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Pre-Digital to AI eras: Changing Role of a Teacher with Technology

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Abstract: The role of teachers has undergone a profound transformation in response to the continuous advancement of emerging educational technologies. While innovations such as artificial intelligence, digital tools, and online learning platforms have significantly altered the educational landscape, teachers continue to occupy a central and indispensable position within the learning process. This study presents a systematic literature review aimed at analyzing the evolving roles and responsibilities, and instructional/pedagogical strategies of teachers across different technological eras. It also explores the challenges educators face in adapting to these shifts. The review identifies and categorizes these transformations into four distinct phases: (1) the Pre-Digital era, characterized by traditional didactic instruction; (2) the Broadcast era, marked by the introduction of mass media such as radio and television; (3) the Internet era, which introduced digital interactivity and online learning; and (4) the Artificial Intelligence era, where intelligent systems support adaptive, personalized learning. Findings reveal that rather than replacing teachers, technology functions as an enabler, enhancing their roles. Teachers transitioned from being *knowledge authorities* in the Pre-Digital era, to mediators and moderators in the Broadcast era, to *facilitators, designers, and co-learners* in the Internet era, and to orchestrators, ethical guides, and mentors in the AI era. The study also identifies shifts in instructional approaches across eras, emphasizing the increasing need for learner-centered, adaptive, and ethically grounded pedagogies. The paper further highlights key challenges, including digital literacy gaps, resistance to technology adoption, and ethical considerations in AI-enhanced education. This study contributes to the ongoing discourse on teacher professional roles, pedagogical adaptation, and the future of teaching in technology-mediated learning environments.

Keywords: Teacher roles, emerging technologies, digital competencies, educational technology, systematic literature review

1. Introduction

The role of the teacher has undergone a transformation in response to the rapid advancement of technology. Once regarded as the primary source of knowledge and authority within the classroom, teachers are now increasingly expected to serve as facilitators, mentors, co-learners, and designers of learning experiences (Todorova, 2022). This shift reflects a broader movement in education toward learner-centred pedagogies, which are being increasingly shaped and supported by innovations in educational technology, including online platforms, mobile learning tools, and, more recently, artificial intelligence (AI) (Demuner et al., 2024). Historically, teaching was largely characterised by direct instruction and content delivery within the physical confines of the classroom.

However, each wave of technological innovation has challenged and expanded this traditional paradigm. The integration of radio and television into classrooms in the mid-20th century, followed by the proliferation of the internet and the rise of Massive Open Online Courses (MOOCs), significantly altered how teachers engaged with content and learners (Milligan et al. 2013). Today, the advent of AI-driven systems such as intelligent tutoring systems, adaptive learning platforms, and AI chatbots marks a new era in which teachers must navigate increasingly complex educational ecosystems. While early narratives often

positioned technology as a potential replacement for teachers, the reality has proven more nuanced. Research consistently shows that technology's effectiveness depends largely on how teachers interpret, adapt, and apply it within their unique pedagogical and cultural contexts (Hazzan-Bishara et al. 2025; Amin 2016).

The novel affordances of digital tools can also reshape classroom dynamics and teacher-student relationships. With students now having instant access to vast amounts of global information, the teacher's role could shift from being a sole knowledge provider to becoming a curator, contextualizer, and guide through an overwhelming information landscape. This change also redistributes power in the classroom, as students assume more active roles in constructing knowledge. Consequently, teachers are expected to adopt more dynamic instructional strategies that support collaboration, personalization, and inquiry-based learning, while also attending to the socio-emotional needs of learners, areas in which technology remains limited. In this evolving landscape, teachers must not only facilitate learning but also act as ethical stewards and digital navigators. They are required to demonstrate proficiency in educational technologies, interpret real-time data dashboards, manage hybrid or blended learning environments, and ensure equitable access to learning for all students (Todorova, 2022). These demands place a premium on teacher adaptability, professional development, and reflective practice (Amin, 2016).

Despite growing scholarly interest in technology-enhanced education, much of the existing literature has disproportionately focused on student outcomes and experiences. Comparatively less attention has been paid to how teachers experience and negotiate their changing roles within tech-rich environments (Todorova, 2022). While some frameworks, such as TPACK (Koehler et al. 2013) and studies on changing (Dwyer, 1991) and persistent teacher beliefs and practices (Ertmer et al. 2012), and teachers' role in technology integration (Wohlfart & Wagner, 2023), have illuminated aspects of these transformations, the literature remains fragmented. In particular, there is a lack of longitudinal and synthesized perspectives that trace teacher role evolution in relation to specific technological epochs. Additionally, the emotional, relational, and identity-related challenges that teachers face in navigating these transitions remain underexplored (Amin, 2016).

