Artificial Intelligence and Teachers' Expansion: A Systematic Review

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Abstract. The implications for the teaching profession are becoming more complex and far-reaching with the introduction of artificial intelligence (AI) in education. AI and changes in teachers' professional roles across teaching practices, professional development, leadership, and ethical engagement. This systematic review integrates the results of 21 papers published from 2019 to 2025. The review employs a narrative synthesis of the literature in accordance with PRISMA criteria and focuses on a range of learning environments, including preservice and in-service teacher settings. The eight primary themes were: enhancing education, individualised professional learning, teacher-AI cooperation in instructional design, ethical issues, emotional and motivational readiness, new roles of leadership, AI literacy frameworks and situational factors. It faces several challenges, including a lack of training, unmet ethical concerns, inadequate infrastructure, and the absence of long-term data, despite studies showing its benefits, such as improved productivity, tailored training, and increased leadership. Besides promoting the application of morally acceptable, pedagogically relevant, and context-specific AI in teacher preparation, this analysis underscores the need for and importance of critical empirical investigation, particularly in low-resource settings. It summarises that although AI can bring a total change in education, its implementation demands extensive training, accommodating legislation, and sustained institutional facilitation and motivation.

Keywords: artificial intelligence; teacher education; instructional design; professional development; ethics in education; educational leadership.

INTRODUCTION

Artificial intelligence (AI) refers to the ability of computer systems to perform tasks such as learning, reasoning, problem-solving, and decision-making that typically require human intelligence. The use of AI tools in education has skyrocketed, encompassing intelligent tutoring systems, automated grading tools, predictive analytics, and adaptive learning platforms. Although the technologies are often associated with enhanced student learning, they are also transforming teachers' working conditions, revisiting their roles, duties, and instructional practices. AI is increasingly finding its way into the classroom and schools, requiring educators to adapt to novel technology and changing expectations. Author [1] exemplifies both of these abilities in the Indian setting, where using AI improved student engagement and educational performance, while also relieving teachers of some of the management burden. Kumar's study also identifies structural factors that prevent adoption across various learning centres worldwide, such as less compelling training, unstable infrastructure, and enduring data privacy concerns.

Authors [2] analysed more than 50 studies. They identified common themes in the literature, including the use of digital pedagogy, the need for AI literacy, and the ethical issues posed by AI, to equip educators to interact with AI purposefully and positively in teacher preparation. Their study results demonstrated the pressing need for technical and reflective AI-related skills to be included in teacher preparation programs. Similarly, authors [3] noted that AI is transforming education by enabling personalised learning, automating repetitive tasks, and shifting power dynamics in the classroom. They argue that teacher preparation programs need to be developed.

This review explores the effect of AI on teachers' roles across different educational scenarios, using a narrative synthesis of 21 recently published peer-reviewed articles from 2019 to 2025. It explores how teachers are being trained to work with

AI, how they perceive its advantages and disadvantages, and how emerging technologies are altering their professional identity as educators, leaders, and moral decision-makers.

This review examines the influence of artificial intelligence on the development and evolution of the teaching role. It particularly seeks to provide answers to the following key question: What are the implications of artificial intelligence for leadership roles, pedagogical approaches, teacher learning, and ethical concerns in learning institutions?

METHOD

The current systematic review follows the PRISMA 2020 statement to promote transparency and reproducibility in studies on artificial intelligence (AI) and to enhance teacher roles, leadership, abilities, and learning [4]. The review aimed to identify empirical studies and literature reviews published in peer-reviewed journals that examine the impact of AI on teacher preparation, awareness, control, and classroom integration at different levels of education. To achieve methodological rigour, the researchers employed a predetermined methodology, first identifying relevant papers. Subsequently, it was screened using preset inclusion and exclusion criteria. The steps in the process were identification, screening, eligibility assessment and final incorporation. The researchers identified sources based on their quality, relevance, and ability to provide insights into how AI technology has changed or transformed teachers' roles [5]. To capture recent trends, they limited the search to works published between 2019 and 2025.

Eligibility Criteria. To be eligible, a study had to fulfil the following criteria:

a) it needed to examine the impact of artificial intelligence on teacher training, development, leadership, or classroom activities;

b) it needed to be a peer-reviewed empirical study or a systematic review;

c) it needed to be published in the English language between 2019 and 2025; and

d) it needed to involve teachers in preservice, inservice, or K-12 schools.

