape. It reflects a broader trend of AI integration in educational instruction during the pandemic period (Chiu, 2023).

This increase in online learning opportunities has catalyzed the development of educational AI, providing students with novel tools for learning. Intelligent tutoring systems, a subset of educational AI, function as expert systems in the academic arena, mimicking the functions of distinguished educators or teaching assistants. By engaging with students, these systems can conduct assessments to uncover each student's unique learning profile, which encompasses their strengths, weaknesses, and preferred learning styles. Underpinned by educational theory, these systems offer tailored instruction, employing methods such as Socratic questioning and the establishment of cognitive scaffolds to facilitate learning (Jia & Zhang, 2023). The integration of such intelligent systems is intended to boost student engagement and stimulate a more dynamic and motivated approach to learning. In terms of assignment design, well-designed assignments with instructional AI technologies can offer innovative forms of homework and feedback mechanisms, providing learners with enhanced personalized learning experience. Additionally, by addressing the individual needs of learners and capturing their attention, these assignments can subsequently boost motivation and foster academic achievement. A substantial body of research suggests that AI can significantly improve language training by giving students synchronous feedback and tailored learning resources, which will increase their autonomy (Qiao & Zhao, 2023), problem-solving skills (Urban et al. 2024).

Educators can leverage computer-assisted tools to optimize assignment design. By employing online collaboration tools, such as discussion forums or project management applications, assignments can be crafted to facilitate interactive learning experiences, thereby stimulating students' motivation to learn. By doing so, teachers should play a positive role in via teacher scaffolding through designing pedagogical activities tailored to their students' needs with the assistance of digital instruction tools (Cheng et al., 2024). These platforms enable learners to engage in a virtual setting, for instance, by participating in online exchanges or role-playing exercises with native English speakers through discussion boards. This approach not only enhances communication skills but also simulates real-world interactions, thereby enriching the educational process.

Moreover, it is essential to provide prospective English instructors with training on how to use AI in the classroom successfully because it is increasingly becoming an essential component of the teaching-learning process (Tulasi & Rao, 2023). The use of CMC (Computer-Mediated Communication) tools in teacher training programs aims to equip educators with the skills to effectively use instructional tools for instruction. This approach not only enhances the teaching process but also addresses the need for continuous professional development in the evolving landscape of AI-integrated education.

Discussion

In this article, scientific studies (N=108) using the PRISMA and Citespace in the study of learning motivation in AI-mediated learning environment between 2014 and 2024 were identified. First, this review aimed to identify the overview and progress of the research of learning motivation in AI-driven contexts situated in the reviewed studies (2014-2024) (RQ1). The study explored the temporal and spatial development of academic research related to AI-enhanced learning motivation, particularly in the domain of second language (L2) education, from 2014 to 2024. Compared to earlier literature, this study provides a longitudinal and quantitative perspective, mapping how research topics have evolved over a decade. While prior works offered qualitative insights into AI's role in motivation to learn (Ismailov & Ono, 2021), learner engagement (Chiu, 2023) and so on. This study contributes a broader view of the field's growth and direction through publication trends and keyword networks.

The analysis of keyword co-occurrence networks offers profound insights into the evolving thematic terrain of this research domain. This trajectory is consistent with broader trends in educational technology, wherein virtual reality (VR) and gamification are increasingly acknowledged for their capacity to enhance both engagement and motivation (Bolter et al., 2021). The shift towards student-centered, game-based learning within virtual reality environments in second language education signifies an evolution towards more engaging and personalized learning experiences facilitated by AI. Comparing these findings with prior research, the increasing focus on VR and gamification as AI-enabled tools for enhancing learning motivation represents a notable development. Earlier studies might have focused more broadly on the impact of computer-assisted language learning (CALL) (Chapelle, 2009) by providing an adaptive feedback (Bimba et al., 2017). In contrast, the current trajectory reflects a more nuanced application of AI, targeting the direct modulation of motivational factors (Zhang & Miao, 2025). This transformation can be attributed to significant strides in AI technology, which have not only made the creation and implementation of VR and gamified learning environments more practical but also more impactful, particularly the motivational effects of gamification in online learning environments (Ertan & Kocadere, 2022). By

identifying key trends and thematic shifts, this analysis offers valuable insights for researchers, educators, and technology developers. It highlights the growing importance of AI in shaping learning motivation research and underscores the emerging focus on immersive and interactive learning technologies.

RQ2 focused on the evolutionary path of learning motivation research under AI empowerment. The thematic evolution uncovered in this study corroborates findings from earlier research while offering a more structured, time-sensitive understanding of how AI-related innovations influence L2 learning motivation. Previous literature often examined these factors in isolation or through qualitative lenses (Ismailov& Ono, 2021). In contrast, this study uses bibliometric visualization to systematically map the field's growth, providing a comprehensive overview of shifting research emphases and methodological directions.

An analysis of the literature shows that the field is still in its infancy, with much untapped potential for future exploration. The growing emphasis on individual differences, learning styles, and learner needs indicates a clear shift in research toward developing technological interventions that cater to diverse learning profiles. Earlier studies have highlighted the transformative potential of AI-driven language learning, particularly in fostering personalized instruction and enhancing learner engagement (Warschauer, 2004). In a similar vein, the Technological Pedagogical Content Knowledge (TPACK) framework proposed by Mishra and Koehler (2006) accentuates the indispensable role of educators in seamlessly integrating AI tools into pedagogical practices. This perspective is further corroborated by recent findings from Fissore et al. (2024), which emphasize the pressing necessity for specialized teacher training in the pedagogical application of AI tools, a need that aligns closely with the overarching objectives of the current study.

The analysis reveals shifting research interests towards individual differences, learning styles, and material design, aligning with contemporary educational theories emphasizing diverse learner needs (Tomlinson, 2014). These findings have profound implications for future research, suggesting a need for ongoing exploration of AI integration, such as AI effectiveness based on individual differences (Yilmaz & Yilmaz, 2023), designing materials and curricula that leverage AI to enhance outcomes (Iweuno et al., 2024).

Eventually, the field's evolution from emotion-focused inquiries to tool-oriented, pedagogically grounded research reflects its increasing maturity. Initial concerns over technology-induced anxiety have given way to more strategic explorations of AI's potential to foster learner autonomy, engagement, and individualized learning trajectories. This shift is reinforced by recent developments in AI-driven models of educational personalization (Salem, 2024; Mahmoud & Sørensen, 2024).

RQ3 aimed to understand attitudes and perceptions that have been documented in the examined studies over the past decade had an impact on learning motivation in an AI-driven contexts. This review has found that over the past decade, the examination of attitudes and perceptions has highlighted the crucial role of intrinsic value derived from AI-driven learning experiences in motivating learners. However, the use of AI tools like ChatGPT has elicited mixed responses due to concerns about ethical implications and impact on the learning process, necessitating a balanced approach. Continuance intention to persist in learning is influenced by perceived usefulness, intrinsic motivation, and satisfaction, with creating satisfying learning experiences being key to encouraging the sustained use of AI tools for self-directed learning. The present

findings substantiate prior research emphasizing the pivotal role of intrinsic motivation in educational achievement, as delineated by Ryan and Deci (2000) within the framework of Self-Determination Theory (SDT). Specifically, the integration of AI tools within educational contexts, particularly in the realm of second language acquisition, provides personalized and interactive learning experiences tailored to individual learner needs, This, in turn, fosters a heightened sense of autonomy and competence (Song et al., 2023). Such outcomes resonate with Amabile et al. (1994), who assert that autonomy and competence are crucial in bolstering intrinsic motivation, which ultimately culminates in enhanced academic performance and learner satisfaction. However, it is imperative to exercise caution against an over-reliance on extrinsic motivators, such as rewards or punishments, as these may not engender authentic engagement in the learning process (Ryan & Deci, 2020). Indeed, excessive deployment of external incentives has the potential to undermine intrinsic motivation (Deci et al., 1999).Therefore, educators should strike a balance between external incentives and strategies that nurture internal motivation to ensure learners develop a genuine passion for learning. The incorporation of AI into learning significantly influences learners' attitudes and perceptions, enhancing their motivation and engagement. However, it is imperative to consider the intricate interplay between intrinsic and extrinsic motivations (Vallerand et al., 1992). Future research endeavors should delve into the effective balancing of these motivations. Ultimately, educators and developers must collaborate to design AI-driven learning tools that not only foster a lifelong love for learning but also facilitates learning attainments, nurturing both intrinsic and extrinsic motivations to cultivate more engaged, motivated, and successful learners.