Against this backdrop, the present study conducts a systematic literature review to examine how the role of the teacher has evolved across four key technological eras: the Pre-Digital era, the Broadcast Media era, the Internet era, and the Artificial Intelligence era. Specifically, it seeks to answer the question: *How has the teacher's role transformed in response to technological developments from the Pre-Digital to the Artificial Intelligence era?* By mapping these transformations, the study aims to contribute a synthesized understanding of teacher roles with evolving technologies.

2. Methodology

This study employs a structured literature review methodology to investigate the evolving role of teachers in response to technological developments in education. This methodological approach was selected due to its capacity for rigor, transparency, and replicability in synthesising existing scholarly knowledge (Massaro, Dumay, & Guthrie, 2016). The study draws from a broad corpus of academic literature to explore longitudinal and cross-contextual trends concerning teacher role transformation across four distinct technological eras: the Pre-Digital era (chalkboard/print), Broadcast Media era (radio/TV), Internet era (web-based tools), and Artificial Intelligence era (AI-driven platforms). The overarching objective of this review is to synthesize and interpret how the professional roles and responsibilities of teachers have transformed in response to successive waves of educational technologies. To gain a deeper and more nuanced understanding of this transformation, two sub-questions were formulated: (a) What pedagogical roles were dominant during each technological era? and (b) What challenges did teachers face in each era?

2.1 *Paper Selection Process*

The literature for this review was curated through a purposive selection strategy, employing the snowballing technique as its primary method. This approach facilitated the identification of highly relevant sources by tracing citations from foundational texts and incorporating key recommendations from academic mentors. Papers were selected based on their relevance to the central research questions, representation of diverse perspectives, and their capacity to provide insight into the four technological eras under investigation. In addition to expert-recommended readings, targeted searches were done on Google Scholar, ERIC, and ChatGPT. These searches were guided by a structured combination of keywords and Boolean operators to ensure breadth and depth of coverage. The search encompassed literature published between the 1970s and 2024, and spanned the domains of education, educational technology, teacher education, and instructional design. The intention was to capture both historical and contemporary perspectives on the evolving role of teachers within technology-integrated education systems.

Key search phrases included combinations such as “teacher role” AND “technology,” “educational technology” AND “pedagogical change,” “teacher identity” AND (“broadcast media” OR “television” OR “radio”), “online learning” OR “digital learning” AND “teacher facilitation,” and “AI in education” AND “teacher roles” OR “pedagogy.” A total of 26 papers were selected, representing a diverse mix of empirical studies, conceptual frameworks, theoretical analyses, systematic reviews, and policy-oriented reflections. Inclusion criteria required the paper to explicitly discuss the role or function of teachers in relation to educational technologies from one of the four technological contexts defined in the study. Selected papers spanned a variety of geographical and educational levels, with English as the publication language. Both peer-reviewed journal articles and pertinent grey literature, such as institutional reports and conference proceedings, were considered to ensure the inclusion of a wide range of scholarly and practice-based perspectives. Exclusion criteria were applied to omit papers that focused solely on student learning outcomes without reference to teacher roles, those that were primarily technical (e.g., emphasizing tool design or usability) with minimal pedagogical context, generic discussions of Educational Technology lacking specificity regarding teacher practices or transformations, non-peer-reviewed sources such as blogs and newspaper articles, and studies that did not situate their findings within a specific technological era. This rigorous selection process ensured the inclusion of literature that was both contextually grounded and analytically robust, thereby providing a strong foundation for synthesizing insights on the shifting roles, identities, and responsibilities of teachers over time.

2.2 *Categorization by Technological eras*

To systematically trace the evolution of the teacher’s role over time, the selected literature was organized into four major technological eras. This temporal categorization served as an analytical framework to compare how teachers resisted or adapted to new tools, how pedagogical practices evolved, and how broader educational paradigms shifted in response to emerging technologies. The four technological eras are:

- Pre-Digital era (Before the 1970s), characterized by traditional classroom instruction utilizing chalkboards, printed textbooks, and face-to-face learning;
- Broadcast Media era (1970s–1990s), marked by the integration of educational radio, television, audio-visual media, and early forms of computer-assisted instruction;
- Internet era (1990s–2010s), encompassing web-based tools, learning management systems, MOOCs, and e-learning environments; and
- Artificial Intelligence era (2010s–Present), defined by the rise of adaptive learning platforms, AI tutors, chatbots, intelligent tutoring systems, data analytics dashboards, and generative AI technologies.