The studies were filtered out when they mainly focused on student performance, were not published in English, lacked a conceptual paper with no data, used AI technology unrelated to instruction, or were higher education-focused systems without faculty teaching-method evaluation. These criteria ensured that the selected studies directly addressed how the role and capabilities of instructors are changing in AI-enhanced learning settings.

Table 1 – Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Studies on teacher training, development, leadership, and AI awareness	Studies are only about student outcomes or tools
Peer-reviewed empirical or systematic reviews	Not teacher-related (policy, admin, tech-focused)
Published between 2019 and 2025 Focus on preservice or in-service teachers.	Editorials, opinions, or conceptual papers
Studies in English	Higher ed with no teaching focus
	Not in English

Information Sources. The researchers used various databases and scholarly sources to conduct a professional and comprehensive search. The analysed databases used retainers such as Web of Science, Scopus, ERIC, and PsycINFO, whereas the grey literature sources included ResearchGate, Google Scholar, and institutional archives. We also searched the UNESCO digital library for policy-related documentation and the arXiv preprint server. To find studies on the effects of AI on educators, all databases were searched individually using preselected phrases and logical operators. To capture recent trends and patterns, the researchers analysed English-language articles published from 2019 to 2025.

Search Strategy. The researchers designed the search strategy using Boolean operators and specific phrases because these elements represent the combination of AI and educator development. The keywords were "Artificial intelligence, machine learning, teacher training, teacher development, teacher leadership, and teacher awareness.

Keywords were modified across databases to correspond with their indexing and metadata systems [6]. The researchers modified search strings across platforms to ensure accuracy and inclusivity. They systematically searched the Web of Science using terms describing educators' functions alongside AI-related terms, and manually searched relevant non-peer-reviewed preprints on arXiv and ResearchGate.

To enhance the relevance of the results, the search strategy employed was keyword refinement after multiple trials. Where necessary, truncation (*) combined the synonyms and plural forms. The search query was as follows: artificial intelligence or ai or machine learning and (teacher training or teacher development or teacher leadership or educator competencies) in most databases. This approach enabled the creation of a comprehensive dataset comprising qualitative and quantitative studies, meta-analyses, and innovative AI-powered teaching methods.

Table 2 – Sample Search Strings and Terms

Database / Source	Search String Example
Web of Science	TS=('artificial intelligence' OR 'AI') AND TS=('teacher training' OR 'teacher development')
Scopus	TITLE-ABS-KEY(('AI' OR 'artificial intelligence') AND ('teachers' OR 'educators')
ERIC	('artificial intelligence' AND 'teacher education')
ResearchGate	manual search: 'AI teacher development'
arXiv	('AI in education') AND ('teacher roles')
Google Scholar	allintitle: 'AI teacher leadership training development'

Study Selection. After extensive searches across Web of Science, Scopus, ERIC, ResearchGate, arXiv, and Google Scholar, the original database query returned 32 entries. Once the researchers imported all recognised entries into a reference management program, the software automatically removed four duplicate records. As a result, 28 unique records were available for review. Two reviewers independently reviewed the titles and abstracts of all 28 records as part of the evaluation process to determine whether they were pertinent to the review issue, which was pedagogical change, role expansion, or artificial intelligence and teacher development.

Twenty-four studies were deemed sufficiently relevant for full-text acquisition and evaluation after screening the titles and abstracts. Each whole article was obtained and carefully reviewed by the evaluators, who then assessed it using the predetermined inclusion and exclusion criteria. At this stage, the researchers excluded three papers because they could not access the full texts. All 21 remaining full-text studies met the inclusion criteria, and the researchers retained them for the final synthesis.

Twenty-one studies were included in the systematic review based on the generated dataset. A PRISMA flow chart (Figure 1) that shows the number of records at each step of the evaluation, from identification to inclusion, depicts the entire study selection process. The review staff did not use automated screening or exclusion tools; they made all inclusion and exclusion decisions manually. Because this review was not an update to a previous systematic review, they did not retain any previously included studies.

Although initially deemed pertinent, many studies were excluded during the eligibility process. For example, authors [7, 8] were excluded because they focused on AI in higher education policy and assessment design, without considering its impact on teachers. Since the authors [9] focused primarily on inclusive education outcomes for children rather than on teacher development, teacher development was omitted. Although relevant to AI in education, Mollick & Mollick lacked empirical support and did not specifically address instructors' roles [9]. The researchers excluded the studies by authors [10, 11] because these authors focused on AI tools and tutoring machines rather than on teacher development or instructional strategies.

PRISMA Flow Diagram Explanation. The complete process of study identification, screening, eligibility assessment, and final inclusion is shown in the PRISMA 2020 flow chart (Figure 1).

