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AI in the Classroom: A Systematic Review of Barriers to Educator Acceptance

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Abstract. This study investigates the barriers to educator acceptance of Artificial Intelligence (AI) technologies in education through a systematic review guided by the PRISMA 2020 framework. With educators occupying a pivotal role in the classroom as facilitators of learning and mediators of technology use, their acceptance and integration of AI tools are critical to the success of educational innovation. Educators' readiness and resistance to AI are examined through the synthesis of empirical findings from peer-reviewed studies published between 2020 and 2025. From an initial 404 records identified, 310 remained after duplicate removal. Following title and abstract screening, 33 records were retained. After a full-text eligibility review, 14 studies were included in the qualitative synthesis, of which 10 met the criteria for final analysis. The results highlight that demographic factors such as age, gender, and digital literacy significantly affect educators' readiness to use AI. Common barriers include insufficient training, infrastructure limitations, ethical concerns, anxiety, and perceived misalignment between AI tools and pedagogical goals. Barriers vary by regional and institutional context. Developing countries face technological and resource-based challenges, while developed nations encounter pedagogical and ethical issues. The study compares several theoretical models, including the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), to explain variations in AI adoption, further integrating perspectives on emotional response, professional identity, and institutional culture. This review provides critical insights for educational policymakers, leaders, and technology developers to design inclusive, ethically sound, and pedagogically aligned strategies for AI integration in classrooms.

Keywords: Artificial Intelligence; Educator Acceptance; Educational Technology Integration; PRISMA

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1. Introduction

Artificial intelligence (AI) is increasingly regarded as a transformative element in the field of education, offering new tools to enhance learning, teaching, and institutional decision-making. Through applications such as adaptive learning platforms, intelligent tutoring systems, automated assessments, and learning analytics, AI supports efforts to personalize instruction, improve learner engagement, and expand access to educational resources (Chassignol et al., 2018; Perrotta & Selwyn, 2020). These technologies enable educators to address diverse learner needs and make data-informed decisions that improve educational outcomes (Adiguzel, Kaya, & Cansu, 2023).

Despite its growing presence, the rapid deployment of AI in education presents unresolved challenges. Concerns regarding data privacy, algorithmic bias, equity, and ethical governance have become more pressing as AI tools are increasingly embedded in classrooms and institutional systems (UNESCO, 2023). Without adequate safeguards, there is a risk that these technologies may deepen existing inequalities or compromise core educational values. In response, global initiatives such as the Beijing Consensus emphasize the importance of a human-centered approach that upholds inclusion, fairness, and human oversight in educational AI systems (Giannini, 2024).

A key factor influencing the effectiveness of AI integration is the role of educators. Their willingness and capacity to engage with AI technologies largely determine the success of implementation efforts (Wang & Johnson, 2023; Peterson & Zhang, 2024). However, research has shown that educator acceptance of AI varies widely due to several factors, including limited technical proficiency, inadequate professional development, institutional constraints, and ethical apprehensions (Alshammari et al., 2024; Papakostas et al., 2024). Moreover, trust in AI systems and alignment with pedagogical objectives are critical to educators' decision to adopt such tools (U.S. Department of Education, 2024).

To explain and predict educator acceptance, many studies apply frameworks such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), which highlight perceived usefulness, ease of use, and institutional support as central influences (Garcia & Williams, 2023; Martinez & Wilson, 2022). However, more recent studies have expanded these models to consider additional factors such as trust, ethical concerns, professional identity, and cultural context (Brown & Garcia, 2023; Lee & Martinez, 2023; Sharma & Johnson, 2023; Wilson & Johnson, 2022). As AI continues to evolve, understanding the conditions that facilitate or hinder its adoption in educational settings remains essential for informing both policy and practice.

Understanding the factors that affect educator acceptance of AI is essential for ensuring that implementation efforts lead to meaningful educational improvements. Multiple studies have identified barriers such as limited technical skills, ethical concerns, lack of infrastructure, and inadequate professional development (Nguyen & Roberts, 2023; Harris & Wong, 2023; Adams &

Thompson, 2022). These challenges are not experienced uniformly; they vary depending on demographic characteristics like teaching experience and career stage, as well as the organizational environment and leadership practices (Jackson & Campbell, 2022; Wong & Davis, 2022).