This classification enabled a diachronic and cross-contextual analysis of how teacher roles have evolved not only in terms of functionality but also in their social, cultural, and ethical dimensions. The literature was reviewed chronologically according to these four

technological categories, allowing for a systematic comparison of pedagogical transformations over time. Each study was coded and analyzed using a structured coding framework aligned with the research questions. Key data points extracted during the analysis included: the technological context or era addressed, the conceptualization of teacher roles, the specific challenges reported by teachers, and the pedagogical changes or role shifts identified within each study. This analytical strategy facilitated a nuanced synthesis of the evolving teacher identity in tandem with the shifting technological landscape of education.

3. Findings

The findings of this structured literature review are organised under the four technological eras identified. Within each era, key patterns emerged concerning the pedagogical approaches adopted by teachers, the challenges encountered, and the nature of role transformation in response to technological change.

3.1 *Pre-Digital era*

In the pre-digital era, roughly spanning the early to mid-20th century, education was predominantly a teacher-centred endeavor. The classroom relied on basic instructional tools such as chalkboards, textbooks, printed handouts, maps, and physical models. This is a dominant mode in most of the classrooms, in developing countries until recently, where we find hints of the presence of digital infrastructure. Reviewing the origins of classrooms in India from the British era, Kumar (1988) provides a very good picture of such a classroom, calling it a textbook culture. Teachers, anchored to the textbooks, operated as the sole authority and transmitter of knowledge, controlling the pace, flow, and nature of instruction. The student's role was largely passive, limited to note-taking, repetition, and memorization. The chalkboard, in particular, served as the central visual aid and symbol of instructional delivery. It was used for problem-solving demonstrations, illustrations, writing key points, and organizing classroom dialogue. However, despite its value in visualizing content, its static nature offered no interactivity or feedback, and its use was entirely dependent on the teacher's ability to engage students through explanation and repetition (Karnam et al. 2020).

Classroom practices in this era typically involved rote learning, direct instruction, and whole-class teaching, often structured around fixed textbooks and curriculum-centred delivery. Teaching styles were hierarchical and unidirectional: the teacher lectured, students listened and wrote. This approach reinforced the teacher's identity as a subject expert, moral authority, and classroom manager. Importantly, the literature from this period reflects a consistent view that the teacher was the "centrepiece" of education, whose presence was essential not only for delivering information but also for maintaining discipline and moral order. Technology had a minimal role, and educational success was deeply intertwined with teacher authority, personal charisma, and classroom presence.

3.2 *Broadcast era (Radio and Television)*

The Broadcast Era, emerging in the 1920s and reaching widespread adoption during the 1970s–1990s, redefined the teacher's role through the integration of radio and instructional television into education. These technologies enabled mass dissemination of knowledge across geographic and socioeconomic boundaries, particularly in rural or under-resourced areas (Hawkridge 1979; Arulchelvan & Viswanathan 2008). Radio and television brought centralized, expertly produced lessons into classrooms and homes, leading many to speculate whether teachers might eventually become obsolete. Initially, radio was hailed as a revolutionary tool. Educational radio broadcasts, often aligned with school curricula, were introduced in countries like Canada and the United States with strong institutional support. In theory, these broadcasts offered standardized, high-quality content from national experts. However, in practice, teachers remained essential mediators. They were responsible for

preparing students to listen, facilitating discussions around the broadcasts, and contextualizing the information for specific classroom needs. In many cases, teachers were expected to “fill in the gaps” left by the generality of the broadcasts, thereby reinforcing their relevance rather than diminishing it.

Instructional TV (Whittington 1987) later expanded on this model by adding visual elements to the learning experience. Teachers used TV to show science demonstrations, dramatizations of historical events and language instruction videos. Additionally, resistance emerged from teachers who feared that technology could de-skill their profession or reduce their autonomy in content delivery. Despite these concerns, research consistently showed that teachers were not displaced but repositioned. Rather than being replaced by broadcasts, teachers adapted by acting as facilitators, content translators and classroom moderators, often supplementing broadcasts with discussion, written assignments and local examples. This era thus began a subtle redefinition of the teacher’s identity from the sole deliverer of content to a more dynamic role that involved integrating and contextualizing external media resources.