Six databases—Web of Science, Scopus, ERIC, Google Scholar, ResearchGate, and arXiv—yielded 32 records in total. After the researchers removed four duplicate items during the first deduplication step, 28 distinct studies remained for screening. To ensure methodological rigour, two reviewers independently screened the remaining records for title and abstract.

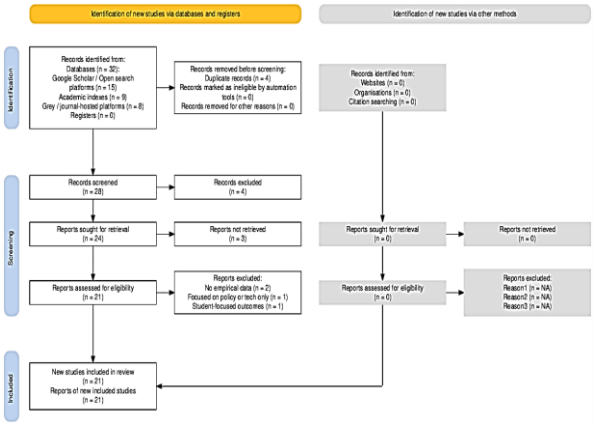

Figure 1 – PRISMA Flow Diagram

Four papers that were obviously out of line with the research objective were eliminated during the screening step based on their titles and abstracts. These studies either ignored teachers' perspectives or emphasised technological innovation without considering its implications for education, leading to 24 full-text acquisition studies. Three papers were unavailable at the eligibility stage because of access limitations or missing publication details. The researchers conducted a comprehensive evaluation of the remaining 21 full-text papers. Each study was evaluated using predetermined inclusion and exclusion criteria that emphasised its applicability to professional development, the growth of teacher roles, and the integration of AI into teaching approaches.

Twenty-one studies ultimately met all eligibility requirements and were included in the final analysis. Because each study demonstrated a clear connection to the main themes of AI-based teacher development, no papers were excluded during the full-text eligibility phase. The flow diagram makes this systematic review easier to replicate and provides a concise and well-structured overview of the selection process. Accountability in the eligibility and screening process is ensured by the comprehensive documentation of missing documents and the justifications for their exclusion.

Study Characteristics. The 21 peer-reviewed publications in this review, published between 2019 and 2025, span a range of geographic locations, research approaches, and educational levels. With a focus on contexts including India, China, Turkey, the United States, Sweden, the United Kingdom, Palestine, Nigeria, and several Arab countries, the study investigates the evolving relationship between artificial intelligence (AI) and teacher development.

In terms of methodology, the sample comprises conceptual/theoretical articles, systematic and narrative reviews, quasi-experimental designs, qualitative interviews and discourse analyses, and quantitative surveys. While some research looks into in-service professional growth, educators' viewpoints, or policy-oriented structures, many studies focus on preservice teacher education. Teachers from elementary and secondary schools, university professors, and educators in teacher training are among the attendees.

Advanced learning management systems (ALMS), chatbots, predictive analytics, automated assessments, and intelligent tutoring systems were among the AI tools discussed. The sample's recurring topics include AI literacy, teacher leadership in AI augmented environments, ethical considerations, pedagogical changes, and educators' viewpoints on integrating AI.

Table 3, shown below, summarises the key characteristics of each included study, allowing comparison across context, population, methodology, and research focus.

Table 3 – Summary of Studies Across Several Contexts

Study	Country	Population	Education Level	Method	Focus	Summary
[1]	India	Teachers	Primary	Mixed Methods	AI in teaching and learning	AI improved engagement and performance, and reduced workload; training gaps, infrastructure, and privacy remain barriers.
[2]	India	Literature (50+ papers)	Pre-/Inservice	Systematic Review	AI in Teacher Education	Thematic synthesis of 50+ articles on AI's role in digital learning, pedagogy,