While prior systematic reviews have investigated individual predictors or isolated issues, there remains a need for a review that combines key findings across studies to provide a clearer understanding of the most common obstacles to AI adoption. Moreover, while several theoretical models have been used, their application has not been consistently compared or synthesized (Walker & Martinez, 2023; Garcia & Williams, 2023). This review is intended to fill these knowledge gaps and support efforts to design targeted interventions, informed policies, and context-appropriate professional development programs.

Several limitations are evident in the existing literature. Many studies examine educator-related factors in isolation, without accounting for how personal, institutional, and environmental variables interact (Chen & Thompson, 2022; Rodriguez & Kim, 2023). Demographic predictors such as age and gender are often oversimplified, even though research suggests that their influence is closely tied to factors such as technology experience and self-efficacy (Harris & Wong, 2023; Wong & Davis, 2022). In addition, while theoretical models like TAM and UTAUT are frequently used, there is limited integration of more recent constructs such as emotional response, trust, and professional role adjustment (Nguyen & Roberts, 2023; Roberts & Chen, 2022).

Moreover, cross-regional comparisons remain limited, despite clear evidence that acceptance patterns are shaped by national culture, educational traditions, and resource availability (Lee & Martinez, 2023; Li & Thomas, 2023). While some studies have proposed strategies to improve acceptance—such as professional development and collaborative leadership, these approaches have not been consistently evaluated for their effectiveness across different settings (Patel & Thompson, 2023; Adams & Zhang, 2023).

This systematic review aims to address these gaps by comprehensively analyzing barriers, context-specific factors, personal characteristics, theoretical frameworks, regional differences, and recommended strategies related to educator acceptance of AI in education. The findings of this research carry significant implications for key stakeholders. For curriculum designers, the insights can inform the integration of AI competencies into preservice and in-service teacher training, ensuring that technological tools align with pedagogical goals. In terms of providing quality education, understanding the conditions that support equitable and effective AI use can help mitigate disparities in learning outcomes and promote inclusive teaching practices.

Researchers can benefit from this synthesis by identifying underexplored variables, refining theoretical models, and building contextually grounded studies that respond to real-world educational environments. Lastly, the study underscores the importance of intentional, ethical, and pedagogically sound

incorporation of technology into educational practice—highlighting the need for sustained investment in infrastructure, professional learning, and policy frameworks that support responsible AI adoption.

1.1 Statement of the Problem

As the integration of Artificial Intelligence (AI) continues to gain momentum in education, understanding the factors that influence its acceptance among educators is crucial. Thus, this study aims to identify the factors that hinder educators from accepting AI technology. Specifically, the following research questions examine various dimensions of AI adoption in educational settings, including barriers, contextual factors, demographic influences, theoretical frameworks, geographic trends, and strategies for overcoming challenges.

1. What personal or demographic characteristics are reported to influence educator acceptance of AI technology?
2. What barriers to the acceptance of AI technology by educators are reported in existing literature?
3. What contextual factors (e.g., country and institution type) are associated with the resistance of educators toward AI in education?
4. What theoretical models have been applied to study educator acceptance of AI?
5. What recommendations have been proposed in the literature to overcome identified barriers and support the adoption of AI technology in teaching and learning?

1.2 Concepts and Theoretical Developments

1.2.1 Artificial Intelligence: Overview and Capabilities

AI-powered intelligent tutoring systems (ITS) and adaptive learning platforms provide customized instruction and real-time feedback, improving student engagement and learning outcomes. For instance, applications such as Khan Academy's Khanmigo and Duolingo use advanced AI models to adjust lesson plans dynamically, allowing learners to progress at their own pace while receiving targeted support. These systems help educators identify learners' strengths and gaps, thereby enhancing instructional effectiveness and addressing diverse learning styles and cultural contexts.

AI also automates routine tasks like grading and lesson planning, reducing teacher workload and enabling educators to focus more on mentorship and coaching roles. Additionally, AI-driven analytics offer actionable insights that inform data-driven decision-making in classrooms. The integration of generative AI further enriches education by producing customized quizzes, instructional materials, and interactive content that reflect students' community and cultural assets, promoting inclusivity and relevance (Zhang & Aslan, 2021).