Some experimental practices during this time further highlighted this evolving role. For instance, “TV schools” during the Cold War attempted to replace teachers with televised instruction, especially during teacher shortages (Maccoby 1966). But these initiatives often failed due to a lack of emotional engagement and classroom management issues, both of which required a human presence. The broadcast era showed that while technology could amplify and enrich instruction, it could not replace the human dimensions of teaching. Teachers remained vital as the interpreters, moderators and emotional anchors in a system increasingly mediated by the media.

3.3 *Internet era*

The emergence of the internet in the late 20th century brought a radical transformation to education, shifting teaching practices from fixed, broadcast-based models to interactive, decentralized, and learner-driven environments (Amin, 2016). This era introduced web-based platforms, learning management systems (LMSs), MOOCs, online forums, collaborative tools (e.g., Google Docs), and virtual classrooms, each of which began to redefine the roles, responsibilities, and required competencies of teachers (Fitria & Suminah, 2020; Todorova, 2022). In contrast to the one-way nature of television and radio, the internet enabled bidirectional, multimodal communication, giving students the power to engage with content, peers, and instructors in new ways. This shift placed pressure on teachers to relinquish some degree of control and embrace more facilitative roles. They were now expected to curate digital resources, scaffold learner autonomy, foster online discussions, and provide individualized feedback within increasingly diverse virtual environments (Todorova, 2022; Amin, 2016).

Tools like MOOCs and asynchronous forums shifted the locus of learning from the classroom to the cloud. Teachers designing or facilitating MOOCs had to think at scale, focusing on clear structure, self-paced navigation and embedded feedback mechanisms (A. Triantafyllou 2021). The learning management system (LMS) became the new administrative and pedagogical centre, with teachers uploading resources, managing submissions, tracking analytics and conducting assessments online (Beaudoin 1990). In blended and flipped classrooms, teachers recorded lectures for homework and used in-class time for discussion and problem-solving. This inverted the traditional flow of classroom instruction, forcing educators to shift from performers to planners, from content deliverers to learning architects. For example, in online collaborative tools like Google Docs or Padlet, students co-constructed knowledge while teachers could monitor, guide, or give feedback often asynchronously.

The literature also reflects growing concern over the emotional and cognitive demands placed on teachers during this transition. Teachers had to adapt quickly to digital tools, often without sufficient training or institutional support (Mehboob et al., 2024). In the context of pedagogical challenges, one major thing is maintaining student engagement in online settings, where a lot of distraction weakens the learners’ focus. Moreover, managing

online engagement, learner motivation, and digital behavior introduced new pedagogical and ethical challenges (Beaudoin, 2013). They face difficulty in fair assessment and evaluation, due to concerns around academic honesty and limited control in the virtual environment. There exists a digital divide as well between teachers and students. From an ethical perspective, there also exist challenges around equity and accessibility as well as the privacy and security of student data in online platforms (Demuner et al., 2024). Teachers also report struggling to manage student behavior digitally, and the literature documents the emergence of teacher burnout in online platforms, where educators sometimes find it difficult to balance professional demands with personal life due to the blurred boundaries of online teaching.

Despite these pressures, the internet era also empowered teachers. With access to global content and communities, they could share resources, engage in professional development and adopt more inclusive, differentiated and student-centered pedagogies (Amin, 2016; Mehboob et al., 2024). They also became designers of learning experiences, using data and feedback tools embedded in platforms to tailor interventions and support struggling students (Beaudoin, 2013). The internet era redefined teachers as facilitators, co-learners, designers and data-informed mentors. While it decentralized knowledge, it simultaneously elevated the pedagogical creativity and technological fluency required of educators (Todorova, 2022; Amin, 2016)

3.4 *AI era*

The rise of artificial intelligence in education marks a new paradigm in the transformation of the teacher's role. Unlike earlier technologies that extended or mediated teacher practices, AI tools such as intelligent tutoring systems (ITS), chatbots, automated assessment platforms, and generative AI models like ChatGPT now can simulate cognitive and, to some extent, emotional functions of teaching (Gentile et al., 2023; Chan & Tsi, 2023). This includes providing personalized feedback, modeling problem-solving processes, tracking student progress in real time, and even engaging in natural language conversations (Guo et al., 2024; Chan & Tsi, 2023). These affordances have shifted the teacher's role further from being the sole knowledge source to being a learning orchestrator, someone who coordinates interactions between learners, platforms, and content (Gentile et al., 2023; Todorova, 2022). Teachers must now design blended environments where AI can automate routine instruction or diagnostics, while they focus on complex pedagogical tasks such as ethical reasoning, emotional support and creative facilitation (Chan & Tsi, 2023; Gentile et al., 2023; Zhai, 2024). Teachers working with these systems are expected to interpret performance dashboards, diagnose learning gaps based on system reports and intervene only when needed, an approach sometimes referred to as "data-driven pedagogy" (Guo et al., 2024; Zhai, 2024). As shown in studies like those by Guo et al. (2024), teachers increasingly depend on visual analytics tools to understand students' problem-solving trajectories and make responsive instructional decisions. However, literature also reveals deep tensions. Many educators express concerns about being reduced to supervisors of algorithmic systems, losing autonomy, or being deskilled by black-box technologies (Gentile et al., 2023; Zhai, 2024). Others worry about the ethical dimensions of AI use issues of surveillance, bias, data privacy and authenticity in student work (Chan & Tsi, 2023; Zhai, 2024).