Study	Country	Population	Education Level	Method	Focus	Summary
						ethics, and teacher education.
[3]	India	Teacher educators	Pre-/Inservice	Review Essay	AI impact on teacher education	Traces AI's evolving role in teacher education, including personalised learning, AI assistants, and content creation.
[12]	Turkey	Teachers (n=792)	K–12	Survey	Teacher perceptions of AI	Optimism about AI's role in enhancing education; concerns about privacy, ethics, and emotional disconnect.
[13]	UK & UAE	Teachers (n=792)	Grade 5– 12	Survey + Predictive Modeling	Factors influencing AI platform adoption	School-level factors (ownership, support, ethics) Predict engagement with adaptive platforms.
[14]	India	Literature-based	Teacher education	Conceptual / Literature Review	AI in teacher training and civilisation	Emphasises AI tools/platforms across training and broader societal impact.
[15]	China	Literature-based	Teacher-student dynamics	Theoretical Analysis	AI and teacher-student relationships	Explores AI's challenges to relationships and offers emotional / ethical rebuilding strategies.
[16]	Israel	6 biology teachers	High School	Discourse analysis during PDP	Trust in AIEdTech and PDP impact	PDPs increased trust in AI-Grader; conceptual clarity and pedagogical control were key.
[17]	China	Conceptual review	K–12 & Higher	Narrative / Conceptual	AI's role in education & teacher support	Discusses how AI can enhance efficiency and proposes frameworks that don't replace teachers.
[18]	Palestine	37 preservice teachers	University	Quasi-experimental (pre/post)	AI literacy professional development	PDP improved AI Literacy: no differences by gender or specialisation.
[19]	Five Arab States	13 in-service teachers	K–12	Qualitative (Phenomenological Interviews)	Impact of AI on teacher leadership	Polarised views on AI expanding or regressing leadership; identifies five new competencies.
[20]	Multicountry	Teachers (K–12 and higher ed)	K–12 and Higher Ed	Systematic review of 10 studies	Challenges and best practices in AI training	Identifies skill/motivation gaps; recommends customised, hands-on PD.

Study	Country	Population	Education Level	Method	Focus	Summary
[21]	Indonesia (West Java)	20 in-service science teachers	Junior High	Qualitative (descriptive, interviews, questionnaire)	AI-supported pedagogy in training	Teachers modified/followed AI lesson suggestions; improved competence and creativity.
[22]	Pakistan (Global scope)	University and school teachers	K–12 and Higher Ed	Theoretical (content synthesis)	AI and teacher competencies	AI enhances content, management, and personalisation while stressing a human-centred balance.
[23]	China	677 learners & vocational college teachers	Higher Vocational	Quantitative (SEM, CFA, Survey)	Teacher Digital Leadership in SLMS	TDL indirectly boosts school culture through scenario design and knowledge integration.
[24]	Nigeria	Teacher educators & trainees (theoretical)	Preservice	Theoretical (position paper)	Preparing teachers for AI integration	Recommends AI literacy, mindset shift, curriculum change, and continuous PD.
[25]	USA	Teacher educators, special education trainees	Teacher Preparation	Theoretical review with practice examples	Historical and future AI in teacher education	Traces AI evolution; advocates simulation, personalisation, and ethical integration.
[26]	Hong Kong	28 in-service teachers from 17 schools	Secondary	Qualitative (Phenomenography; Interviews)	Teacher conceptions of AI teaching	Identifies six conceptions from basic awareness to intellectual empowerment.
[27]	Sweden	18 teachers and teacher educators	K–12	Mixed (Questionnaire + Focus Groups)	Teachers' AI understanding and classroom integration	Found misconceptions, emotional barriers, and TPACK challenges.
[28]	UAE	Theoretical (educators, trainers)	Teacher PD (Pre-/ Inservice)	Analytical literature review	AI in teacher professional development	Recommends immersive, adaptive, AI-supported PD frameworks and networks.
[29]	China	375 teachers from schools and universities	K–12 and Higher Ed	Quantitative Survey	Teacher perceptions of AI in training	Mixed support; noted readiness issues, misconceptions, and lack of institutional infrastructure.

RESULTS AND DISCUSSION

A narrative synthesis of the 21 reviewed studies yielded eight central themes that characterise how artificial intelligence (AI) is shaping and expanding teachers' professional roles. These themes reflect AI's diverse influence across instructional, developmental, ethical, and leadership domains, providing a global perspective on how AI reconfigures teacher identity and capacity.

Improvement of Instruction and Automation. AI is increasingly being used to handle laborious teaching tasks, freeing up teachers to focus on student engagement and instructional strategies. Accord-

ing to Kumar, AI-driven solutions such as automated grading and lesson development significantly reduced teachers' administrative load in India, improving their time management and increasing student engagement [1]. According to Hazra, AI tools also helped with curriculum development and classroom administration, making instructors' daily tasks more efficient [14]. According to the authors [3], automating basic chores freed up teachers' time to focus on more complex teaching strategies, encouraging a more inquiry-based, student-centred approach to learning.

Tailored Professional Development. AI's role in tailoring professional development (PD) to the unique requirements and proficiency levels of individual teachers has been the subject of numerous studies.

