

The Use of Artificial Intelligence in Primary School English Teachers' Teaching and Learning: A Systematic Literature Review

Nur Iliana Mohd Fouzi & Mohd Jasmy Abd Rahman

Faculty of Education, Universiti Kebangsaan Malaysia

DOI: <https://doi.org/10.47772/IJRISS.2026.1026EDU0601>

Received: 12 September 2026; Accepted: 17 September 2026; Published: 01 October 2026

ABSTRACT

In line with the rapid advancement of artificial intelligence (AI) in education, AI integration in the teaching and learning practices of primary school English teachers has gained increasing attention due to its potential to enhance teaching effectiveness and support personalised learning. However, the factors supporting and challenges constraining AI integration in this context have yet to be systematically synthesised. Therefore, this systematic literature review synthesised the factors supporting and challenges hindering AI integration in the teaching and learning practices of primary school English teachers, guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines. Literature searches were conducted across three databases: Scopus, Web of Science (WoS), and the Education Resources Information Center (ERIC). A total of 20 articles published between 2022 and 2026 were selected based on predetermined inclusion and exclusion criteria and analysed using thematic analysis. The findings identified five key supporting factors: teacher competence, teacher attitudes and acceptance, pedagogical benefits of AI, enhanced teacher productivity, and organisational support. Six major challenges were also identified: insufficient teacher competence, teacher-related psychological factors, AI-related ethical issues, technological and infrastructural constraints, organisational constraints, and pedagogical challenges. Overall, successful AI integration depends not only on technological advancement but also on the interplay of individual, pedagogical, organisational, and educational environmental factors. These findings provide useful insights for teachers, administrators, policymakers and researchers to support effective, ethical and systematic AI integration in education.

Keywords: artificial intelligence, teaching and learning, primary school English teachers, AI integration, systematic literature review

INTRODUCTION

The transformation of the global education system has seen artificial intelligence (AI) evolve from merely a current trend into a critical necessity that plays an important role in teaching and learning, in line with the advancement of the Fourth Industrial Revolution (IR 4.0). The application of AI has brought a new dimension to the education sector by serving as an effective teaching aid with the potential to enhance the quality of learning (Farah Farhana Awang & Nisma Wahab, 2026). In the context of primary school English language education, the integration of AI offers significant potential to transform learning experiences and provide more precise feedback to address the diverse needs of pupils. This is particularly important because the primary school years represent a critical period in second language acquisition, requiring intensive, contextual and interactive exposure (Nur Sakinah Zulkarnain & Melor Md Yunus, 2023).

Global studies have demonstrated that the use of AI in language education through adaptive learning platforms and virtual tutors has significantly improved students' motivation, literacy skills and engagement (Bernal et al., 2025; Mananay, 2024). In addition, AI can help enhance pupils' confidence by providing a safe digital learning environment free from social anxiety (Karataş et al., 2024). The use of AI in English language education also enhances differentiated learning by providing personalised materials tailored to pupils' proficiency levels and needs while offering interactive learning experiences that can improve literacy skills among primary school pupils (Mohd Amzari Tumiran et al., 2025). Furthermore, AI enables more consistent and faster automated feedback while helping teachers reduce administrative workloads, such as marking assignments, managing

grades and recording attendance. This allows teachers to devote greater attention to the quality of instruction and interactions with pupils in the classroom (Zamri Mahamod, 2026).

In line with these global developments, Malaysia has also taken proactive steps to leverage AI technology to strengthen the national education system. This commitment is reflected in the implementation of the Digital Education Policy by the Ministry of Education Malaysia (MOE) in 2023 which emphasises the development of a digitally fluent generation, the enhancement of educators' digital competencies and the strengthening of digital education infrastructure and ecosystems (Syakirah Che Dahalan & Mohd Syaubari Othman, 2025). However, the level of technology use among English language teachers remains inconsistent despite the rapid development of AI and its growing prominence in the education sector. Previous studies have found that AI use varies among teachers due to digital disparities in terms of skills, experience, and technological readiness (Lie et al., 2020; United Nations Educational Scientific and Cultural Organization, 2023). In addition, demographic factors such as age and teaching experience also influence teachers' acceptance and use of AI in teaching and learning (Nur Khairunnisa Odin & Selvam, 2025). In addition, infrastructural challenges and limited organisational support remain barriers to the effective implementation of AI. Schools in rural areas, in particular, continue to face constraints related to digital infrastructure and unstable internet connectivity which limit the optimal use of AI in the classroom (Eden et al., 2024; Saleem et al., 2025).

Furthermore, teachers also face psychological barriers and a lack of targeted professional development, which hinder the transition towards modern teaching approaches. A study by Syakirah Che Dahalan & Mohd Syaubari Othman (2025) found that the level of AI use among teachers remains relatively low despite their basic knowledge of the technology. The lack of formal training and specialised professional development programmes makes it difficult for educators to develop the technical skills, readiness, and confidence required to integrate AI effectively into teaching and learning (Ng et al., 2023; Noraini Hamzah & Hafizhah Zulkifli, 2025). These instructional constraints ultimately lead to feelings of anxiety and undermine teachers' sense of competence in using the technology in the classroom. (Ayanwale et al., 2022; Celik et al., 2022). These instructional constraints may ultimately lead to feelings of anxiety and undermine teachers' sense of competence in using the technology in the classroom (Lim et al., 2024; Ting & Helmi Norman, 2024). At the same time, the integration of AI into primary school classrooms also raises significant pedagogical dilemmas and ethical concerns among educators (Aljabr et al., 2025; Aravatinos et al., 2024). There is a risk of over-reliance on technology which may adversely affect creativity, human interaction and critical thinking skills among young pupils (Fang & Han, 2025). Teachers often face challenges in balancing the instructional automation offered by AI with the human aspects of pedagogy (Bates et al., 2020). Educators' lack of confidence in navigating this transition also stems from the perception that inadequate technological competence may undermine their professional autonomy, thereby raising concerns about the potential replacement of teachers' roles by automated systems (Bond et al. 2024; Zeng et al. 2025). This also raises critical questions about the effectiveness of existing technology integration strategies as the use of AI depends not only on the availability of technological devices but also on various complex human factors.

Although research on AI in education continues to expand, a knowledge gap remains regarding the use of AI in the teaching and learning of English at the primary school level. Furthermore, most previous studies have focused on secondary or higher education rather than primary education (Crompton & Burke, 2023; Zhai et al., 2024). In addition, studies on the use of AI by primary school English teachers have yet to be comprehensively synthesised, despite English being one of the subjects that could potentially benefit from the integration of AI into teaching and learning (Sharadgah & Sa'di, 2022; Yaseen & Alnakeeb, 2023). The factors that support and the challenges that hinder the use of AI in primary school English teaching and learning have yet to be systematically synthesised, thus highlighting the need for a systematic literature review. Therefore, this study aims to synthesise previous studies on the use of AI in the teaching and learning practices of primary school English teachers through a systematic literature review approach. To achieve this aim, the study addresses the following two research questions:

1. What factors support the integration of artificial intelligence (AI) into the teaching and learning practices of primary school English teachers?
2. What challenges hinder the integration of artificial intelligence (AI) into the teaching and learning practices of primary school English teachers?

METHODOLOGY

To conduct this systematic literature review, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol was adopted as the primary guideline to ensure that the review process was conducted systematically, transparently and in an organised manner, thereby enhancing the transparency, reliability and quality of the study findings. This method involved establishing inclusion and exclusion criteria prior to conducting the review and comprised three main stages: identification, screening, and inclusion, in accordance with the PRISMA 2020 statement updated by Page et al. (2021).