The pedagogical applications of AI in learning motivation, as discussed in RQ4, underscores the transformative potential of AI in reshaping teaching practices in a review of studies conducted between 2014 and 2024. For instance, AI optimizes teaching methods, with teachers using computer-assisted tools to create engaging assignments. Teacher scaffolding with digital tools customizes activities to student needs (Chiu et al., 2024), improving learning experiences and upholding the principles of effective teaching. The current findings corroborate previous research on the pedagogical deployment of AI technologies in language education, underscoring AI's capacity to facilitate personalized learning pathways and enhance student engagement (Hossain & Al Younus, 2025). In particular, the integration of CMC (Computer-Mediated Communication) tools within teacher training programs further underscores the imperative for educators to acquire competencies in seamlessly embedding AI into their instructional practices. In response to evolving educational paradigms, recent studies suggest that digital storytelling not only serves as a motivational strategy for fostering teacher development but also exemplifies its potential as a transformative pedagogical tool (Mannion, 2023). This aligns with the increasingly acknowledged notion that AI is an indispensable facet of the teaching-learning continuum, necessitating continuous professional development to remain abreast of rapid technological advancements (Mishra & Koehler, 2006). Despite promising outcomes demonstrated in the context of writing skills (Song & Song, 2023), significant opportunities remain for future inquiry into AI's applicability across the full spectrum of language skills. To address these gaps, forthcoming research should focus on the strategic integration of AI into instructional practices, with particular emphasis on its potential to enhance both learner motivation and educational outcomes across all language domains.

Building upon these observations, the alignment of our findings with prior research further solidifies the notion that AI's pedagogical applications extend beyond mere automation, actively contributing to enhanced teaching efficacy and student motivation. The capacity of AI-driven tools to support the design of engaging, interactive assignments directly addresses

the perennial challenge of sustaining student interest, a key determinant of motivation (Keller, 2010). Furthermore, the use of digital technologies to facilitate teacher scaffolding and personalize learning activities aligns with the core tenets of differentiated instruction, which have been shown to positively impact student engagement and motivation by catering to diverse learning styles and paces (Tomlinson, 2001).

Furthermore, the present findings enrich existing research by shedding light on AI's distinctive role in enhancing learning motivation. While previous studies have extensively examined AI's roles in personalized learning, adaptive assessments, and feedback mechanisms, this study draws particular attention to its direct influence on both intrinsic and extrinsic motivational factors. For instance, AI-powered tools can track student engagement patterns and generate data-driven insights, enabling educators to customize motivational strategies more effectively. Adaptive learning platforms dynamically adjust content and difficulty based on individual progress, thereby promoting a sense of competence and self-efficacy that are core components of intrinsic motivation (Bandura, 1977). In parallel, AI-integrated gamification features engage extrinsic motivators, driving greater participation and sustained effort.

Nevertheless, it is essential to acknowledge that the successful pedagogical deployment of AI to enhance learning motivation is fraught with challenges. Concerns regarding data privacy, algorithmic bias, and the potential for undue reliance on technology necessitate thorough scrutiny (Selwyn, 2021). Future research should not only focus on the exploration of innovative AI applications but also on addressing the ethical and practical implications of their implementation in educational settings to ensure equitable and effective learning experiences for all students.

Conclusions and Implications

This review study aimed to showcase an analysis of previous studies on learning motivation in AI-mediated learning environment in terms of the temporal distribution by publication year, spatial distribution of keyword co-occurrence, the research topics of keywords, and the evolutionary path of research through Citespace. Based on the data mining and visualization network analysis of documents collected from the Web of Science (WoS) database (2014-2024), the author proposed four questions revolved around the overview the progress of research publication and the overview of keywords of the research topic, the evolutionary path of keywords of the research topic, users' attitudes and perceptions, as well as the pedagogical applications. The findings showed that: There is an overall upward trend in research publications from 2014 to 2023. The radial connections between the concept of AI and the concept of language learning imply a growing emphasis on student-centered, game-based learning in virtual reality environments for education. The evolutionary path of learning motivation in AI-driven contexts have evolved through three distinct periods: the initial exploration phase, the rapid transformation phase, and the thriving development phase. The attitudes and perceptions of learners towards AI-influenced learning are positive, with intrinsic value and continuance intention emerging as key factors; In pedagogical applications, AI has made significant strides in enhancing writing skills and optimizing teaching practices.

There are several limitations in this study. In the first place, the study may not include all related publications. Since only Web of Science (WoS) databases were collected and domestic literature databases were ignored, it cannot fully represent the overall development of the mainstream of AI empowerment under learning motivation internationally. In the second place, the research on whether the impact of AI on learning motivation is beneficial or detrimental is still in a controversial stage, like ChatGPT's influence on learners' motivation remains largely

unknown (Ali et al., 2023), which deserves further exploration. In the future, researchers could examine how to more systematically reflect on the role of AI tools in education both theoretically and pedagogically. Finally, although there are many varieties of approaches to bibliometric analysis, this paper only uses CiteSpace, which is the most popular and widely used software for literature reviews worldwide. It would be helpful for future research to apply a wider variety of statistical software to the field of applied linguistics.

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Appendix A
The quality assessment of included studies

N.	Research Title	Research Question	Research Foci	Quality Assessment				
				(a)	(b)	(c)	(d)	Total
1	The Role of Learners' Socioeconomic Status and Perception of Technology Use in their Second Language Learning Motivation and Achievement	Clear	modeled how learners' SES and their perception of technology use for language learning are linked to their motivation for learning English as a foreign language (EFL) and level of English achievement	2	2	2	2	8
2	Types, Features, and Effectiveness of Technologies in Collaborative Writing for Second Language Learning	Clear	The types and effectiveness of technologies in collaborative writing	2	2	2	2	8
3	Perceived Usefulness Predicts Second Language Learners' Continuance Intention toward Language Learning Applications: A Serial Multiple Mediation Model of Integrative Motivation and Flow	Clear	investigate the possible association between perceived usefulness and continuance intention in the context of language learning and the mediating effects of integrative motivation and flow	2	2	2	2	8