The U.S. Department of Education highlights AI's potential to increase feedback loops and support educators in managing variability in student learning, while also emphasizing the need for trust, safety, and guardrails to mitigate risks such as algorithmic bias. The department recommends human-in-the-loop approaches and education-specific guidelines to ensure responsible AI use (U.S. Department

of Education, 2023). Research shows a dramatic growth in AI education publications, with a 47.9% annual growth rate and increased global collaboration, particularly between China and the United States. Key research themes include AI ethics, policy, and literacy, reflecting the field's maturation and the growing importance of addressing ethical concerns and equitable access (Irfan et al., 2025).

2. Literature Review

2.1 Applications of AI in Education

AI is increasingly embedded into educational systems through technologies such as intelligent tutoring systems, learning analytics platforms, automated assessment tools, and content generation applications. These tools aim to support personalization, real-time feedback, student engagement, and administrative efficiency (Wang & Johnson, 2023; Rodriguez & Kim, 2023).

For instance, intelligent tutoring systems can adapt instructional content based on student performance and learning preferences, offering individualized support similar to one-on-one teaching (Peterson & Zhang, 2024). Learning analytics tools allow educators to interpret student data to inform interventions and instructional adjustments. Meanwhile, AI-powered grading systems reduce the time spent on repetitive tasks, enabling teachers to focus more on pedagogical planning and student mentoring (Adams & Thompson, 2022).

2.3 Challenges and Ethical Concerns

Despite its potential, AI in education raises significant ethical and practical challenges. Key concerns include data privacy, algorithmic bias, lack of transparency, and overreliance on automated decision-making (Brown & Garcia, 2023). Educators and policymakers have expressed apprehensions about the misuse of student data and the lack of accountability in AI-driven assessments.

Additionally, issues of fairness and accessibility remain critical. Without inclusive design and equitable deployment, AI may amplify existing disparities in education (Sharma & Johnson, 2023). The opaque nature of many AI algorithms also complicates trust-building between educators and technology providers, especially when outcomes such as grades or learner profiles are influenced by automated systems (Walker & Martinez, 2023).

2.4 Educator Acceptance of Artificial Intelligence

Educators play a pivotal role in determining the success of AI integration. However, their willingness to adopt AI tools varies across contexts and is influenced by several factors. The Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT) are commonly applied to explain these variations, identifying perceived usefulness, perceived ease of use, and institutional support as major determinants of acceptance (Garcia & Williams, 2023; Martinez & Wilson, 2022). Educator acceptance of AI encompasses the willingness, readiness, and overall attitude of teachers and academic professionals toward incorporating AI tools into their instructional practices, classroom management, and administrative responsibilities (Venkatesh et al., 2003). This acceptance extends beyond mere agreement to use technology;

it involves a meaningful and sustained engagement that effectively supports teaching and learning processes.

A critical determinant of acceptance is the perceived usefulness of AI tools. Educators are more inclined to adopt AI when they believe these technologies can save time, personalize instruction, or provide valuable insights that enhance educational outcomes (Al Darayseh, 2023). However, perceived usefulness alone is insufficient. The perceived ease of use significantly influences willingness to adopt AI, as educators often face demanding workloads and may resist technologies that appear complex or time-consuming (Chen & Thompson, 2022; Ofosu-Ampong et al., 2023). Empirical studies confirm a positive correlation between perceived ease of use and educators' attitudes toward AI integration, underscoring the necessity for user-friendly AI applications (Dergipark, 2024).

Beyond technical considerations, acceptance is deeply affected by affective and professional factors, including trust and ethical concerns. Educators frequently express apprehensions regarding data privacy, algorithmic bias, and fears of professional displacement (UNESCO, 2019; García-Martínez et al., 2023). Furthermore, psychological dimensions, such as individual personality traits-particularly openness to experience and conscientiousness play a significant role in shaping educators' adaptability and acceptance of AI technologies (Kaya et al., 2022; Stein et al., 2024).