Inclusion and Exclusion Criteria

The criteria were established to ensure that only relevant articles aligned with the study objectives were selected for analysis. The selection criteria covered several aspects including publication year, language, type of literature, database and research focus. In terms of publication year, only articles published within the most recent five-year period from 2022 to 2026 were selected to ensure that the literature analysed reflected current developments in the use of AI in teaching and learning. This period was selected to enable the review to focus on current trends and developments in artificial intelligence technology, which continues to evolve rapidly (Crompton & Burke, 2023).

For source selection, three databases—Scopus, Web of Science (WoS) and ERIC were selected because they complement one another in providing broad and comprehensive coverage of the literature in the field of education. Scopus and WoS are internationally recognised indexing databases that include high-quality, peer-reviewed journals while ERIC is a specialised education database that provides a wide range of scholarly articles related to educational research and practice. The combination of these three databases enabled a more comprehensive literature search and reduced the risk of overlooking relevant articles (Baig et al., 2020; Elmoazen et al., 2023).

In terms of language, only articles published in English were included in this review as no articles published in Malay met the study criteria in the selected databases. Furthermore, English is the predominant language of international scholarly publications, providing access to a broader range of relevant sources on the use of AI in teaching and learning. In terms of literature type, this review included only journal articles, while theses, conference proceedings, book chapters, reports and news articles were excluded. This selection was made because journal articles typically undergo a peer-review process and provide more systematic methodologies and research findings thereby enhancing the credibility and accuracy of the synthesis produced in this systematic literature review.

Article Selection Process

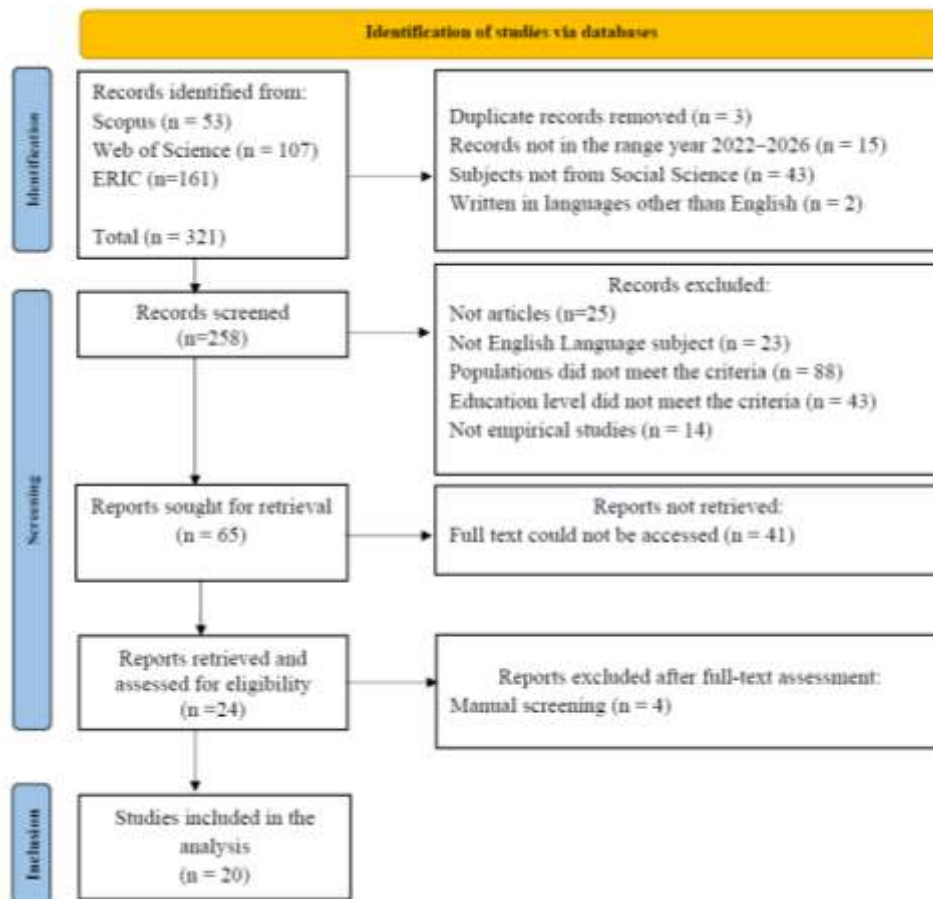
The search keywords were systematically developed to ensure that the retrieved articles were aligned with the research questions. As the use of AI in the teaching and learning practices of primary school English teachers encompasses various dimensions, concepts and terminologies, the use of a single keyword was insufficient to retrieve comprehensive and relevant literature. Therefore, several key terms and their synonyms were identified and combined to broaden the scope of the search, improve the accuracy of the search results and reduce the risk of overlooking articles that met the scope of the review. The keywords used in the search process included artificial intelligence, teacher, ELT, primary school and factor. To ensure a more systematic and comprehensive search process, the Boolean operators AND and OR were used to combine keywords with the same or similar meanings and to connect the main components of the study. This strategy enabled a more precise and comprehensive search for relevant articles. Table 1 below presents the search strings used to identify articles in each database.

Table 1: Search Strings Used in the Systematic Literature Review

Database	Search String
Scopus / ERIC	("artificial intelligence" OR "AI" OR "generative AI") AND ("factor" OR "influence" OR "determinant" OR "barrier" OR "adoption" OR "acceptance" OR "readiness" OR "perception") AND ("English" OR "language" OR "ELT" OR "ESL" OR "EFL") AND

	("primary school" OR "elementary school" OR "primary education" OR "elementary education") AND ("teacher" OR "educator" OR "instructor")
WoS	(((((TS = "artificial intelligence") OR (TS = "AI")) OR (TS = "generative AI")) AND ((((((TS = "factor") OR (TS = "influence")) OR (TS = "determinant")) OR (TS = "barrier")) OR (TS = "adoption")) OR (TS = "acceptance")) OR (TS = "readiness")) OR (TS = "perception")) AND (((((TS = "English") OR (TS = "language")) OR (TS = "ELT")) OR (TS = "ESL")) OR (TS = "EFL")) AND (((TS = "primary school") OR (TS = "elementary school")) OR (TS = "primary education")) OR (TS = "elementary education")) AND ((TS = "teacher") OR (TS = "educator"))

Figure 1 : Flow diagram of the article selection process. (Adapted from Page et al. (2021))



Stage 1 – Identification

At the identification stage, a total of 321 records were identified from three databases: Scopus (n = 53), Web of Science (n = 107) and ERIC (n = 161). An initial filtering process was then conducted, resulting in the removal of 3 duplicate records, 15 records published outside the 2022–2026 period, 43 records outside the field of Social Sciences and 2 records published in languages other than English. Following this process, 258 records remained for the next stage.

Stage 2 – Screening

During the screening stage, 258 records were screened based on their titles and abstracts according to the predetermined inclusion and exclusion criteria. A total of 193 records were excluded because they were not journal articles (n = 25), focused on subjects other than English (n = 23), involved study populations or samples that did not meet the criteria (n = 88), focused on educational levels that did not meet the criteria (n = 43) and were not empirical studies (n = 14). Consequently, 65 reports were sought for retrieval. Of these, 41 reports could not be retrieved because their full texts were inaccessible, while 24 reports were successfully retrieved and assessed for eligibility. Thus, the 65 reports sought for retrieval comprised 41 reports that could not be retrieved and 24 reports that were successfully retrieved for eligibility assessment (65 – 41 = 24).