4	Digital Game-Based Learning of Formulaic Expressions in Second Language Chinese	Clear	investigated the instructional and motivational effects of a digital game on learning Chinese formulaic expressions	2	2	2	2	8
5	Technologies in Content and Language Integrated Learning: Types, Purposes, and Outcomes	Clear	systematically reviewed studies on technology-enhanced CLIL (T-CLIL) and the learning outcomes reported	2	2	2	2	8
6	A Contribution-Oriented Self-Directed Mobile Learning Ecology Approach to Improving EFL Students' Vocabulary Retention and Second Language Motivation	Clear	A Contribution-oriented Self-Directed Mobile Learning Ecology (CSDMLE) model is proposed for developing student-directed and motivational vocabulary learning activities in groups.	2	2	2	2	8
7	Effects of CALL-Mediated TBLT on Motivation for L2 Reading	Clear	investigated the effectiveness of CALL-mediated TBLT on the motivation of Iranian university non-English major EFL students	2	2	2	2	8
8	Teaching Foreign Languages Using Mobile Technologies	Clear	examines the role of mobile applications used in the educational process of the university	2	2	1	2	8
9	Finding Satisfaction: Intrinsic Motivation for Synchronous and Asynchronous Communication in the Online Language Learning Context	Clear	explore the motivation for asynchronous collaborative writing practice, motivation for video-synchronous speaking practice, course satisfaction, and the mediating effect course satisfaction has on behavioral intentions to use language learning technology	2	2	2	2	8
10	The Role of Mobile Phones in Developing Motivation through	Clear	elucidate the effects of mobile phones as tools for teaching reading in	2	2	2	2	8

	Reading Activities in English Language Learners		fostering motivation in EFL students					
11	Enhancing English Acquisition: Effects of among us Game-Based Gamification on Language Competence, Motivation, Attention, and Attitude towards the English Subject	Clear	ascertain if there was a significant impact on the acquisition of English language competence, motivation, attention, and emotions towards English as a Second Language (ESL) after the development of gamification based on the famous Among us game with primary education students aged 7-8 years (n = 24) from a state school in Ciudad Real (Castilla-La Mancha)	2	2	2	2	8
12	Computer-Assisted English Learning: Uncovering the Relationship between Motivation and Self-Regulation	Clear	analyses the relationship between Hong Kong university students' motivation and self-regulation by considering their emotions in computer-assisted synchronic online English courses	2	2	2	2	8
13	Facilitating English-Language Learners' Oral Reading Fluency with Digital Pen Technology	Clear	to support the repeated reading strategy for promoting English-language oral reading fluency, learning motivation, and learning satisfaction	2	2	2	2	8
14	Dialogic Investigations: Motivation in Japanese Language Learning	Clear	shows how situation-specific and future-oriented motivations are related to each other	2	2	2	2	8
15	Online Videos for Self-Directed Second Language Learning	Clear	presents qualitative findings from a longitudinal study of the self-directed study behaviours	2	2	2	1	7
16	Latent Classes of Smartphone Dictionary Users	Clear	aims to explore types of motivation for smartphone dictionary	2	2	2	2	8

	Among Chinese EFL Learners: A Mixed-Method Inquiry into Motivation for Mobile Assisted Language Learning		use among Chinese university EFL learners					
17	Mastering Technology-Enhanced Language Learning, Computer-Assisted Language Learning, and Mobile-Assisted Language Learning	Clear	TELL, CALL, and MALL effectively improve learning motivation and develop better attitudes in students and language learners toward language learning	2	2	2	2	8
18	Modeling Students' Perceptions of Artificial Intelligence Assisted Language Learning	Clear	explored junior and senior high school students' behavioral intentions to use AI in second language (L2) learning, and the roles of related technological, social, and motivational factors	2	2	2	2	8
19	Social Robots for (Second) Language Learning in (Migrant) Primary School Children	Clear	tested the potential advantage of a social robot over a tablet in (second) language learning on performance, engagement, and enjoyment	2	2	2	1	8
20	Modality and Task Complexity Effects on Second Language Production in CMC	Clear	investigates the relationship between language production and motivation among second language learners via video CMC	2	2	2	2	8
21	Integrating Reflection into a Mobile-Assisted Reading Program for Learning English as a Second Language in China	Clear	aims to investigate students' perception of a mobile-assisted reading program facilitated with reflective activities as well as their preferences for reflection modes adopted	2	2	2	1	7
22	Artificial Intelligence-Based Content Generator	Clear	examined the extent to which the artificial intelligence-based	2	2	2	2	8

	Technology for Young English-as-a-Foreign-Language Learners' Reading Enjoyment		content generator-based activity could influence the participants' foreign language enjoyment and interests in reading English books					
23	The Effect of Using Artificial Intelligence and Digital Learning Tools based on Project-Based Learning Approach in Foreign Language Teaching on Students' Success and Motivation	Clear	determine the effect of digital tools and artificial intelligence applications on the achievement, motivation and retention of university students on the basis of project-based teaching approach in foreign language course	2	2	2	2	8
24	Digital Innovations in L2 Motivation: Harnessing the Power of the Ideal L2 Self	Clear	reports on an exploratory study which investigated the possibility of using technology to create representations of language learners' ideal L2 selves digitally	2	2	2	2	8
25	Enhancing L2 Learning through a Mobile Assisted Spaced-Repetition Tool: An Effective but Bitter Pill?	Clear	tested the effectiveness of the spaced-repetition flashcard application, Anki, on improving 62 university-level learners' second language (L2) learning in a semester-long beginning Spanish course	2	2	2	1	7
26	Knowledge Base Development for Second Language Learning in the 3D Virtual Space	Clear	aims to improve students' linguistic knowledge by summarizing classroom experiences, incorporating their feedback to enhance learning materials, and developing an algorithm to automatically generate tests and exercises based on the virtual library's knowledge base to	2	2	2	2	8

			support self-assessment and increase motivation					
27	Immersion into Virtual Reality for Language Learning	Clear	aimed at elaborating the effects of virtual immersion on language learning, especially on the affective dimension, including learner motivation and autonomy	2	2	2	2	8
28	Measuring Language Learners' Speaking Proficiency in a Second Language Using Economical Digital Tools	Clear	discussed student and instructor perceptions of using free and open source software	2	2	2	2	8
29	Psychological Factors Affecting Language-Learning Process in Saudi Arabia: The Effect of Technology-Based Education on High School Students' Motivation, Anxiety, and Attitude through Flipped Learning	Clear	examined the impacts of flipped learning as a kind of technology-based instruction on Saudi Arabia students' motivation, anxiety, and attitude	2	2	2	2	8
30	Chatbot-Based Learning of Logical Fallacies in EFL Writing: Perceived Effectiveness in Improving Target Knowledge and Learner Motivation	Clear	investigated the perceived effectiveness of chatbots in developing knowledge of logical fallacy in EFL writing and enhancing learner motivation	2	2	2	2	8
31	Measuring Motivational Pattern on Second Language Learning and its relationships to Academic Performance: A Case Study of Blended Learning course	Clear	elucidated learning behaviors indicating SRL and motivation during a BL course on second language learning	2	2	2	2	8
32	Integrating Computational	Clear	examines a method which can be used by	2	2	2	2	8