2.5 Barriers to Educator Acceptance of AI

One of the most prominent obstacles is the lack of adequate training and professional development opportunities. Many educators report feeling unprepared to integrate AI tools into their classrooms effectively, primarily due to insufficient exposure during teacher education programs and a lack of targeted in-service training (Zawacki-Richter et al., 2019). This skill gap creates hesitation and uncertainty in using AI technologies. Additionally, concerns about data privacy and ethical use remain significant. Educators are often wary of how student data is collected, analyzed, and potentially misused by AI systems, raising fears about surveillance, algorithmic bias, and the transparency of decision-making processes (Akgün & Greenhow, 2021).

Another substantial barrier is the limited infrastructure and technical support available within many educational institutions. Without reliable internet access, updated hardware, or ongoing IT assistance, the implementation of AI tools becomes impractical, particularly in underfunded or rural schools (Huang et al., 2023). Furthermore, the perceived misalignment between AI tools and pedagogical goals can lead to skepticism. Some educators view AI as adding complexity or increasing workload rather than enhancing teaching and learning (Liu et al., 2022). Resistance is also fueled by broader concerns about the future role of teachers, as some fear that AI could undermine their professional autonomy or even replace aspects of their work (Kong et al., 2021). Building trust in AI technologies and fostering educator involvement in their development and deployment is essential to overcoming these barriers.

Ethical concerns constitute another critical barrier. Educators frequently express apprehensions regarding the privacy and security of student data collected by AI systems, the potential reinforcement of biases embedded within AI algorithms, and the equitable distribution of AI benefits, particularly in under-resourced educational settings (UNESCO, 2019). These concerns reflect broader debates about the responsible use of AI in education and the need to safeguard students' rights and promote fairness. Additional factors influencing resistance include fear of change, skepticism about AI's educational effectiveness, and perceived loss of teacher autonomy. Many educators worry that AI-driven decision-making may standardize instruction, thereby limiting their professional control and creativity in tailoring learning experiences to individual student needs (Brown & Yupse, 2024).

More recent studies have expanded on these frameworks, adding constructs such as ethical alignment, emotional response, trust, and professional identity (Nguyen & Roberts, 2023). For instance, educators are more likely to embrace AI when they believe it supports—rather than replaces—their professional role. Conversely, fears about de-skilling and loss of autonomy can hinder adoption. Addressing these multifaceted barriers requires comprehensive strategies such as targeted professional development, evidence-based demonstrations of AI's educational value, empowerment of teacher leadership in technology decisions, and fostering collaborative cultures that support experimentation and shared learning. Furthermore, transparent communication about AI's role as a tool to augment rather than replace educators is essential to building trust and mitigating fears related to job security (Chananagari & Prabhakar, 2024).

2.6 Contextual and Demographic Influences

Research shows that AI acceptance is also shaped by contextual variables such as institutional type, geographic region, and cultural norms. For example, Lee and Martinez (2023) found that educators in collectivist societies are more influenced by social and organizational expectations compared to those in individualist cultures. Similarly, Wilson and Johnson (2022) noted differences in acceptance between K–12 and higher education faculty, with the latter expressing greater concern about academic freedom and pedagogical control. Demographic factors such as age, teaching experience, and digital literacy further affect educators' readiness to engage with AI technologies (Wong & Davis, 2022; Harris & Wong, 2023). However, the impact of these variables is often complex and mediated by professional development, institutional support, and access to resources.

2.7 Professional Development and Implementation Support

Effective professional development is widely recognized as a cornerstone of successful AI integration. Educators need structured training that goes beyond technical skills to include pedagogical applications and ethical considerations. Studies suggest that training programs that involve collaboration, reflection, and hands-on practice yield better adoption outcomes than one-time, lecture-based sessions (Peterson & Zhang, 2024; Anderson & Thompson, 2022). However, many institutions lack sustained implementation strategies or underfund professional learning initiatives, contributing to resistance or superficial adoption (Chen &

Thompson, 2022; Adams & Zhang, 2023). Without sufficient support, educators may view AI as an additional burden rather than a pedagogical asset.

3. Methodology

This study employed a systematic review methodology with a narrative synthesis approach, focusing on quantitative studies that examined factors that hinder educator acceptance of AI in education. While the included studies were primarily empirical and quantitative, a meta-analytic procedure was not conducted due to heterogeneity in study designs, variables, and outcome measures. Instead, the findings were synthesized narratively to identify common barriers, theoretical frameworks, and contextual factors shaping AI adoption across educational settings. It considered empirical literature published from January 2020 to May 2025.