Stage 3 – Inclusion

At this stage, 24 full-text articles were assessed for eligibility and underwent quality assessment based on the established criteria. However, a manual review found that four articles did not fully meet the scope and focus of the study and were therefore excluded. Consequently, a total of 20 articles were selected and included in the final analysis of this systematic literature review.

Quality Assessment

Articles that passed the manual screening subsequently underwent a quality assessment process using a rubric adapted from Mullet et al. (2017) to ensure that the included studies met seven key quality criteria: research objectives and aims, literature review, theoretical or conceptual framework, study participants, research methods, findings and conclusions, and study significance. Each criterion was assessed using a four-point scale: 4 (exceeds the standard), 3 (meets the standard), 2 (nearly meets the standard), and 1 (does not meet the standard). Therefore, the maximum total score for each article was 28 points. In this review, the quality assessment threshold was set at a minimum of 50% of the total score, equivalent to 14 out of 28 points. Articles scoring 14 points or above were considered to have met the established quality standard and were eligible for inclusion in the study synthesis, whereas articles scoring below this threshold were excluded. This assessment aimed to ensure that only articles of sufficient quality were included in the synthesis. Overall, all articles obtained scores ranging from 25 to 28 points, indicating a high level of methodological quality. Therefore, all 20 articles were retained and included in the study synthesis.

Data Analysis

Following the completion of the quality assessment process, 20 articles were identified as meeting all the study criteria and were selected for the final synthesis. Data analysis was conducted systematically in two main stages. In the first stage, data extraction was carried out by extracting key information, including authors, year of publication, study title, research objectives, research methodology, key findings, limitations, and study implications. In addition, the findings from each article were mapped according to Research Question 1 and Research Question 2 to develop a synthesis matrix that facilitated comparison and synthesis across the studies. This process aimed to ensure that information from each article was recorded systematically and consistently before the thematic analysis was conducted. Table 2 presents a summary of the article findings based on the two research questions.

In the second stage, data from the 20 selected articles were analysed using thematic analysis to identify the main themes and subthemes related to the research questions. The analysis began with repeated readings of the articles to gain a comprehensive understanding of their content. Subsequently, the findings from each article were coded and colour-coded according to the identified categories. This approach facilitated the systematic development of themes and subthemes based on patterns emerging from the findings of the analysed articles, thereby supporting a comprehensive synthesis of the studies.

Table 2: Summary matrix of article findings based on the research questions

Author(s)	Factors Supporting AI Integration in Teaching and Learning	Challenges Hindering AI Integration in Teaching and Learning
Benek (2025)	Personalised learning, immediate feedback, tailored content and enhanced teaching effectiveness.	Ethical concerns, curriculum compatibility, AI dependency and limited professional development.
Deshen et al. (2026)	AI literacy, motivation, computational thinking, readiness and positive attitudes.	AI anxiety, digital divide and low AI literacy.
Hastomo et al. (2026)	Rapid and creative generation of level-appropriate teaching materials and learning activities.	Limited practical training, AI literacy and professional development.
Jatileni et al. (2024)	Positive attitudes, perceived relevance, confidence and perceived social benefits of AI.	Low confidence, limited readiness and concerns about emerging technologies.

Karagiorgou et al. (2026)	Perceived usefulness, ease of use, positive attitudes, ICT training and experience.	Limited practical readiness and demographic differences in AI use.
Lademann et al. (2026)	Professional development enhances AI literacy, confidence, attitudes and readiness.	Lack of continuous professional development and limited AI competence.
Sofronieva et al. (2025)	Creative, interactive and pupil-centred AI-generated language activities.	Limited experience, training and AI-related skills.
Taani et al. (2025)	Teaching material preparation, instructional design, classroom dialogue and teacher self-regulation.	Differences in school type, gender and teaching experience.
Xu et al. (2025)	Interactive digital games enhance vocabulary, communication, engagement and personalised learning.	Technical constraints and limited AI system functionality.
Pratiwi et al. (2025)	Personalised learning, immediate feedback, enriched teaching strategies and access to diverse information.	Infrastructure limitations, digital divide, low AI literacy, ethical concerns and AI dependency.
Riggs (2025)	Positive perceptions, pupil engagement, personalised learning and improved teaching effectiveness.	Limited professional development, educational resources and ethical concerns.
Iddrisu & Iddrisu (2025)	Self-efficacy, technology experience and institutional support.	Limited training, infrastructure and ethical concerns.
Crosthwaite et al. (2025)	Differentiated learning, material development, assessment, reduced workload and effective prompting.	Limited prompting skills and need for prompt-engineering training.
Galindo-Domínguez et al. (2024)	Positive attitudes and perceptions encourage AI adoption and use.	Gap between positive attitudes and actual classroom use due to limited practical skills.
Wu et al. (2025)	Organisational support, positive school culture and a supportive educational ecosystem.	Weak innovation culture and insufficient organisational support.
Zimotti et al. (2024)	ChatGPT supports innovation, creativity and flexibility in language teaching.	Academic integrity, ethical concerns and unclear AI policies.
Velandar et al. (2024)	AI literacy and knowledge support effective pedagogical decision-making.	Limited AI knowledge, unclear guidelines and emotional concerns.
Nga et al. (2025)	Ease of use, technological pedagogical knowledge and self-efficacy.	Perceived difficulty, limited technological pedagogical knowledge and low self-efficacy.
Cetin et al. (2024)	Positive perceptions, instructional planning and personalised learning.	Plagiarism, information accuracy, ethical concerns and unclear guidelines.
Viberg et al. (2025)	AI trust, prior experience and AI literacy enhance teacher readiness.	Low AI literacy, limited trust in AI reliability, risks and uncertainties.

FINDINGS

Factors supporting the integration of artificial intelligence (AI)

To address Research Question 1, the thematic analysis of the 20 selected articles identified five key factors (themes) that support AI integration in the teaching and learning practices of primary school English teachers. These factors were teacher competence, teacher attitudes and acceptance, the pedagogical benefits of AI, enhanced teacher productivity and organisational support. These themes were developed through the coding and grouping of findings with similar meanings across the analysed articles.

The analysis indicates that teacher competence is the most dominant factor supporting AI integration in the teaching and learning practices of primary school English teachers. The findings show that the development of teacher competence encompasses several key aspects, including AI literacy, professional development, experience in using AI, self-efficacy, and teacher readiness. Four studies reported that AI literacy, understanding of AI and professional development enhance teachers' understanding of AI technology, foster more positive attitudes towards its use in teaching and increase teachers' confidence in integrating AI into teaching and learning. (Deshen et al., 2026; Lademann et al., 2026; Velander et al., 2024; Viberg et al., 2025). In addition, studies by Iddrisu Hassan and Iddrisu Simon (2025) and Nga et al. (2025) also found that teachers' self-efficacy and readiness serve as catalysts for the acceptance of AI in teaching and learning practices. However, two studies placed a different emphasis, finding that teachers' positive attitudes and perceptions of AI's usefulness had a greater influence on their willingness to use AI than competence alone (Jatileni et al., 2024; Karagiorgou et al., 2026). Consistent with the importance of teacher competence, teachers' attitudes and acceptance were also identified as factors supporting the use of AI in teaching. Seven studies reported that positive perceptions of AI, trust in the capabilities of the technology and teacher motivation increased teachers' willingness to integrate AI into their teaching practices (Cetin et al., 2024; Galindo-Domínguez et al., 2024; Jatileni et al., 2024; Karagiorgou et al., 2026; Riggs, 2025; Viberg et al., 2025; Zimotti et al., 2024). However, two studies by Deshen et al. (2026) and Lademann et al. (2026) reported that positive attitudes alone do not guarantee the use of AI if teachers lack sufficient knowledge and skills to apply AI in teaching and learning.