	Thinking Concept Into Digital Storytelling to Improve Learner's Motivation and Performance		instructors pursuing innovative methods for language teaching, which expands learners' motivation in second language learning					
33	Neuropsychological Maturity and Use of ICT in the Learning of English	Clear	aims to investigate if the learning of the second languages through the TIC influences in the motivation of the alumnado	2	2	2	2	8
34	Technical Assessment of Websites for Autonomous Learning of English as a Second Language	Clear	aims to identify the usefulness of a web tool (Lu and Yeung, 1998), thus impacting the user experience	2	2	2	1	7
35	The Effects of Blog-Mediated Peer Feedback on Learners' Motivation, Collaboration, and Course Satisfaction in a Second Language Writing Course	Clear	reported on a study of using blogs as out-of-class assignments for the development of learners' writing competence	2	2	2	1	7
36	Does a 3D Immersive Experience Enhance Mandarin Writing by CSL Students?	Clear	aimed at enhancing the Mandarin essay writing by learners of Chinese as a second language (CSL) in Singapore by using authentic contexts in Second Life (SL)	2	2	2	2	8
37	Online Media Creation and L2 Motivation: A Socially Situated Perspective	Clear	Using a grounded theory ethnographic approach (Charmaz, 2006), and with the aim of developing a theoretical account of the emergence of motivation in online media creation, this study investigated a blog project in an English language classroom in Sweden.	2	2	2	2	8

38	Opening the "Black Box": How Out-of-Class Use of Duolingo Impacts Chinese Junior High School Students' Intrinsic Motivation for English	Clear	presents a model based on self-determination theory and propose the idea of "motivational transfer" to explain the psychological mechanism underpinning the impact of technology	2	2	2	2	8
39	Presence and Agency in Real and Virtual Spaces: The Promise of Extended Reality for Language Learning	Clear	looks at opportunities, including higher learner motivation and challenges in the use of extended reality (XR) for second language learning	2	2	2	2	8
40	A Pedagogical Chatbot: A Supplemental Language Learning Tool	Clear	introduces a chatbot that was developed to support and motivate second language learners during the COVID-19 pandemic	2	2	2	2	8
41	Affective Variables and Informal Digital Learning of English: Keys to Willingness to Communicate in a Second Language	Clear	examined the under-researched relationship between informal digital learning of English (IDLE) activities (receptive IDLE activities and productive IDLE activities), affective variables (grit, motivation, self-confidence and second language speaking anxiety) and willingness to communicate in a second language	2	2	2	2	8
42	Mobile-Assisted Language Learning: A Duolingo Case Study	Clear	investigates the semester-long learning experiences and results of nine participants learning Turkish on Duolingo	2	2	2	2	8
43	Study for the Validation of Two Instruments for the Evaluation of Foreign Language Learning Websites	Clear	emphasizes the transformative role of technology in second language teaching and learning	2	2	2	1	7

44	L2 Writing Practice: Game Enjoyment as a Key to Engagement	Clear	aims to identify the relationship between interactions with W-Pal and writing performance and positive attitudes towards the system (engagement, motivation, and perceived performance)	2	2	2	2	8
45	Research Trends of Blended Language Learning: A bibliometric Synthesis of SSCI-Indexed Journal Articles during 2000-2019	Clear	aims to synthesize research trends of blended language learning studies over the past two decades, from 2000 to 2019	2	2	2	2	8
46	A Comparison of the Autonomous Use of Technology for Language Learning for EFL University Students of Different Proficiency Levels	Clear	examines the autonomous use of TELL outside the English classes of English learners of different proficiency levels	2	2	2	2	8
47	Individual Interest, Self-Regulation, and Self-Directed Language Learning with Technology beyond the Classroom	Clear	surveyed 322 university students on self-regulation and two interest constructs (interest in learning English and interest in pursuing personal interest in English), and tested how these factors related to their engagement in self-directed use of technology for English learning beyond the classroom.	2	2	2	2	8
48	Translation Apps: Increasing Communication with Dual Language Learners	Clear	discusses the potential benefits, such as learner's motivation, engagement, etc., and drawbacks of using translation apps	2	2	2	2	8
49	Contemporary American Literature in Online	Clear	aims to determine whether the developed online course enhances	2	2	2	2	8

	Learning: Fostering Reading Motivation and Student Engagement		student motivation and engagement in contemporary American literature					
50	Motivating Online Language Learners: From Theory to Design Strategies	Clear	introduces the self-determination theory (SDT) as an appropriate theoretical framework for addressing learning and motivation challenges in online Chinese learning	2	2	2	2	8
51	Mobile-Assisted Narrative Writing Practice for Young English Language Learners from a Funds of Knowledge Approach	Clear	To explore the learning effects of scaffolding young ELLs' narrative writing skills through the use of tablet computers (iPads) and a digital handwriting app (Penultimate). Research findings showed that ELLs' learning motivation and quality of narrative writing abilities were enhanced through the use of this mobile technology.	2	2	2	2	8
52	Early Second Language Learning and Adult Involvement in a Real-World Context: Design and Evaluation of the "ELENA Goes Shopping" Mobile Game	Clear	describes the theory-informed design of the "ELENA goes shopping" mobile game and reports on the evaluation of its effectiveness through a design research approach	2	2	2	2	8
53	A Framework for Enhancing Mobile Learner-Determined Language Learning in Authentic Situational Contexts	Clear	aims to explore the correlation between merger of these dimensions and external contextual elements with three interdependent learning concepts-personalization, adaptation, and relevancy-which enhance the mobile	2	2	2	2	8

			learner's motivation and self-determination					
54	Presenting Lecture Materials in English Using CLIL Technologies	Clear	aimed at researching of students' motivation to study the course using CLIL technologies	2	2	2	2	8
55	The Influence of Implementing Reciprocal Teaching in L2 Classes on Female Students' Perception of their Reading Skills and Motivation to Read	Clear	aimed to investigate the effectiveness of reciprocal teaching (RT) in improving high school female students' attitudes toward reading in a second language as the results might shed light on effective teaching practices in the L2 classrooms	2	2	2	1	7
56	Motivation, International posture, and willingness to communicate as predictors of L2 communication in online contexts	Clear	examines the relations between affective variables [L2 motivation, international posture, and willingness to communicate in a second language (L2 WTC)] and L2 FC in online contexts	2	2	2	2	8
57	Immersive Virtual Reality as a Tool for a Successful Learning of Russian as a Foreign Language	Clear	proposes a system for modeling integrated learning using VR technologies in Russian as a foreign language (RFL) lessons for different purposes: general language proficiency, professional communication	2	2	2	1	7
58	Factors Determining Students' Low Usage of Mobile Tools in their English Vocabulary Learning	Clear	explored high school students' use (1 digital vocabulary English learning strategies and the attitudes of Romanian students towards learning vocabulary in second language acquisition with digital tools	2	2	2	1	7
59	Mobile Formative Assessment and	Clear	aims at investigating how mobile formative	2	2	2	2	8

	Affective Factors in Italian University Students of Spanish		assessment (ATFA) impacts affective factors, in particular motivation and anxiety, in Italian university students learning Spanish as an Lz					
60	Assignment Design and its Effects on Japanese College Freshmen's Motivation in L2 Emergency Online Courses: A Qualitative Study	Clear	to examine various factors influencing Japanese college freshmen's (n = 80) motivation when completing graded online assignments as part of asynchronous English reading courses held during the COVID-19 pa1024ndemic	2	2	2	2	8
61	Addressing Language and Study Skills Challenges in Online Undergraduate EMI Courses	Clear	examines the correlation between the particular challenges they faced with reading and study skills (especially self-motivation) and any other skill	2	2	2	2	8
62	Technology-Supported Peer Feedback in ESL/EFL Writing Classes: A Research Synthesis	Clear	conducted comparative reviews of the characteristics, the pros and cons, and the differences between synchronous and asynchronous interaction for this mode of peer feedback, using Glaser and Strauss' Grounded Theory (1967) constant comparison method	2	2	2	1	7
63	Enjoyment, Boredom, and Perceived Effectiveness of Learners in language MOOCs: The Mediating Effect of Self-Regulated Learning	Clear	exploring the relationship between foreign language enjoyment (FLE), boredom (FLB), self-regulated learning (SRL), and perceived effectiveness in LMOOC learning	2	2	2	2	8
64	Integrating E-Learning into Process Writing:	Clear	explores, compared to students' traditional writing counterparts,	2	2	2	2	8