Guided by the PRISMA 2020 framework, the study aimed to provide a comprehensive synthesis of factors influencing educators' readiness to adopt AI, including personal, contextual, institutional, and theoretical dimensions. Relevant studies were retrieved from academic databases such as Google Scholar, Scopus, and Research Rabbit, along with reference lists of selected articles. To ensure both breadth and precision in the search process, Boolean search terms were used, including: "artificial intelligence" AND ("educator" OR "teacher") AND ("acceptance" OR "perception" OR "attitude" OR "adoption"); as well as supplementary terms such as "barriers" OR "challenges" OR "resistance," "facilitators" OR "strategies," "demographic factors," "contextual factors," and "education level."

The inclusion criteria required that studies focus on educator-related acceptance of AI technologies, be empirical in nature (quantitative or mixed methods), conducted within formal education settings (primary, secondary, or tertiary), published in English, and peer-reviewed. Studies also needed to address at least one of the research dimensions: demographic characteristics, contextual influences, perceived barriers, theoretical frameworks, or recommended strategies. Conversely, studies were excluded if they centered solely on student or administrator perspectives, were non-empirical (e.g., editorials or opinion pieces), constituted grey literature (e.g., unpublished theses, institutional reports), lacked full-text availability, or discussed general educational technologies without specific reference to AI. Refer to table 1 below.

Table 1: Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
• Focus on educator-related acceptance of AI technologies • Empirical studies (quantitative or mixed methods) • Conducted in formal education settings (primary, secondary, or tertiary) • Published in English • Peer-reviewed publications	• Focus solely on student or administrator perspectives • Non-empirical works (e.g., editorials, opinion pieces) • Grey literature (e.g., unpublished theses, institutional reports) • Studies without full-text access • Studies on general educational technologies not specific to AI

Following the PRISMA methodology, the review proceeded through four stages. During the identification phase, a total of 404 records were initially retrieved. After removing 94 duplicates, 310 studies remained. In the screening stage, titles and abstracts were independently reviewed by two trained reviewers using a predefined screening protocol. Discrepancies in inclusion decisions were resolved through discussion and consensus. To ensure consistency and reliability, a pilot test involving 10% of the records was conducted prior to full screening. Inter-rater agreement was monitored throughout the process, with percentage agreement recorded to confirm consistency in the application of inclusion and exclusion criteria.

The remaining 33 studies underwent full-text assessment in the eligibility phase, during which the same dual-reviewer approach was maintained. Nineteen studies were excluded for not meeting the inclusion criteria. Ultimately, 14 studies were retained for qualitative synthesis, and of these, 10 met all criteria for final analysis. The PRISMA flow diagram below outlines the study selection process.

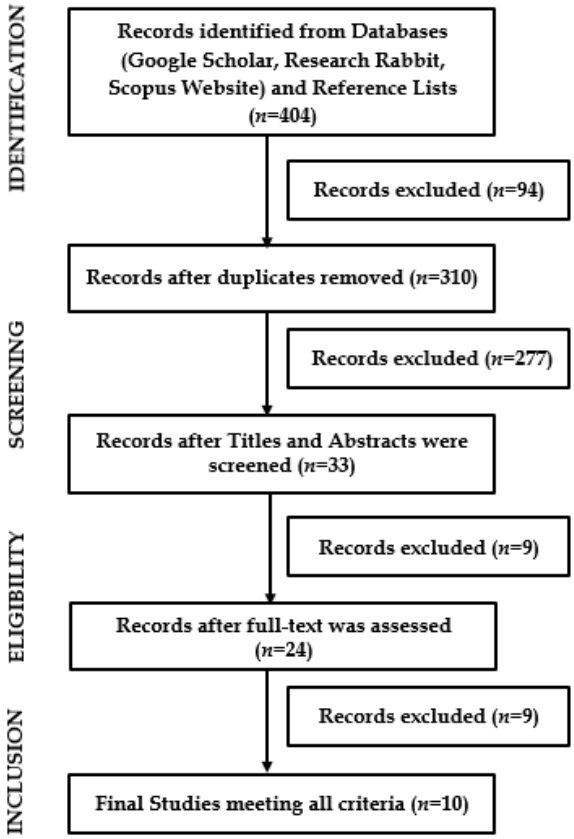

Figure 1: PRISMA flow diagram

Data extraction was guided by a coding matrix that categorized study content according to the six research questions. Extracted data included educator demographic variables, contextual settings (e.g., institution type, country), reported barriers to AI adoption, theoretical models used, and strategies proposed to overcome resistance.