The pedagogical benefits of AI were also identified as a key factor driving its use in teaching and learning. Five studies showed that AI can support personalised learning, facilitate the implementation of differentiated learning, provide immediate feedback and enhance pupil interaction in the learning process (Benek, 2025; Crosthwaite et al., 2025; Hastomo et al., 2026; Pratiwi et al., 2025; Xu et al., 2025). Although the AI applications used varied across the study contexts, all five studies reported consistent pedagogical benefits in supporting learning that is more responsive to pupils' needs through different approaches. However, the study by Sofronieva et al. (2025) placed greater emphasis on the use of AI as a tool for creating creative learning activities, whereas Xu et al. (2025) focused on scenario-based digital game learning that supports pupils' vocabulary acquisition and communication practice. In addition, enhanced teacher productivity was identified as a closely related factor supporting the use of AI in teaching and learning. Four studies consistently reported that the use of AI helps teachers develop teaching materials more efficiently, save time in lesson planning, reduce administrative workloads, and support the more systematic implementation of assessment (Crosthwaite et al., 2025; Hastomo et al., 2026; Sofronieva et al., 2025; Taani et al., 2025). However, the studies by Benek (2025) and Xu et al. (2025) placed greater emphasis on the impact of AI on enhancing pupils' learning experiences rather than improving teacher productivity.

From an organisational perspective, institutional support, a positive school culture, and the provision of adequate technological infrastructure and facilities also play important roles in supporting AI integration in teaching and learning. An organisational environment that supports digital innovation was found to enhance teachers' readiness to use AI in teaching while strengthening their confidence in exploring new pedagogical practices (Iddrisu Hassan & Iddrisu Simon 2025; Karagiorgou et al. 2026; Nga et al. 2025; Wu et al. 2025). Although all studies addressing the theme of organisational support agreed on its importance, they differed in terms of the focus of their discussions. For example, Wu et al. (2025) placed greater emphasis on establishing a school ecosystem that supports innovation, whereas Karagiorgou et al. (2026) and Iddrisu Hassan and Iddrisu Simon (2025) emphasised the provision of training, infrastructure, and technological facilities.

Challenges hindering the integration of artificial intelligence (AI)

Based on the thematic analysis of the 20 selected articles, six key themes were identified to explain the challenges hindering AI integration in the teaching and learning practices of primary school English teachers. These themes include insufficient teacher competence, teacher-related psychological factors, AI-related ethical issues, technological and infrastructural constraints, organisational constraints, and pedagogical challenges.

The analysis indicates that insufficient teacher competence is the most dominant challenge to AI integration in teaching and learning. Fourteen (for example Deshen et al. 2026; Hastomo et al. 2026; Iddrisu Hassan & Iddrisu Simon 2025; Lademann et al. 2026; Riggs 2025; Velander et al. 2024) of the 20 studies reported that a lack of

professional development, low levels of AI literacy, limited experience, and insufficient technical skills reduced teachers' readiness to integrate AI into teaching and learning. However, Jatileni et al. (2024) and Karagiorgou et al. (2026) placed a different emphasis, finding that although teachers held positive perceptions of AI, their levels of confidence and practical readiness to use it remained low. Alongside insufficient teacher competence, teacher-related psychological factors were also identified as challenges to the use of AI in teaching and learning. Four studies reported that technology-related anxiety or *AI anxiety*, low self-confidence, and uncertainty about the use of AI were psychological factors that limited teachers' ability to integrate AI into teaching and learning (Deshen et al., 2026; Jatileni et al., 2024; Velandar et al., 2024; Viberg et al., 2025). In addition, Deshen et al. (2026), Lademann et al. (2026) and Viberg et al. (2025) also reported that training and experience in using AI can enhance teachers' confidence and strengthen their readiness to integrate AI into teaching and learning.

Besides, AI-related ethical issues were frequently raised as challenges in the analysed articles. Five studies reported that concerns regarding plagiarism, academic integrity, data privacy and security, and the reliability of AI-generated information were factors limiting its use in education. (Benek 2025; Cetin et al. 2024; Iddrisu Hassan & Iddrisu Simon 2025; Pratiwi et al. 2025; Zimotti et al. 2024). In terms of technological and infrastructural constraints, the analysis indicates that the digital divide, lack of devices, unstable internet connectivity, and limited technological infrastructure remain barriers to the implementation of AI in teaching and learning. Schools with limited technological facilities face difficulties in integrating AI optimally (Iddrisu Hassan & Iddrisu Simon 2025; Karagiorgou et al. 2026; Pratiwi et al. 2025; Riggs 2025). Karagiorgou et al. (2026) and Taani et al. (2025) also showed that demographic factors, teaching experience, and school type influence the level of AI use, thereby contributing to a digital divide among teachers.

The analysis also found that organisational constraints, such as the absence of clear policies, insufficient administrative support, and a school ecosystem that does not support innovation, pose challenges to AI integration in teaching and learning. Three studies reported that the absence of clear policies, insufficient administrative support, and a school ecosystem that does not support innovation hinder the integration of AI into teaching and learning (Velandar et al., 2024; Wu et al., 2025; Zimotti et al., 2024). Conversely, three studies also showed that organisations providing institutional support through professional development, technological facilities, and a school environment that supports digital innovation demonstrated higher levels of readiness to integrate AI into teaching and learning (Iddrisu Hassan & Iddrisu Simon 2025; Karagiorgou et al. 2026; Wu et al. 2025). Furthermore, pedagogical challenges were identified as barriers limiting the use of AI in teaching and learning. Three studies identified the risk of over-reliance on AI, the decline of pupils' critical thinking and creativity, and the tendency towards excessive use of AI as pedagogical challenges in teaching and learning (Benek, 2025; Pratiwi et al., 2025; Zimotti et al., 2024). All three studies also highlighted the need to balance the use of AI with appropriate pedagogical strategies to ensure that AI functions as a supportive tool in the teaching and learning process.

DISCUSSION

Factors supporting AI integration in the teaching and learning practices of primary school English teachers

The synthesis findings indicate that the successful integration of AI into the teaching and learning practices of primary school English teachers is influenced by a combination of factors, including teacher competence, teacher attitudes and acceptance, the pedagogical benefits of AI, enhanced teacher productivity, and organisational support. These factors demonstrate that the effective use of AI depends not merely on technological advancement but also on teacher readiness and an educational environment that supports the implementation of digital innovation. Teacher competence emerged as the most dominant factor supporting AI integration in teaching and learning. This finding suggests that AI integration depends not only on the availability of technology but also on teachers' ability to understand, evaluate, and apply the technology according to pedagogical needs (Casal-Otero et al., 2023). This finding is consistent with the Technological Pedagogical Content Knowledge (TPACK) framework, which emphasises that the effective use of technology requires the simultaneous integration of technological, pedagogical, and content knowledge (Koehler & Mishra, 2006). Furthermore, Ertmer and Ottenbreit-Leftwich (2010) also explained that teacher competence is an important prerequisite for the successful use of technology in the classroom. Therefore, the development of teacher competence should be viewed as a process that extends beyond the acquisition of technical skills to encompass the ability to integrate AI meaningfully into pedagogical practices.