Yet, AI has also brought new opportunities for reclaiming the human core of teaching. Since AI struggles with empathy, moral judgment, cultural sensitivity, and adaptive mentoring, teachers are increasingly valued for their emotional intelligence and relational presence (Chan & Tsi, 2023; Gentile et al., 2023; Zhai, 2024). In some classrooms, teachers use AI as a co-teacher or brainstorming partner, while retaining full control over how learning is scaffolded, paced, and evaluated. Thus, in the AI era, teachers emerge as critical agents who not only facilitate learning but also mediate the impact of technology on students' lives. They are required to be ethically aware, emotionally grounded, and technologically fluent—roles far beyond the traditional instructor and even beyond the facilitator of the internet age (Gentile et al., 2023; Chan & Tsi, 2023; Todorova, 2022). AI doesn't eliminate the teacher, it amplifies the complexity and value of human judgment in education.

Table 1. An *Evolution of Teacher's Role and instructional approaches Across Technological eras along with challenges*

Era	**Dominant Technology**	**Teacher's Role**	**Pedagogical approaches**	**Challenges**
Pre-Digital (Kumar,1988)	Chalkboard Print textbooks Face-to-face instruction	Knowledge Authority	Direct, rote learning, textbook-driven teacher-centred, uniform curriculum	Limited interactivity, centralized control, limited access to resources, textbook dependency, no differentiation: lack of individualized instruction
Broad cast (Hawkridge, 1979; Arulchelvan & Viswanathan, 2009; Mehboob et al., 2024; Stefanyshyn & Kendell, 2012)	Radio TV Audio-visual media	Mediator and Moderator	Passive + supplemented, guided discussion	Loss of autonomy, lack of context, infrastructural barriers, lack of teacher training, reduced content control
Internet (Todorova, 2022; Milligan et al., 2013; Amin, 2016; Triantafyllou, 2021; Li, 2023; Fitria & Suminah, 2020; Beaudoin, 1990, 2013)	Web 2.0 tools LMS MOOCs, E-learning platforms	Learning Facilitator, Digital course designer, Content curator, Online moderator	Interactive, asynchronous & blended learning, networked collaboration	Engagement, assessment fairness, digital divide, tool overload, pedagogical shift resistance
AI (Zhai, 2024; Taufikin et al., 2024; Cai, 2024; Demuner et al., 2024; Gentile et al., 2023; Chan &Tsai, 2023; Fitria, 2023; Li & Wang, 2020)	GenAI (e.g. ChatGPT), AI-based tools (eg.Intelligent Tutoring Systems, chatbots), Adaptive learning platforms, AI dashboards (data analytics), Virtual Assistants	Orchestrator of personalised learning paths, Socio-emotional and ethical guide and mentor, Data interpreter, Decision-maker, Content co-creator	Personalized and data-driven learning, Co-creation with AI, Learner-centred design, Real-time formative assessment, Blended AI-human instruction	Digital and AI literacy gaps among teachers, ethical concerns (like privacy, bias, data misuse), shifting teacher identity and role clarity, overdependence on AI systems, deskilling fears, dilemmas to the professional roles of teachers, like loss of authority/ role confusion emotional and relational limitations of AI

4. Discussion and Conclusion

The synthesis of literature across four technological eras reveals a progressive, though non-linear, transformation in the teacher's role, shaped by shifting pedagogical responsibilities and the persistent challenges of integrating technology. While educational technology has often been framed as a driver of innovation and efficiency, evidence shows it has consistently redefined rather than replaced the centrality of teachers (Rifah & Zamahsari, 2022; Carrillo, 2012; Gentile et al., 2023). Technology has acted less as a substitute and more as a catalyst, altering how teachers teach, interact, and support learners, while leaving their socio-emotional and relational capacities irreplaceable.