To enhance the reliability of the synthesis and minimize potential bias, each study included in the final analysis was subjected to a risk of bias assessment. This involved evaluating methodological quality indicators such as sampling strategy, response rate, clarity of research design, validity of instruments used, and transparency of data analysis procedures. Studies with unclear or low-quality reporting were noted, and their findings were interpreted cautiously during synthesis. Although formal scoring was not applied due to variability in study types, this qualitative appraisal supported the rigor and trustworthiness of the review's conclusions.

4. Results and Discussion

4.1 Demographic Factors Associated with AI technology Adoption

Some studies reviewed included diverse age groups; however, most did not consider personal or demographic variables. Nevertheless, it is worth noting that findings consistently showed that mid-career to older educators were more prominently represented. For example, Ahmed et al. (2022) reported that most participants were aged 36–40, while Daskalaki et al. (2024) showed that the

majority of respondents were aged 46–55 (39.3%) and 36–45 (26.2%). Similarly, Abdelaal and Sawi (2024) included participants aged 24 to 63, with a concentration in the mid-range. Regarding gender, female educators made up the majority of the studies. Ahmed et al. (2022) had 143 female participants versus 75 male, while Abdelaal and Sawi (2024) reported 67.2% female and 32.8% male participants. Daskalaki et al. (2024) also found that females comprised 69.6% of their sample. However, some studies, such as Ayanwale et al. (2024), had a male-dominated sample, with 74.6% male and 25.4% female participants.

The literature reveals notable patterns in age and gender regarding barriers to AI adoption in education. Age-wise, older educators tend to encounter more challenges with AI integration. For instance, Fernández-Miranda et al. (2024) noted that younger teachers (ages 20–29) displayed significantly higher AI knowledge than those over 60, with the lowest familiarity with tools like ChatGPT. Meanwhile, both genders face personal and institutional barriers; findings suggest gender differences in AI familiarity and anxiety. For example, Fernández-Miranda et al. (2024) found that male teachers exhibited greater knowledge and use of AI tools than females. Conversely, Ayanwale et al. (2024) noted that male teachers were more likely to report anxiety about using AI-based educational technology, while female teachers were less likely to express such concerns. These findings highlight the need for gender-sensitive and age-responsive strategies in AI integration efforts in education.

4.2 Barriers to AI Technology Acceptance among Educators

The figure below presents various studies highlighting key barriers to AI adoption in education. Many studies underscore the role of inadequate infrastructure and system complexity. Ahmed et al. (2022) point to compatibility issues, insufficient tools, and system complexity. Cheng and Wang (2023) note difficulties in selecting and using AI systems due to lack of standardization and technical support.

Alshorman (2024) and Oyetola et al. (2024) also highlight poor internet connectivity and scarcity of tools as significant constraints. Meanwhile, lack of administrative support, unclear policies, and insufficient professional development are recurrent themes. Ahmed et al. (2022) identify the absence of policy and resources as institutional obstacles. Cheng and Wang (2023) reinforce this, adding that time constraints and limited training hinder effective use. Oyetola et al. (2024) mention institutional skepticism and negative perceptions that limit integration.

Furthermore, educators' attitudes and capabilities also influence adoption. Ayanwale et al. (2024) and Ahmed et al. (2022) refer to anxiety, resistance to change, and low ICT skills. Torres et al. (2025) and Abdelaal and Sawi (2024) highlight a general lack of knowledge, concerns over AI replacing traditional pedagogy, and fears of dehumanizing teaching roles. Several authors also raise concerns about data privacy and ethical issues. Fernández-Miranda et al. (2024) and Alshorman (2024) specifically mention data security and privacy. Abdelaal and Sawi (2024) and Cheng and Wang (2023) also point to the need for clearer guidelines on AI ethics and data use.