	The Case of a Primary School in Hong Kong		students in the e-learning classes, regardless of their language ability, motivation to write in English					
65	Understanding, Investigating, and Promoting Deep Learning in Language Education: A Survey on Chinese College Students' Deep Learning in the Online EFL Teaching Context	Clear	synthesized theoretical insights from deep learning in the education domain and related theories in the second language acquisition and thus proposed the four-dimension model hypothesis of deep learning involving the motivation of deep learning, the engagement of deep learning, the strategy of deep learning, and the directional competence of deep learning	2	2	2	2	8
66	Understanding Hong Kong Primary School English Teachers' Continuance Intention to Teach with ICT	Clear	synthesizes the technology acceptance model (TAM), the value-expectancy theory, and a learning perspective to propose a model -for investigating ESL teachers' continuance intention to use ICT in teaching	2	2	2	2	8
67	Augmented Reality Stories for Language Learning	Clear	explores the advantages of these digital tales with regard to the acquisition of literacy skills, as well as the motivation of the students	2	2	2	2	8
68	Gamifying ESL Classrooms through Gamified Teaching and Learning	Clear	explores the application of gamification or gamified learning in ESL teaching and learning. Based on the review, the researchers highlighted that motivation, engagement, and	2	2	2	2	8

			competition in learning through a gamification approach could assist students' meaningful ESL learning					
69	Collaborative Kinesthetic English Learning With Recognition Technology	Clear	employed advanced recognition technologies, pedagogical mechanisms, and interesting activity design. First, kinesthetic learning with a speaking accuracy measuring function to facilitate English as foreign language (EFL) learning is proposed. Namely, this function is about measuring the learners' speaking accuracy and recognizing whether their body movements and facial expressions match their English speaking content via recognition technology. This function is expected to improve the learners' pronunciation and motivation during the experiment.	2	2	2	2	8
70	Perceived Acceptance of Enacting Google Docs in an Online Collaborative EFL Writing Classroom	Clear	encapsulates the feasibility of enacting GD as a medium of online collaborative EFL writing practices in the age of the Covid-19 pandemic. Further research examining the acceptance of GD and other dependent variables, such as learning outcomes, engagement, motivation, and etc.	2	2	2	2	8
71	Modern Communication Technologies in	Clear	conclude that the creation of book trailers is one of the most relevant motivators for	2	2	2	2	8

	Education: Book Trailer		pupils in their cognitive activity as it combines work with a book and mastering modern communication technologies, increases interest in learning and the level of motivation to read					
72	Teachers' Use of Facebook Motivating Vietnamese Students to Improve Their English Language Learning	Clear	demonstrated that learning connections made through mobile learning and virtual learning environments could have a positive effect on learning outcomes and also increase students' motivation as well as a sense of community	2	2	2	2	8
73	Mobile Mediated Learning in Language Classrooms: Learner's Satisfaction, Their Perceived Usefulness of Instruction and Classroom Achievement	Clear	investigate how different aspects of mobile mediated learning including omnipresence, context customization, interactivity, perceived self-efficacy, and m-learning motivation affect second language learning	2	2	2	2	8
74	Investigating the Impact of a Mobile Learner-Generated-Content Tool on Pupils' after-School English Vocabulary Behavioural Learning Patterns, Learning Performance and Motivation: A Case Study	Clear	reports on a case study of investigating the effect of a mobile learner-generated content (m-LGC) tool on pupil' after-class English as a second language (ESL) vocabulary behavioural learning patterns, learning performance and motivation	2	2	2	2	8
75	The Use of Social Media Platforms to Enhance Vocabulary Developing in Learning a New Language: A	Clear	Recognized the correlation between Social media platforms (SMPs) and learner engagement, motivation, and	2	2	2	1	7

	Review of The Literature		vocabulary development					
76	Effects of Gamifying Questions on English Grammar Learning Mediated by Epistemic Curiosity and Language Anxiety	Clear	explored the effectiveness of gamifying content by examining how participants' two types of epistemic curiosity (i.e., interest-type epistemic curiosity (IEC) and deprivation-type epistemic curiosity (DEC)) related to posing questions affected their attitude towards gamification (ATG) and their learning progress	2	2	2	2	8
77	Complementing in-Class Language Learning with Voluntary out-of-Class MALL. Does Training in Self-Regulation and Scaffolding Make a Difference?	Clear	focuses on self-regulation and scaffolding for mobile assisted language learning (MALL)	2	2	2	2	8
78	Technology-Assisted L2 Research in Immersive Contexts Abroad	Clear	examine the contributions from recent cognitively-oriented SA studies that employ these techniques. We also include an overview of other technological resources employed in non-cognitively oriented studies, such as online surveys, blogs (i.e., public discussions and posts meant to be shared), and e-journals (i.e., on-going personal reflections), which have proved useful when answering important question related to learners' motivation, identity, and	2	2	2	2	8

			intercultural competence.					
79	An Experimental Study on Reading in High-Immersion Virtual Reality	Clear	VR could be used as a motivational tool to engage students in reading activities	2	2	2	2	8
80	The Predicative Power of Learner and Teacher Variables on Flow in a Chinese Blended English as a Foreign Language Learning Context	Clear	used a mixed-method approach to collect data from 607 Chinese English-as-a-Foreign-Language learners	2	2	2	1	7
81	Profiling Chinese EFL Students' Technology-Based Self-Regulated English Learning Strategies	Clear	reports the development and validation of an instrument, the Technology-Based Self-Regulated English Learning Strategies Scale (TSELSS), in terms of its multifaceted structure of self-directed use of technology in English learning among Chinese university EFL students	2	2	2	2	8
82	Digital Game-Based Vocabulary Learning: Where are We and Where are We Going?	Clear	revealed 10 types of digital games dominate the field, and these generally demonstrate positive effects in promoting short-term and long-term vocabulary learning, facilitating reading and listening comprehension, increasing motivation and engagement, decreasing anxiety and fostering interactions among learners	2	2	2	2	8
83	Engaging University Students in an ESL Live Broadcast	Clear	were to explore the following aspects for engaging students' participation: operation-monitoring, planning and implementation, incentives and motives,	2	2	2	2	8

			interactions with multiple formats and challenges						
84	Effects of the Reading Practice Platform (Readvise) in Developing Self-Regulated Reading Skills of Tertiary Students in L2 Learning	Clear	The focus of this design-based research is 39 undergraduate students who study English as a second language (L2). According to the results, through the elimination of the main barriers and uncertainties declared by the students when reading independently in L2, the platform contributes to the advancement of L2 reading skills of the students, encourages changes in their L2 reading behaviour, fosters metacognitive abilities, and reinforces intrinsic reading motivation.	2	2	2	2	8
85	Virtual World-Supported Contextualized Multimodal EFL Learning at a Library	Clear	to investigate the influence of story creation on young EFL learners' reading performance.	2	2	2	2	8
86	The Interaction Effects of an Instructor's Emotions in Instructional Videos and Students' Emotional Intelligence on L2 Vocabulary Learning	Clear	investigated the interaction effects of an instructor's emotions (positive vs. negative vs. neutral) and students' emotional intelligence (low vs. high) on students' second language vocabulary learning from instructional videos with consideration of attention paid to the learning material (i.e., average fixation time, referring to the duration of each fixation on the learning material),	2	2	2	2	8