In the Pre-Digital era, pedagogy was largely didactic, with teachers seen as authoritative transmitters of knowledge and moral custodians who shaped learners within the physical classroom (Kumar, 1988). The teacher's professional identity was closely tied to authority, discipline, and the one-way delivery of content.

The Broadcast Media era, marked by radio, television, and audiovisual aids, repositioned teachers as mediators who contextualized centrally produced content for diverse learners (Arulchelvan & Viswanathan, 2015). The integration of broadcast media brought greater structure and standardization into classrooms, but the fixed nature of centrally produced programs often constrained teacher agency. While technology promised scalability and wider reach, the teacher's role remained crucial in adapting static materials to local contexts and ensuring learners' engagement.

With the Internet era, a significant departure from one-way communication emerged. Interactive and learner-centered approaches began to take precedence. Teachers became co-learners, digital content curators, and designers of technology-enhanced environments that encouraged collaboration and personalization (Beblavý, Baiocco, Kilhoffer, Akgüç, & Jacquot, 2019). This era underscored the teacher's capacity to orchestrate digital resources, but it also revealed new challenges: uneven infrastructure, differences in digital competence, and varied pedagogical adaptability. The Internet expanded opportunities for student autonomy, yet reinforced the indispensability of teachers in scaffolding, guiding, and contextualizing learning.

The current Artificial Intelligence era has again reshaped expectations. Teachers are now tasked with managing complex algorithmically mediated learning environments, interpreting AI-driven insights, and addressing ethical questions raised by automated systems (Chan & Tsi, 2023; Zhai, 2024). While AI tools provide powerful support for personalization and assessment, they require teachers to critically evaluate their appropriateness and reliability. The teacher's role has thus expanded to include responsibilities as an interpreter of data, a gatekeeper of ethics, and a mentor fostering students' digital and critical literacies. Despite these technological advances, empathy, adaptability, and interpersonal guidance remain outside the domain of automation and continue to define the human dimensions of teaching.

Across these eras, two imperatives for educational ecosystems become evident. First, teachers must be recognized not as passive recipients of technology but as active agents who co-shape and humanize its application. Their professional judgment determines whether technology is used meaningfully or superficially. Second, the design of educational technologies must account for the realities of teachers' work—their pedagogical commitments, institutional constraints, and contextual variations. As Ertmer and Ottenbreit-Leftwich (2010) argue, technology's potential is only realized when teachers are provided with training, autonomy, and reflective spaces to integrate innovations into practice.

While the categorization into eras provides a useful framework for tracing historical shifts, it risks flattening the diversity of teachers' experiences. Adoption trajectories differ by region, school type, and subject domain, meaning that the teacher's role is better understood as a culturally and temporally situated construct, shaped by the interplay of pedagogy, policy, and technology. Rather than a linear progression, role evolution is a process of dynamic negotiation, with teachers continually reinterpreting their professional identity in response to new tools, systemic pressures, and pedagogical ideologies.

This review contributes a synthesized, diachronic understanding of how teacher roles have evolved across four major eras—Pre-Digital, Broadcast Media, Internet, and AI. It highlights continuities and shifts, showing that despite recurring claims about teacher replacement, technology has consistently augmented the importance of educators. Teachers emerge not as obsolete but as adaptive, relational, and ethically grounded professionals. Socio-emotional competencies, critical thinking, and pedagogical judgment remain beyond automation, reaffirming the centrality of human educators in technology-mediated contexts.

The implications for policy and practice are significant. Educational leaders and policymakers must invest in sustained teacher training that extends beyond technical skills to include ethical reasoning, emotional intelligence, and pedagogical adaptability. Technology developers should involve teachers directly in design and implementation processes to ensure tools are responsive to classroom realities. Teacher education programs must prepare future educators for fluid roles requiring technological fluency alongside human-centered pedagogy.

Nonetheless, limitations remain. This review draws primarily on English-language and purposively selected literature, constraining global generalizability and possibly introducing selection bias. The division into four eras, while analytically helpful, simplifies the uneven and overlapping nature of technology adoption across contexts. Future research should move toward more nuanced analyses through empirical, longitudinal, and comparative studies, with particular attention to how teachers negotiate identity, ethics, and agency in AI-mediated classrooms. Action research and co-design involving teachers and developers could ground innovation in pedagogical reality, while cross-disciplinary and cross-level studies would illuminate how technological shifts differentially reshape teaching roles.

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