Daskalaki et al. (2024) brings a unique perspective, noting that educators worry about students' lack of critical thinking, exposure to biased or harmful content, and emotional attachment to AI tools. These concerns suggest that student readiness and awareness are as crucial as teacher preparedness. Finally, Rahiman and Kodikal (2024) find that perceived risks significantly shape educators' attitudes toward AI adoption. These may include uncertainties about outcomes, trust in technology, or its long-term impact on teaching and learning. These studies collectively show that AI adoption in education faces multifaceted barriers—technical, institutional, personal, and ethical—that must be addressed for effective integration.

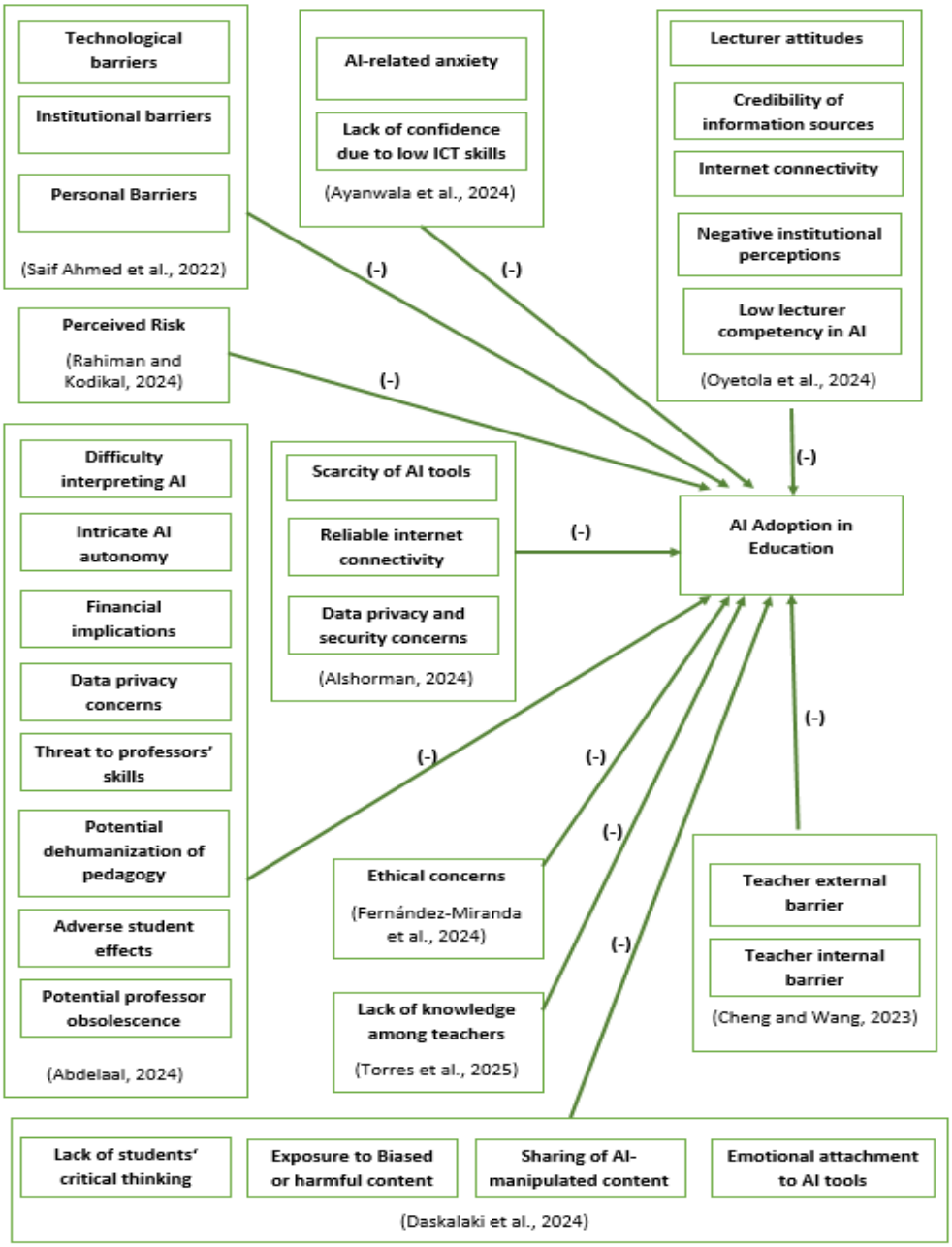

Figure 2: Barriers to AI technology adoption among teachers

4.3 Contextual Factors Associated with the Barriers

4.3.1 Barriers to AI Technology Adoption by Country Classification

Table 2 below shows the systematic review of barriers between developing and developed countries.