			learning experience (i.e., motivation, engagement, interaction), and learning performance (both immediate and delayed)					
87	How Technology Tools Impact Writing Performance, Lexical Complexity, and Perceived Self-Regulated Learning Strategies in EFL Academic Writing: A Comparative Study	Clear	to investigate 280 Chinese undergraduate English as a foreign language (EFL) students' academic writing performance, lexical complexity, and perceptions of self-regulated strategies in academic writing	2	2	2	2	8
88	The "Training Firm" as a Way of Implementing a System- and Activity-Based Approach to Teaching in Higher Education Institutions	Clear	the use of new information technologies (Moodle, Google Presentation Service, and Padlet virtual whiteboard) facilitated further interest and motivation, which was confirmed by the results of the students' survey.	2	2	2	2	8
89	Factors Affecting Parental Intention to Use AI-Based Social Robots for Children's ESL Learning	Clear	to explore the factors that drive parental intention to adopt AI-based social robots for children's ESL learning. The research model is proposed based on the theories and literature regarding motivations, product smartness, personality traits and physical risk perception	2	2	2	2	8
90	Impacts of an Information and Communication Technology-Assisted Program on Attitudes and English Communication	Clear	suggest the importance of maintaining students' motivation to keep using such information and communication technology-assisted learning programs if they are not already	2	2	2	2	8

	Abilities: An Experiment in a Japanese High School		incorporated into the existing curriculum					
91	Promoting EFL Learner Autonomy in a Teacher-Centered Culture through Video-Sharing and Collaborating in Online Forums	Clear	aimed at assessing the development of autonomous learning behavior and the motivational impact of student collaboration on encouraging a change in student behavior toward autonomy	2	2	2	2	8
92	Learner Affect in Computerised L2 Oral Grammar Practice with Corrective Feedback	Clear	investigates learners' affective states and practice behaviour in a novel context: oral grammar practice with a computer-assisted language learning (CALL) system employing automatic speech recognition (ASR) technology to analyse learners' speech and provide feedback	2	2	2	2	8
93	Construction and Application of the Multi-intermediate Multi-media English Oral Teaching Mode	Clear	proposes a multi-interactive multi-media teaching mode based on computer technology combined with the development of oral English teaching under Chinese characteristics. The model proposed in this paper will combine the first layer of interaction in oral English teaching, that is, classroom and extracurricular teacher-student interaction, life-and-life interaction, and vital interaction and second-level interaction, namely teacher-student emotion, context and motivation	2	2	2	2	8

94	Augmented Reality for ESL/EFL and Bilingual Education: An International Comparison	Clear	The most noted advantages of AR are that it enhances classroom engagement and its focus is different from traditional teaching methods, increasing student motivation and facilitating their learning processes.	2	2	2	2	8
95	Synchronous Computer-mediated Corrective Feedback and EFL Learners' Grammatical Knowledge Development: A Sociocultural Perspective	Clear	employed a mixed methods approach to explore the effect of synchronous computer-mediated corrective feedback on EFL learners' grammatical knowledge development	2	2	2	2	8
96	The Relationship Between Future Career Self Images and English Achievement Test Scores of Japanese STEM Students	Clear	To encourage the formation of students' images of Ideal L2 selves or stronger Probable L2 selves, STEM teachers and language teachers of Japanese STEM students could introduce motivational interventions	2	2	2	2	8
97	The Effect of Online Interaction via Microsoft Teams Private Chat on Enhancing the Communicative Competence of Introverted Students	Clear	the use of Microsoft Private Chat for teacher-student interaction significantly contributes to the communicative competence of introverted students as it helps lower anxiety and boosts motivation and self confidence	2	2	2	2	8
98	Utilising Social Networking Sites to Improve Writing: A Case Study with Chinese Students in Malaysia	Clear	identifying what motivates English as a Second Language students to write in English on Facebook	2	2	2	2	8
99	Pedagogic Tasks in Digital Games:	Clear	Higher English proficiency had a	2	2	2	1	7

	Effects of Feedback Conditions and Individual Characteristics on Learning Request-Making		positive impact on their immediate gains in productive knowledge, while motivation to learn English had a negative impact on receptive knowledge					
100	A Method to Diagnose, Improve, and Evaluate Children's Learning Using Wearable Devices Such as Mobile Devices in the IoT Environment	Clear	to transform the traditional classroom into a modern classroom in order to increase the ease and efficiency of the teaching process	2	2	2	2	8
101	The Emergence and Influence of Group Leaders in Web-Based Collaborative Writing: Self-Reported Accounts of EFL Learners	Clear	provided affective support during the writing activity, with group members reporting that praise and motivational phrases received from their group leaders increased their self-confidence and motivation towards writing in English	2	2	2	2	8
102	Robots in Situated Learning Classrooms with Immediate Feedback Mechanisms to Improve Students' Learning Performance	Clear	Motivation in the learning process could be enhanced using authentic objects and scenarios in the digital situated learning environment.	2	2	2	2	8
103	Factors Influencing Chinese Undergraduate Students' Emotions in an Online EFL Learning Context during the COVID Pandemic	Clear	examined the influence of students' perceived online teaching quality and appraisals of control and value on their achievement emotions in an online second language (L2) learning context instigated by the COVID-19	2	2	2	2	8
104	Virtual Reality in Teaching Dialogic Speech in English: MGIMO-	Clear	have shown that virtual reality (VR) technology can significantly	2	2	2	2	8

	Odintsovo Experience		enhance students' learning motivation					
105	Flipped Teaching with CALL Media in EFL Writing Course: Indonesian EFL Writing Teachers' Reflection	Clear	explaining how flipped teaching with CALL motivates students and develops students' autonomous learning	2	2	2	2	8
106	Investigation of the Effect of Flipped Listening Instruction on the Listening Performance and Listening Anxiety of Chinese EFL Students	Clear	examined the effect of flipped listening instruction on the Chinese English as a foreign language (EFL) students' listening performance and listening anxiety using a quasi-experimental research design	2	2	2	2	8
107	Interactive Online Teaching of Phonetic Skills: Introductory Phonetic Course	Clear	to develop a methodology for forming communication skills (specifically phonetic skills) through a virtual learning environment involving online learning platforms, online tools, and mobile applications, which determines the relevance and timeliness of the study	2	2	2	2	8
108	Towards Lessening Learners' Aversive Emotions and Promoting Their Mental Health Developing and Validating a Measurement of English Speaking Demotivation in the Chinese EFL Context	Clear	attempts to develop and validate an English Speaking Demotivation Scale (ESDS)	2	2	2	2	8

References

Adiguzel, T., Kaya, M. H., & Cansu, F. K. (2023). Revolutionizing education with AI: Exploring the transformative potential of ChatGPT. *Contemporary Educational Technology*, 15(3).

Ali, J. K. M., Shamsan, M. A. A., Hezam, T. A., & Mohammed, A. A. (2023). Impact of ChatGPT on learning motivation: teachers and students' voices. *Journal of English Studies in Arabia Felix*, 2(1), 41-49.

Amabile, T. M., Hill, K. G., Hennessey, B. A., & Tighe, E. M. (1994). The Work Preference Inventory: assessing intrinsic and extrinsic motivational orientations. *Journal of personality and social psychology*, 66(5), 950.