According to authors [16], a professional development program that included an AI grading system increased Israeli biology teachers' confidence in AI and helped them better understand algorithmic feedback. Younis conducted a quasi-experimental study with preservice teachers in Palestine and found that, after targeted instruction, their AI literacy and confidence significantly improved, underscoring the importance of structured exposure [18]. To increase the flexibility and contextual relevance of professional development, the author [28] advocated for AI-driven, adaptable systems that mimic individualised coaching environments and offer real-time performance monitoring.

Creation of a Partnership between AI and Educational Design. AI is increasingly being integrated into educational design processes, serving as a cooperative partner in instructional planning rather than as a driving force. According to the authors [21], 50% of participants in an Indonesian science teacher training program modified AI-generated lesson concepts to better suit classroom environments, demonstrating an active rather than a passive use of technology. Likewise, authors [23] found that Chinese vocational teachers who were highly proficient in digital leadership incorporated Smart Learning Management Systems (SLMS) into the design and implementation of adaptive learning classrooms, revealing the influence of teachers' contributions to AI-enhanced learning spaces and the integration of knowledge.

Data Problems and Ethical Issues. The ethical connotations of AI that teachers are concerned with typically centre on privacy, surveillance, and equity. Author [12] conducted a study by interviewing over 700 Turkish teachers and found that, although educators recognised the instructional power of AI, many were concerned about the risk of data misuse and the potential loss of the emotional bond between them and students. As the author [15] explains, AI might deteriorate the connection between teachers and students by replacing emotional interaction with mechanical responses, thereby compromising the relational aspect of learning unless educators implement it thoughtfully. To achieve responsible AI applications in education, [3] highlighted these issues, noting that teacher education programs do not provide formal ethical training and that policymakers should implement regulatory frameworks.

Affective and Inspirational Obstacles. Emotional preparation and incentives were also necessary, alongside technical expertise, to adopt AI. In a mixed-methods study, authors [27] found that Swedish teachers generally viewed AI as abstract or even frightening and felt confused and nervous due to ambiguity in the policy guidelines. Authors [29] in their survey study involving 375 teachers in China and Russia found that although most teachers had heard of artificial intelligence (AI), few had ever used it, and many were unsure whether it would be practical in real-life training environments. Authors [20], in their evaluation of the world literature, indicated that even the most thoughtful professional development programs could not succeed if motivational principles such as a sense of relevance, emotional support, and confidence are overlooked.

Reconceptualising Teacher Leadership in Artificial Intelligence-Enhanced Environments. AI adoption has altered the role of a teacher leader. Authors [19] concluded in a qualitative study of Arab states that, whilst some educators believed they were less empowered due to the impact of AI, others viewed new leadership opportunities, such as supporting the curriculum and data-driven coaching. Authors [22] alleged that, following the application of AI tools, educators could influence the learning process even when not in the classroom, acting as instructional designers, moral custodians, and advocates of personalised learning. Authors [24] proposed a model for training teacher leaders in Nigeria in the era of artificial intelligence, combining technology literacy with reflective and collaborative leadership skills.

Instruction Concept Models AI Literacy. Teachers' knowledge of technology directly affected how they incorporated AI into their lessons. In a recent study, authors [26] applied phenomenography and distinguished six perspectives of Hong Kong secondary teachers regarding an essential tool, ranging from simplistic tool awareness at one end of the spectrum to more advanced perspectives that involve intellectual empowerment and ethical reasoning at the other. Although national regulations promote the infusion of AI, authors [27] found that several teachers struggled to translate general AI concepts into practical methods to help their students learn. Based on this research, educators must build AI-oriented pedagogical content knowledge (PCK) alongside general digital competency to achieve successful integration.

Context and Infrastructure Dependencies. The quality of implementation of AI is highly affected by the organisational culture, the coherence of the school policy, and the school infrastructure. After analysing the evidence from schools in the UK and the UAE, the authors [13] concluded that teacher independence, moral values, and management support emerged as strong predictors of the implementation of AI platforms. It is also worth noting what authors [29] stated about under-resourced schools: the lack of hardware, poor connectivity, and insufficient institutional preparation hindered access and motivation. In addition to technical resources, Authors [17] argue that implementing AI in education involves cooperation across industries, long-term maintenance, and local customisation.

CONCLUSIONS

In conclusion, artificial intelligence can help instructors expand their roles, but only if educational institutions provide careful planning, ongoing training, moral guidance, and system-level support. The goal of AI in education is to reimagine instruction with teachers at its core, not to replace them.

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