Teachers' attitudes and acceptance indicate that their decision to adopt AI is influenced not only by technical aspects but also by their beliefs about the value of the technology in enhancing the quality of teaching and learning. This finding supports the Technology Acceptance Model (TAM) by Davis (1989) which explains that perceived usefulness and perceived ease of use influence technology acceptance. However, the synthesis findings indicate that positive attitudes alone are insufficient to ensure the effective use of AI without adequate competence. This suggests that AI acceptance depends on a combination of positive perceptions and teachers' ability to apply the technology within the context of teaching and learning (Lucas et al., 2024). The identified pedagogical benefits of AI demonstrate that its true value lies not in the technology itself but in its ability to support pedagogical practices that are more responsive to learner diversity. This finding is consistent with the study by Guettala et al. (2024) which explains that AI enables learning content to be tailored to pupils' proficiency levels, interests, and needs, thereby enhancing motivation and academic achievement while supporting more inclusive learning. In the context of primary school English language teaching, this potential is particularly significant because teachers need to manage pupils with varying levels of language proficiency within the same classroom.

Furthermore, enhanced teacher productivity demonstrates AI's potential to transform how teachers manage their professional responsibilities. Reducing routine tasks, such as preparing teaching materials and assessments, allows teachers to devote greater attention to aspects of teaching that require professional judgement and direct interaction with pupils. This finding is consistent with Kasneci et al. (2023) and Tlili et al. (2023) which emphasises that AI functions as a supportive tool for enhancing teachers' work efficiency. However, AI should not replace teachers' professional judgement; rather, it should complement pedagogical decision-making processes in the classroom. Organisational support also demonstrates that the successful integration of AI does not depend solely on individual teachers' efforts. Instead, AI implementation requires a supportive school ecosystem that facilitates teachers' professional development, provides adequate technological facilities and fosters an organisational culture that encourages innovation. This is consistent with the theory of educational by Fullan (2007) which emphasises that the success of educational innovation is influenced by leadership, organisational culture and institutional support. Recent studies have also shown that teacher professional development, school leadership that supports innovation and the provision of clear policies and guidelines are important factors influencing the successful implementation of AI in education (Crompton & Burke, 2023; Davy et al., 2023).

Challenges hindering AI integration in the teaching and learning practices of primary school English teachers

The synthesis findings indicate that AI integration in the teaching and learning practices of primary school English teachers continues to face several key challenges involving individual, organisational and technological aspects. The interrelationship among these challenges suggests that AI implementation is influenced not only by technological factors but also by teacher readiness and support within the educational environment. Insufficient teacher competence emerged as the most dominant challenge in this review. This finding indicates that AI integration depends not only on the availability of technology but also on teachers' ability to acquire the knowledge, skills and experience required to apply AI meaningfully in teaching and learning (Bond et al., 2024). This finding supports the view of Ertmer (1999) who distinguishes barriers to technology integration into external barriers (*first-order barriers*) and internal barriers (*second-order barriers*). In the context of this study, insufficient competence represents an internal barrier related to teachers' knowledge, skills and confidence. This finding also reinforces the TPACK framework, which explains that insufficient technological knowledge can hinder teachers' ability to integrate technology meaningfully into their teaching practices (Koehler & Mishra, 2006). Therefore, the development of teacher competence should be regarded as an important prerequisite for ensuring that AI can be effectively utilised within pedagogical contexts.

Teacher-related psychological factors demonstrate that AI acceptance is influenced not only by technical capabilities but also by teachers' confidence and perceptions of the technology. This finding can be explained through the Technology Acceptance Model (TAM) by Davis (1989) which states that perceived usefulness and perceived ease of use influence the acceptance of a particular technology. Furthermore, Venkatesh et al. (2003) through the Unified Theory of Acceptance and Use of Technology (UTAUT) model, also explains that performance expectancy, effort expectancy and users' confidence influence technology-use behaviour. This indicates that

psychological factors and competence are interrelated, as increased knowledge and experience in using AI may enhance teachers' confidence in the technology.

AI-related ethical issues also demonstrate that the challenges of AI integration are not limited to pedagogical and technological aspects but also involve responsibility for the ethical use of technology. Concerns related to academic integrity, data privacy, information security, and the reliability of AI-generated content highlight the need for clear regulatory mechanisms governing the implementation of AI in schools (Zhai et al., 2024). This finding is consistent with UNESCO (2023) which emphasises that the use of AI in education should be guided by the principles of transparency, accountability, and data protection to ensure the responsible use of the technology. Therefore, the development of clear ethical guidelines is an important element in strengthening teachers' confidence in the use of AI.

Furthermore, technological and infrastructural constraints indicate that the benefits of AI are difficult to realise fully when disparities exist in access to devices, internet connectivity, and technological facilities. This finding is consistent with the report by UNESCO (2023) which indicates that unequal access to digital technology remains a major challenge in implementing digital transformation in education across many countries. In the context of primary schools, these constraints not only limit teachers' opportunities to use AI but also create disparities in the implementation of digital innovation between schools with different levels of technological resources. Organisational constraints also demonstrate that the successful integration of AI cannot depend solely on individual teachers' efforts. Instead, AI implementation requires institutional support encompassing school leadership, continuous professional development, clear policies, and an organisational culture that encourages innovation (Cecilia, 2023). This finding is consistent with Fullan (2007) theory of organisational change, which emphasises that the success of educational innovation depends on leadership, organisational culture, and institutional support. Therefore, insufficient organisational support may limit AI implementation even when teachers possess a high level of competence. Pedagogical challenges also demonstrate the need to balance AI use with appropriate pedagogical considerations. Although AI has the potential to enhance the effectiveness of teaching and learning, its use should not reduce pupils' active engagement or replace the teacher's role in guiding the learning process. AI should complement the teacher's role rather than replace the processes of interaction and knowledge construction that occur in the classroom (Holmes & Tuomi, 2022). Therefore, the effectiveness of AI depends on teachers' ability to integrate the technology in a balanced manner with pedagogical strategies that support active learning and the development of higher-order thinking skills.

IMPLICATIONS

This study provides important implications for educational practice, particularly in strengthening AI integration in the teaching and learning practices of primary school English teachers. The findings indicate that the development of teacher competence should be prioritised through continuous professional development, enhanced AI literacy, and exposure to the use of AI in authentic teaching contexts. At the same time, efforts to strengthen teachers' positive attitudes and confidence towards AI should also be emphasised to enhance their readiness to integrate the technology meaningfully into teaching and learning. Furthermore, this study has implications for schools and educational policymakers. The provision of adequate technological facilities, the development of clear policies and guidelines for AI use, and continuous support from school leadership are essential for creating an educational ecosystem that supports digital innovation. Ethical considerations, including data privacy, academic integrity, and information security, should also be strengthened to ensure that AI is used responsibly and ethically. From a research perspective, this study addresses a gap in the literature by systematically synthesising the factors that support and the challenges that hinder AI integration in the teaching and learning practices of primary school English teachers. This synthesis provides a more comprehensive understanding of the factors influencing AI integration in this context and can serve as a foundation for future empirical research.

LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

This study has several limitations that should be considered when interpreting the findings. First, the selection of articles was restricted to English-language journal articles indexed in three databases: Scopus, Web of Science (WoS) and ERIC. Although these databases provide substantial coverage of educational research, relevant studies indexed in other databases or published in languages other than English may not have been captured. Future

systematic reviews could therefore broaden the search strategy by incorporating additional databases and non-English publications where appropriate. Second, the scope of the review was limited to AI integration in the teaching and learning practices of primary school English teachers. Consequently, the findings may not be directly generalisable to teachers of other subjects, different educational levels or other educational contexts. In addition, the included studies varied in terms of research designs, sample characteristics and types of AI applications examined which may have contributed to differences in the findings and limited direct comparisons across studies. Future research could extend the scope to other subject areas, educational levels and more diverse educational contexts while placing greater emphasis on robust empirical research designs to strengthen the evidence concerning AI integration in education.

A further limitation concerns the retrieval of potentially relevant studies. Of the 65 reports sought for retrieval following the screening stage, 41 reports (63.1%) could not be retrieved because their full texts were inaccessible, leaving 24 reports for eligibility assessment. The relatively high proportion of inaccessible reports may have introduced retrieval or selection bias as potentially relevant evidence could not be assessed for eligibility or included in the final synthesis. Consequently, the 20 studies included in this review may not fully represent the available evidence on AI integration among primary school English teachers. To reduce the potential impact of retrieval bias, future systematic reviews should consider additional retrieval strategies such as searching institutional repositories, contacting authors, accessing open-access sources and using alternative scholarly databases where appropriate.

Finally, the findings also indicate the need for greater attention to the practical implementation of AI in educational settings. Future research should examine how targeted prompt-engineering training can enhance teachers' ability to formulate effective prompts, evaluate AI-generated outputs and integrate AI tools appropriately into pedagogical practices. At the institutional level, further research should also explore the development and implementation of clear AI ethics policies addressing issues such as data privacy, academic integrity, transparency, responsible use and teacher accountability. Expanding practical recommendations in these areas would strengthen the educational impact of future research by providing clearer guidance for teachers and educational institutions in navigating the opportunities and challenges associated with AI integration.

Overall, these limitations highlight the need for broader and more comprehensive research to strengthen the empirical evidence on AI integration in education. Future studies should seek to incorporate wider evidence sources, diverse educational contexts and rigorous empirical designs while also examining practical approaches to teacher training and institutional AI governance. Such efforts could contribute to a more comprehensive understanding of the factors and challenges associated with AI integration among primary school English teachers and support the development of responsible and pedagogically meaningful AI practices in education.

CONCLUSION

Overall, this study conducted a systematic literature review guided by PRISMA 2020, involving 20 articles retrieved from three databases—Scopus, Web of Science (WoS), and ERIC—to examine the factors supporting and challenges hindering AI integration in the teaching and learning practices of primary school English teachers. Through thematic analysis, the study identified five key factors supporting AI integration: teacher competence, teacher attitudes and acceptance, the pedagogical benefits of AI, enhanced teacher productivity, and organisational support. At the same time, six major challenges limiting AI integration were identified: insufficient teacher competence, teacher-related psychological factors, AI-related ethical issues, technological and infrastructural constraints, organisational constraints, and pedagogical challenges. These findings indicate that successful AI integration depends not solely on technological advancement but also on the interplay of individual, pedagogical, organisational, and educational environmental factors. Therefore, this study contributes to a more comprehensive understanding of AI integration in primary school English teaching and learning and provides a foundation for broader, empirical future research focusing on the pedagogical and ethical implications of AI in education.

REFERENCES

1. Aljabr, F., Zakarneh, B., Annamalai, N., & Al Said, N. (2025). Integrating AI: challenges and opportunities in teaching English writing skills. *World Journal of English Language*, 15(5), 371–382. <https://doi.org/10.5430/wjel.v15n5p371>

2. Aravantinos, S., Lavidas, K., Voulgari, I., Papadakis, S., Karalis, T., & Komis, V. (2024). Educational approaches with AI in primary school settings: a systematic review of the literature available in Scopus. *Education Sciences*, 14(744), 1–27. <https://doi.org/10.3390/educsci14070744>
3. Ayanwale, M. A., Sanusi, I. T., Adelana, O. P., Aruleba, K. D., & Oyelere, S. S. (2022). Teachers' readiness and intention to teach artificial intelligence in schools. *Computers and Education: Artificial Intelligence*, 3, 100099. <https://doi.org/10.1016/j.caeai.2022.100099>
4. Baig, M. I., Shuib, L., & Yadegaridehkordi, E. (2020). Big data in education: a state of the art, limitations, and future research directions. *International Journal of Educational Technology in Higher Education*, 17(44), 1–23. <https://doi.org/10.1186/s41239-020-00223-0>
5. Bates, T., Cobo, C., Mariño, O., & Wheeler, S. (2020). Can artificial intelligence transform higher education? *International Journal of Educational Technology in Higher Education*, 17(42), 1–12. <https://doi.org/10.1186/s41239-020-00218-x>
6. Benek, K. (2025). EFL learners' and teachers' perceptions of AI-Powered language learning technologies: benefits and challenges. *International Journal of Instruction*, 18(2), 103–120. <https://doi.org/10.29333/iji.2025.1827a>
7. Bernal, A. P. P., Coronel, E. A. R., Aldas, K. J. M., Carvajal, C. A. M., Valarezo, B. D. C. E., Vera, J. G. A., & Chávez, J. U. C. (2025). The impact of artificial intelligence on personalized learning in English language education. *Ciencia Latina Revista Científica Multidisciplinar*, 9(1), 5500–5518. https://doi.org/10.37811/cl_rcm.v9i1.16234
8. Bond, M., Khosravi, H., De Laat, M., Bergdahl, N., Negrea, V., Oxley, E., Pham, P., Chong, S. W., & Siemens, G. (2024). A meta systematic review of artificial intelligence in higher education: a call for increased ethics, collaboration, and rigour. *International Journal of Educational Technology in Higher Education*, 21(4), 1–41. <https://doi.org/10.1186/s41239-023-00436-z>
9. Casal-Otero, L., Catala, A., Fernández-Morante, C., Taboada, M., Cebreiro, B., & Barro, S. (2023). AI literacy in K-12: a systematic literature review. *International Journal of STEM Education*, 10(29), 1–17. <https://doi.org/10.1186/s40594-023-00418-7>
10. Cecilia, C. K. Y. (2023). A comprehensive AI policy education framework for university teaching and learning. *International Journal of Educational Technology in Higher Education*, 20(38), 1–25. <https://doi.org/10.1186/s41239-023-00408-3>
11. Celik, I., Dindar, M., Muukkonen, H., & Järvelä, S. (2022). The promises and challenges of artificial intelligence for teachers: a systematic review of research. *TechTrends*, 66, 616–630. <https://doi.org/10.1007/s11528-022-00715-y>
12. Cetin, Y., Taş, Ö., Alakuş, H., & Kaplan, H. İ. (2024). Examining school principals' and teachers' perceptions of using ChatGPT in education. *Educational Process: International Journal*, 13(3), 85–96. <https://doi.org/10.22521/edupij.2024.133.5>
13. Crompton, H., & Burke, D. (2023). Artificial intelligence in higher education: the state of the field. *International Journal of Educational Technology in Higher Education*, 20(22), 1–22. <https://doi.org/10.1186/s41239-023-00392-8>
14. Crosthwaite, P., Smala, S., & Spinelli, F. (2025). Prompting for pedagogy? Australian F-10 teachers' generative AI prompting use cases. *Australian Educational Researcher*, 52(3), 1795–1825. <https://doi.org/10.1007/s13384-024-00787-0>
15. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340.
16. Davy, T. K. N., Jac, K. L. L., Su, J., Ross, C. W. N., & Samuel Kai, W. C. (2023). Teachers' AI digital competencies and twenty-first century skills in the post-pandemic world. *Educational Technology Research and Development*, 71, 137–161. <https://doi.org/10.1007/s11423-023-10203-6>
17. Deshen, M., Harari, R., & Aharony, N. (2026). Teachers' artificial intelligence (AI) literacy: an exploratory study. *Smart Learning Environments*, 13(1), 1–27. <https://doi.org/10.1186/s40561-026-00433-5>
18. Eden, C. A., Chisom, O. N., & Adeniyi, I. S. (2024). Integrating AI in education: opportunities, challenges, and ethical considerations. *Magna Scientia Advanced Research and Reviews*, 10(2), 006–013. <https://doi.org/10.30574/msarr.2024.10.2.0039>
19. Elmoazen, R., Saqr, M., Khalil, M., & Wasson, B. (2023). Learning analytics in virtual laboratories: a systematic literature review of empirical research. *Smart Learning Environments*, 10(23), 1–20. <https://doi.org/10.1186/s40561-023-00244-y>