Annamalai, N., Eltahir, M. E., Zyoud, S. H., Soundrarajan, D., Zakarneh, B., & Al Salhi, N. R. (2023). Exploring English language learning via Chabot: A case study from a self-determination theory perspective. *Computers and Education: Artificial Intelligence*, 5, 100148.

Ayedoun, E., Hayashi, Y., & Seta, K. (2019). Adding communicative and affective strategies to an embodied conversational agent to enhance second language learners' willingness to communicate. *International Journal of Artificial Intelligence in Education*, 29(1), 29-57.

Ayeni, O. O., Al Hamad, N. M., Chisom, O. N., Osawaru, B., & Adewusi, O. E. (2024). AI in education: A review of personalized learning and educational technology. *GSC Advanced Research and Reviews*, 18(2), 261-271.

Azamatova, A., Bekeyeva, N., Zhaxylikova, K., Sarbassova, A., & Ilyassova, N. (2023). The effect of using artificial intelligence and digital learning tools based on a project-based learning approach in foreign language teaching on students' success and motivation. *International Journal of Education in Mathematics, Science and Technology*, 11(6), 1458-1475.

Bahari, A. (2023). Affordances and challenges of technology-assisted language learning for motivation: A systematic review. *Interactive Learning Environments*, 31(9), 5853-5873.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological review*, 84(2), 191.

Bartolacci, F., Caputo, A., & Soverchia, M. (2020). Sustainability and financial performance of small and medium-sized enterprises: A bibliometric and systematic literature review. *Business Strategy and the Environment*, 29(3), 1297-1309.

Bewersdorff, A., Hornberger, M., Nerdel, C., & Schiff, D. S. (2025). AI advocates and cautious critics: How AI attitudes, AI interest, use of AI, and AI literacy build university students' AI self-efficacy. *Computers and Education: Artificial Intelligence*, 8, 100340.

Biju, N., Abdelrasheed, N. S. G., Bakiyeva, K., Prasad, K. D. V., & Jember, B. (2024). Which one? AI-assisted language assessment or paper format: An exploration of the impacts on foreign language anxiety, learning attitudes, motivation, and writing performance. *Language Testing in Asia*, 14(1), 45.

Bimba, A. T., Idris, N., Al-Hunaiyyan, A., Mahmud, R. B., & Shuib, N. L. B. M. (2017). Adaptive feedback in computer-based learning environments: a review. *Adaptive Behavior*, 25(5), 217-234.

Bolter, J. D., Engberg, M., & MacIntyre, B. (2021). *Reality media: Augmented and virtual reality*. MIT Press.

Chapelle, C. A. (2009). The relationship between second language acquisition theory and computer-assisted language learning. *The modern language journal*, 93, 741-753.

Chen, C., Hu, W., & Wei, X. (2024). From anxiety to action: exploring the impact of artificial intelligence anxiety and artificial intelligence self-efficacy on motivated learning of undergraduate students. *Interactive Learning Environments*, 1-16.

Cheng, X., Gao, L. X., & Liu, Y. (2024). The enactment of positive emotions via teacher scaffolding: The case of Chinese high school EFL learners' engagement with teacher written feedback. *System*, 124, 103375.

Chiu, T. K. (2023). Student engagement in K-12 online learning amid COVID-19: A qualitative approach from a self-determination theory perspective. *Interactive learning environments*, 31(6), 3326-3339.

Chiu, T. K., Moorhouse, B. L., Chai, C. S., & Ismailov, M. (2024). Teacher support and student motivation to learn with Artificial Intelligence (AI) based chatbot. *Interactive Learning Environments*, 32(7), 3240-3256.

Collie, R. J., & Martin, A. J. (2024). Teachers' motivation and engagement to harness generative AI for teaching and learning: The role of contextual, occupational, and background factors. *Computers and Education: Artificial Intelligence*, 6, 100224.

Crawford, C., Boyd, C., Jain, S., Khorsan, R., & Jonas, W. (2015). Rapid Evidence Assessment of the Literature: Streamlining the systematic review process and creating utility for evidence-based health care. *BMC Research Notes*, 8(1), 1-9.

Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin*, 125(6), 627-668.

Deckker, D., & Sumanasekara, S. (2025). Emotional AI for student motivation and retention: A systematic review and future directions. *International Journal of Global Economic Light*, 11(3).

Deng, X., & Yu, Z. (2022). A systematic review of machine-translation-assisted language learning for sustainable education. *Sustainability*, 14(13), 7598.

Doo, M. Y., & Zhu, M. (2024). A meta-analysis of effects of self-directed learning in online learning environments. *Journal of Computer Assisted Learning*, 40(1), 1-20.

Dörnyei, Z., & Ushioda, E. (2009). *Motivation, language identity and the L2 self*. Multilingual Matters.

Ertan, K., & Kocadere, S. A. (2022). Gamification design to increase motivation in online learning environments: A systematic review. *Journal of Learning and Teaching in Digital Age*, 7(2), 151-159.

Fan, J., & Zhang, Q. (2024). From literacy to learning: The sequential mediation of attitudes and enjoyment in AI-assisted EFL education. *Heliyon*, 10(17), e37158.

Fang, X., Ng, D. T. K., Leung, J. K. L., & Xu, H. (2024). The applications of the ARCS model in instructional design, theoretical framework, and measurement tool: a systematic review of empirical studies. *Interactive Learning Environments*, 32(10), 5919-5946.

Fissore, C., Floris, F., Conte, M.M., Sacchet, M. (2024). Teacher Training on Artificial Intelligence in Education. In: Sampson, D.G., Ifenthaler, D., Isaías, P. (eds) *Smart Learning Environments in the Post Pandemic Era. Cognition and Exploratory Learning in the Digital Age*. Springer, Cham.

Gligorea, I., Cioca, M., Oancea, R., Gorski, A. T., Gorski, H., & Tudorache, P. (2023). Adaptive learning using artificial intelligence in e-learning: A literature review. *Education Sciences*, 13(12), 1216.

Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial Intelligence in Education: Promises and Implications for Teaching and Learning*. Center for Curriculum Redesign.

Hossain, M. K., & Al Younus, M. A. (2025). Teachers' perspectives on integrating ChatGPT into EFL writing instruction. *TESOL Communications*, 4(1), 41-60.

Ishida, K., & Sekiyama, Y. (2024). Variables influencing students' learning motivation: Critical literature review. *Frontiers in Education*, 9, 1445011.

Ismailov, M., & Ono, Y. (2021). Assignment design and its effects on Japanese college freshmen's motivation in L2 emergency online courses: A qualitative study. *The Asia-Pacific Education Researcher*, 30(3), 263-278.

Iweuno, B. N., Orekha, P., Ojediran, O., Imohimi, E., & Adu-Twum, H. T. (2024). Leveraging Artificial Intelligence for an inclusive and diversified curriculum. *World Journal of Advanced Research and Reviews*, 23(2), 1579-1590.

Jia, J., & Zhang, Y. (2023). Artificial intelligence and education: Opportunities, challenges, and strategies. *Peking University Education Review*, 21(1), 49-61.

Jin, S. H., Im, K., Yoo, M., Roll, I., & Seo, K. (2023). Supporting students' self-regulated learning in online learning using artificial intelligence applications. *International Journal of Educational Technology in Higher Education*, 20(1), 37.

Katsantonis, A., & Katsantonis, I. G. (2024). University students' attitudes toward artificial intelligence: An exploratory study of the cognitive, emotional, and behavioural dimensions of AI attitudes. *Education Sciences*, 14(9), 988.