20. Ertmer, P. A. (1999). *Addressing first- and second-order barriers to change: strategies for technology integration*. 47(4), 47–61.
21. Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). *Teacher technology change: how knowledge, confidence, beliefs, and culture intersect*. 42(3), 255–284.
22. Fang, S., & Han, Z. H. (2025). On the nascency of ChatGPT in foreign language teaching and learning. *Annual Review of Applied Linguistics*, 45, 148–178. <https://doi.org/10.1017/S026719052510010X>
23. Farah Farhana Awang, & Nisma Wahab. (2026). Integrasi AI dalam pengajaran bahasa asing di universiti awam Malaysia: Potensi, cabaran dan hala tuju. *Journal of Advanced Islamic And Legal Research*, 3(1), 64–71.
24. Fullan, M. (2007). *The New Meaning of Educational Change* (4th ed.). Teachers College Press.
25. Galindo-Domínguez, H., Delgado, N., Losada, D., & Etxabe, J. M. (2024). An analysis of the use of artificial intelligence in education in Spain: The in-service teacher's perspective. *Journal of Digital Learning in Teacher Education*, 40(1), 41–56. <https://doi.org/10.1080/21532974.2023.2284726>
26. Guettala, M., Bourekache, S., Kazar, O., & Harous, S. (2024). Generative artificial intelligence in education: advancing adaptive and personalized learning. *Acta Informatica Pragensia*, 13(3), 460–489. <https://doi.org/10.18267/j.aip.235>
27. Hastomo, T., Widiati, U., Maria Ivone, F., & Laily Zen, E. (2026). Integrating generative AI in primary English material design: insights from Indonesian teachers' perceptions. *Journal Of Elementary Education*, 19(1), 77–91. <https://doi.org/10.18690/rei.5409>
28. Holmes, W., & Tuomi, I. (2022). State of the art and practice in AI in education. *European Journal of Education*, 00, 1–570. <https://doi.org/10.1111/ejed.12533>
29. Iddrisu, H. M., & Iddrisu, S. A. (2025). Teacher readiness to use AI tools in the classroom. *International Journal of Research in Education and Science*, 11(3), 494–510. <https://doi.org/10.46328/ijres.1314>
30. Jatileni, C. N., Sanusi, I. T., Olaleye, S. A., Ayanwale, M. A., Agbo, F. J., & Oyelere, P. B. (2024). Artificial intelligence in compulsory level of education: perspectives from Namibian in-service teachers. *Education and Information Technologies*, 29, 12569–12596. <https://doi.org/10.1007/s10639-023-12341-z>
31. Karagiorgou, C. E., Koukis, N., Koundourou, C., & Tzovla, E. (2026). Exploring K-12 teachers' attitudes and perceptions towards the use of AI applications in the teaching process. *Contemporary Educational Technology*, 18(2), 645. <https://doi.org/10.30935/cedtech/18149>
32. Karataş, F., Abedi, F. Y., Ozek Gunyel, F., Karadeniz, D., & Kuzgun, Y. (2024). Incorporating AI in foreign language education: An investigation into ChatGPT's effect on foreign language learners. *Education and Information Technologies*, 29, 19343–19366. <https://doi.org/10.1007/s10639-024-12574-6>
33. Kasneci, E., Sessler, K., Uchemann, S. K. ", Bannert, M., Dementieva, D., Fischer, F., Gasser, U., Groh, G., Unnemann, S. G. ", Krusche, S., Kutyniok, G., Michaeli, T., Nerdel, C., Ugen Pfeffer, J. ", Poquet, O., Sailer, M., Schmidt, A., Seidel, T., Stadler, M., ... Kasneci, G. (2023). ChatGPT for good? on opportunities and challenges of large language models for education. *Learning and Individual Differences*, 103, 1–13.
34. Koehler, M. J., & Mishra, P. (2006). Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. *Teachers College Record*, 108(6), 1017–1054.
35. Lademann, J., Henze, J., Honke, N., Wollny, C., & Becker-Genschow, S. (2026). Teacher training in the age of AI: impact on AI literacy and teachers' attitudes. *Frontiers in Education*, 10, 1671306. <https://doi.org/10.3389/feduc.2025.1671306>
36. Lie, A., Tamah, S. M., Gozali, I., Triwidayati, K. R., Utami, T. S. D., & Jemadi, F. (2020). Secondary school language teachers' online learning engagement during the COVID-19 pandemic in Indonesia. *Journal of Information Technology Education: Research*, 19, 803–832. <https://doi.org/10.28945/4626>
37. Lim, G. F. C., Norshamshizar Abdul Jalil, Dayang Suraya Awang Hidup, & Marlissa Omar. (2024). Pengintegrasian teknologi dalam pendidikan: cabaran guru. *International Journal of Modern Languages and Applied Linguistics*, 8(1), 49–67.
38. Lucas, M., Zhang, Y., Bem-haja, P., & Vicente, P. N. (2024). The interplay between teachers' trust in artificial intelligence and digital competence. *Education and Information Technologies*, 29(17), 22991–23010. <https://doi.org/10.1007/s10639-024-12772-2>