Keller, J. M. (2010). *Motivational design for learning and performance: The ARCS model approach*. Springer.

Li, C. (2023). Exploring L2 Motivational Dynamics among Chinese EAP Learners in an EMI Context from a Socio-cultural Perspective. *SAGE OPEN*, 13(2), 1-13.

Li, C., Fang, X., & Derakhshan, A. (2025). Unlocking the interplay among Chinese EFL Learners' L2 motivation, regulatory focus, and language learning achievement: From a regulatory focus theory perspective. *Learning and Motivation*, 91, 102141

Liu, W., & Yu, H. (2012). Effectiveness study of English learning in blended learning environment. *Theory & Practice in Language Studies* (TPLS), 2(3).

Mahmoud, C. F., & Sørensen, J. T. (2024). Artificial Intelligence in Personalized Learning with a Focus on Current Developments and Future Prospects. *Research and Advances in Education*, 3(8), 25-31.

Mannion, P. (2023). SLA Doctoral Students' Collaborative Digital Storytelling Experiences and Perceptions. *TESOL Communications*, 2(2), 63-80.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017-1054.

Mohebbi, A. (2025). Enabling learner independence and self-regulation in language education using AI tools: a systematic review. *Cogent Education*, 12(1), 2433814.

Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., Shekelle, P., Stewart, L. A., & Prisma-P Group. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic reviews*, 4, 1-9.

Ng, D. T. K., & Chu, S. K. W. (2021). Motivating students to learn STEM via engaging flight simulation activities. *Journal of Science Education and Technology*, 30(5), 608-629.

Nguyen, L., Tomy, S., & Pardede, E. (2024). Enhancing Collaborative Learning and E-Mentoring in a Smart Education System in Higher Education. *Computers*, 13(1), 28.

Qiao, H., & Zhao, A. (2023). Artificial intelligence-based language learning: illuminating the impact on speaking skills and self-regulation in Chinese EFL context. *Frontiers in Psychology*, 14, 1255594.

Ray, S., & Sikdar, D. P. (2024). AI-Driven flipped classroom: Revolutionizing education through digital pedagogy. *British Journal of Education, Learning and Development Psychology*, 7(2), 169-179.

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, 25(1), 54-67.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1), 68-78.

Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology*, 61, 101860.

Salem, I. b. (2024). Integrating artificial intelligence in personalized learning: A future-oriented approach to enhance student engagement and achievement. *International Journal of Post Axial: Futuristic Teaching and Learning*, 111-119.

Selwyn, N. (2021). *Education and technology: Key issues and debates*. Bloomsbury Publishing.

Sharma, K., Giannakos, M., & Dillenbourg, P. (2020). Eye-tracking and artificial intelligence to enhance motivation and learning. *Smart Learning Environments*, 7(13).

Song, C., & Song, Y. (2023). Enhancing academic writing skills and motivation: assessing the efficacy of ChatGPT in AI-assisted language learning for EFL students. *Frontiers in Psychology*, 14, 1260843.

Song, C., Shin, S. Y., & Shin, K. S. (2023). Optimizing foreign language learning in virtual reality: a comprehensive theoretical framework based on constructivism and cognitive load theory (VR-CCL). *Applied Sciences*, 13(23), 12557.

Strielkowski, W., Grebennikova, V., Lisovskiy, A., Rakhimova, G., & Vasileva, T. (2025). AI-driven adaptive learning for sustainable educational transformation. *Sustainable Development*, 33(2), 1921-1947.

Teng, M. F., & Yang, Z. (2023). Metacognition, motivation, self-efficacy belief, and English learning achievement in online learning: Longitudinal mediation modeling approach. *Innovation in language learning and teaching*, 17(4), 778-794.

Tomlinson, C. A. (2001). *How to differentiate instruction in mixed-ability classrooms*. ASCD.

Tomlinson, C. A. (2014). *The differentiated classroom: Responding to the needs of all learners*. ASCD.

Tossell, C. C., Tenhundfeld, N. L., Momen, A., Cooley, K., & de Visser, E. J. (2024). Student perceptions of ChatGPT use in a college essay assignment: Implications for learning, grading, and trust in artificial intelligence. *IEEE Transactions on Learning Technologies*, 17, 1069-1081.

Toste, J. R., Didion, L., Peng, P., Filderman, M. J., & McClelland, A. M. (2020). A meta-analytic review of the relations between motivation and reading achievement for K-12 students. *Review of Educational Research*, 90(3), 420-456.

Tulasi, L., & Rao, C. S. (2023). Integration of AI-technologies into ELT: A brief study. *Journal for Research Scholars and Professionals of English Language Teaching*, 7(38).

Urban, M., Děchtěrenko, F., Lukavský, J., & others. (2024). ChatGPT improves creative problem-solving performance in university students: An experimental study. *Computers & Education*, 215, 105031.

Vallerand, R. J., Pelletier, L. G., Blais, M. R., Briere, N. M., Senecal, C., & Vallieres, E. F. (1992). The Academic Motivation Scale: A measure of intrinsic, extrinsic, and amotivation in education. *Educational and psychological measurement*, 52(4), 1003-1017.

VanLehn, K. (2011). The relative effectiveness of human tutoring, intelligent tutoring systems, and other tutoring systems. *Educational Psychologist*, 46(4), 197–221.

Wang, C., Li, Z., & Bonk, C. (2024). Understanding self-directed learning in AI-Assisted writing: A mixed methods study of postsecondary learners. *Computers and Education: Artificial Intelligence*, 6, 100247.

Warschauer, M. (2004). *Technology and social inclusion: Rethinking the digital divide*. MIT Press.

Wesely, P. M. (2012). Learner attitudes, perceptions, and beliefs in language learning. *Foreign Language Annals*, 45(1), 98-117.

Wigfield, A., & Eccles, J. S. (2000). Expectancy-value theory of achievement motivation. *Contemporary Educational Psychology*, 25(1), 68-81.

Xin, Z., & Derakhshan, A. (2025). From excitement to anxiety: Exploring English as a foreign language learners' emotional experiences in the artificial intelligence-powered classrooms. *European Journal of Education*, 60(1), e12845.

Yang, C., Wei, M., & Liu, Q. (2025). Intersections between cognitive-emotion regulation, critical thinking and academic resilience with academic motivation and autonomy in EFL learners: Contributions of AI-mediated learning environments. *British Educational Research Journal*.

Yilmaz, R., & Yilmaz, F. G. K. (2023). The effect of generative artificial intelligence (AI)-based tool use on students' computational thinking skills, programming self-efficacy and motivation. *Computers and Education: Artificial Intelligence*, 4, 100147.

Yuan, L., & Liu, X. (2025). The effect of artificial intelligence tools on EFL learners' engagement, enjoyment, and motivation. *Computers in Human Behavior*, 162, 108474.

Zawacki-Richter, O., Mar ń, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education–where are the educators?. *International journal of educational technology in higher education*, 16(1), 1-27.

Zhang, Y., & Miao, Z. (2025). Enhancing EFL Learners' Engagement and Motivation Through Immersive Technologies: The Role of Artificial Intelligence, Augmented Reality, Virtual Reality, and Mobile Applications. *European Journal of Education*, 60(2), e70128.

Zheng, L., Fan, Y., Gao, L., Huang, Z., Chen, B., & Long, M. (2024). Using AI-empowered assessments and personalized recommendations to promote online collaborative learning performance. *Journal of Research on Technology in Education*, 57(1), 1-27.

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