39. Mananay, J. A. (2024). Integrating artificial intelligence (AI) in language teaching: effectiveness, challenges, and strategies. *International Journal of Learning, Teaching and Educational Research*, 23(9), 361–382. <https://doi.org/10.26803/ijlter.23.9.19>
40. Mohd Amzari Tumiran, Batrisyia Hidayah Baharuddin, & Nasharuddin Mohammad. (2025). Potensi kecerdasan buatan (AI) dalam sistem pendidikan di Malaysia: analisis kandungan. *Quantum Journal of Social Sciences and Humanities*, 6(2), 237–250. <https://doi.org/10.55197/qjssh.v6i2.638>
41. Mullet, D. R., Rinn, A. N., & Kettler, T. (2017). Catalysts of women's talent development in STEM: a systematic review. *Journal of Advanced Academics*, 28(4), 253–289. <https://doi.org/10.1177/1932202X17735305>
42. Ng, D. T. K., Leung, J. K. L., Su, J., Ng, R. C. W., & Chu, S. K. W. (2023). Teachers' AI digital competencies and twenty-first century skills in the post-pandemic world. *Educational Technology Research and Development*, 71(1), 137–161. <https://doi.org/10.1007/s11423-023-10203-6>
43. Nga, N. T. H., Nhung, N. T. P., & Anh, N. T. Q. (2025). Exploring teacher adoption of AI: A structural analysis of Microsoft Copilot in education. *Journal of Education and E-Learning Research*, 12(3), 479–487. <https://doi.org/10.20448/jeelr.v12i3.7395>
44. Noraini Hamzah, & Hafizhah Zulkifli. (2025). Kesediaan guru dalam penggunaan kecerdasan buatan (AI) untuk pembelajaran terbeza pendidikan Islam di sekolah rendah. *ATTARBAWIY: Malaysian Online Journal of Education*, 9(2), 55–66. <https://doi.org/10.53840/attarbawiy.v9i2.301>
45. Nur Khairunnisa Odin, & Selvam, S. (2025). Faktor jantina, umur, dan lokasi sekolah yang mempengaruhi pengetahuan dan pengaplikasian teknologi kecerdasan buatan dalam pengajaran guru Bahasa Melayu sekolah rendah TS25. *Jurnal Pendidikan Bahasa Melayu*, 15, 77–88.
46. Nur Sakinah Zulkarnain, & Melor Md Yunus. (2023). Primary teachers' perspectives on using artificial intelligence technology in English as a second language teaching and learning: a systematic review. *International Journal of Academic Research in Progressive Education and Development*, 12(2), 812–825. <https://doi.org/10.6007/ijarped/v12-i2/17119>
47. Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*, 372(71), 1–9. <https://doi.org/10.1136/bmj.n71>
48. Pratiwi, H., Riwanda, A., Hasruddin, H., Sujarwo, S., & Syamsudin, A. (2025). Transforming learning or creating dependency? teachers' perspectives and barriers to AI integration in education. *Journal of Pedagogical Research*, 9(2), 127–142. <https://doi.org/10.33902/JPR.202531677>
49. Riggs, V. (2025). Teachers' perceptions and readiness for AI integration in under-resourced K-12 classrooms. *Journal of Research Initiatives Journal of Research*, 9(1), 1–20.
50. Saleem, T., Saleem, A., & Aslam, M. (2025). Integrating AI in Pakistani ESL classrooms: teachers' practices, perspectives, and impact on student performance. *PLOS ONE*, 20(9), e0333352. <https://doi.org/10.1371/journal.pone.0333352>
51. Sharadgah, T. A., & Sa'di, R. A. (2022). A systemic review of research on the use of artificial intelligence in English language teaching and learning (2015-2021): what are the current effects? *Journal of Information Technology Education: Research*, 21, 337–377. <https://doi.org/10.28945/4999>
52. Sofronieva, E., Dimitrova-Gyuzeleva, S., & Beleva, C. (2025). Designing language activities for young learners based on human and AI-generated stories. *International Journal of Cognitive Research in Science, Engineering and Education*, 13(3), 573–587. <https://doi.org/10.23947/2334-8496-2025-13-3-573-587>
53. Syakirah Che Dahalan, & Mohd Syaubari Othman. (2025). Tahap pengetahuan dan penggunaan teknologi artificial intelligence (AI) dalam kalangan guru Bahasa Melayu di sekolah rendah Program Transformasi Sekolah 2025 (TS25). *Jurnal Pendidikan Awal Kanak-Kanak Kebangsaan*, 14(2), 98–115. <https://doi.org/10.37134/jpak.vol14.2.7.2025>
54. Taani, O., Alarabi, K., Tairab, H., Khurma, O. A., & Alsadrani, B. (2025). Navigating the game-changer: ChatGPT's influence on in-service teachers' self-regulation and teaching practices in the UAE. *Contemporary Educational Technology*, 17(4), 597. <https://doi.org/10.30935/cedtech/17315>
55. Ting, S. C., & Helmi Norman. (2024). Teachers' perceptions about the use of artificial intelligence (AI) in teacher teaching at the middle school level. *Jurnal Pendidikan Bitara UPSI*, 17(2), 150–157. <https://doi.org/10.37134/bitara.vol17.2.13.2024>

56. Tlili, A., Shehata, B., Adarkwah, M. A., Bozkurt, A., Hickey, D. T., Huang, R., & Agyemang, B. (2023). What if the devil is my guardian angel: ChatGPT as a case study of using chatbots in education. *Smart Learning Environments*, 10(15), 1–24. <https://doi.org/10.1186/s40561-023-00237-x>
57. United Nations Educational Scientific and Cultural Organization. (2023). Guidance for Generative AI in Education and Research. In *Guidance for generative AI in education and research*. UNESCO. <https://doi.org/10.54675/ewzm9535>
58. Velander, J., Taiye, M. A., Otero, N., & Milrad, M. (2024). Artificial intelligence in K-12 education: eliciting and reflecting on Swedish teachers' understanding of AI and its implications for teaching & learning. *Education and Information Technologies*, 29, 4085–4105. <https://doi.org/10.1007/s10639-023-11990-4>
59. Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: toward a unified view. *MIS Quarterly*, 27(3), 425–478.
60. Viberg, O., Cukurova, M., Feldman-Maggor, Y., Alexandron, G., Shirai, S., Kanemune, S., Wasson, B., Tømte, C., Spikol, D., Milrad, M., Coelho, R., & Kizilcec, R. F. (2025). What explains teachers' trust in AI in education across six countries? *International Journal of Artificial Intelligence in Education*, 35, 1288–1316. <https://doi.org/10.1007/s40593-024-00433-x>
61. Wu, D., Zhang, X., Wang, K., Wu, L., & Yang, W. (2025). A multi-level factors model affecting teachers' behavioral intention in AI-enabled education ecosystem. *Educational Technology Research and Development*, 73, 135–167. <https://doi.org/10.1007/s11423-024-10419-0>
62. Xu, S., Lo, C. K., Ling, M. H., & Chen, G. (2025). Leveraging generative AI in a 3D scenario-based game for vocabulary acquisition and conversation practice: Insights from primary EFL educators through the technology acceptance model. *Cogent Education*, 12(1), 2560059. <https://doi.org/10.1080/2331186X.2025.2560059>
63. Yaseen, M. G., & Alnakeeb, S. S. (2023). Exploring the evolution of AI integration in English as a foreign language education: a Scopus-based bibliometric analysis (1997-2023). *Mesopotamian Journal of Computer Science*, 2023, 143–158. <https://doi.org/10.58496/MJCSC/2023/019>
64. Zamri Mahamod. (2026). *Kecerdasan Buatan dalam Pendidikan Bahasa Melayu: Cabaran dan Penyelesaian*. Penerbit Universiti Kebangsaan Malaysia.
65. Zeng, M., Cheah, K. S. L., & Abdullah, Z. (2025). The influence of school principals' digital leadership on teachers' competency in integrating artificial intelligence: a systematic thematic review. *Frontiers in Education*, 10, 1655967. <https://doi.org/10.3389/feduc.2025.1655967>
66. Zhai, C., Wibowo, S., & Li, L. D. (2024). The effects of over-reliance on AI dialogue systems on students' cognitive abilities: a systematic review. *Smart Learning Environments*, 11(28), 1–37. <https://doi.org/10.1186/s40561-024-00316-7>
67. Zimotti, G., Frances, C., & Whitaker, L. (2024). The future of language education: teachers' perceptions about the surge of large language models like ChatGPT. *Technology in Language Teaching and Learning*, 6(2), 1–24. <https://doi.org/10.29140/tl.v6n2.1136>