Table 2: Key barriers to AI technology adoption by country

Country Type	Key Barriers
Developing Countries	- Technological, institutional, and personal barriers (Ahmed et al., 2022) - Perceived risks negatively influence attitude (Rahiman & Kodikal, 2024) - Difficulty interpreting AI outcomes, cost concerns, and ethical apprehensions (Abdelaal and Sawi, 2024) - AI-related anxiety and low ICT skills (Ayanwale et al., 2024) - Lack of AI tools, poor internet, and data security concerns (Alshorman, 2024) - Negative attitudes, low AI competency, credibility issues (Oyetola et al., 2024) - Lack of teacher knowledge on AI (Torres et al., 2025)
Developed Countries	- Lack of curriculum guidance and ethical policy frameworks (Cheng & Wang, 2023) - Complexity of AI systems, lack of teacher training, and time constraints (Cheng & Wang, 2023) - Student over-reliance on AI, exposure to harmful content, and emotional attachment to AI (Daskalaki et al., 2024) - Ethical concerns regarding AI use (Fernández-Miranda et al., 2024)

Studies from developing countries (e.g., Ahmed et al., 2022; Rahiman & Kodikal, 2024; Abdelaal and Sawi, 2024; Ayanwale et al., 2024; Alshorman, 2024; Oyetola et al., 2024; Torres et al., 2025) reveal that barriers to AI adoption are multifaceted, involving technological, institutional, and personal factors. In these contexts, challenges often stem from limited access to resources, inadequate infrastructure, and foundational digital skills gaps, underscoring a persistent digital divide and the need for comprehensive systemic support to facilitate AI integration in education.

In contrast, research from developed countries (e.g., Cheng & Wang, 2023; Daskalaki et al., 2024; Fernández-Miranda et al., 2024) suggests that while infrastructure is less of a barrier, obstacles are predominantly pedagogical, ethical, and psychological. These include concerns about ethical AI use, the effective integration of AI into teaching practices, and the behavioral impacts of AI on students. Addressing these context-specific challenges requires tailored policies,

targeted professional development, and inclusive strategies that align with each country's unique socio-economic and educational realities.

4.3.2 Barriers to AI Technology Adoption by Institution Type
Table 3 below shows the systematic review of barriers among the different school levels.

Table 3: Key barriers to AI technology adoption by institution

Level	Key Barriers
Primary to Secondary	- Lack of AI curriculum guidance, unclear ethical policies (Cheng & Wang, 2023) - Complexity of AI tools and lack of standard systems (Cheng & Wang, 2023) - Limited teacher understanding and confidence (Cheng & Wang, 2023) - Pedagogical and ethical concerns, fear of dehumanization (Abdelaal and Sawi, 2024)
Secondary Only	- AI-related anxiety, low ICT skills (Ayanwale et al., 2024) - Scarcity of AI tools, poor internet, lack of PD opportunities (Alshorman, 2024) - Concerns about data privacy and security (Alshorman, 2024)
Tertiary Only	- Technological complexity, lack of infrastructure (Ahmed et al., 2022) - Lack of administrative support and institutional policies (Ahmed et al., 2022; Oyetola et al., 2024) - Perceived risk and negative attitudes (Rahiman & Kodikal, 2024) - Ethical concerns (Fernández-Miranda et al., 2024) - Lack of AI knowledge (Torres et al., 2025)
All Levels	- Lack of critical thinking in students (Daskalaki et al., 2024) - Exposure to biased or harmful content (Daskalaki et al., 2024) - Student sharing of AI-manipulated content (Daskalaki et al., 2024) - Emotional attachment to AI tools by students (Daskalaki et al., 2024)

Challenges to AI adoption vary by education level. In basic education, barriers arise from limited teacher understanding, insufficient curricular guidance, and infrastructural constraints (Abdelaal and Sawi, 2024; Cheng & Wang, 2023). At the secondary level, psychological readiness, access to AI tools, and institutional support become critical issues (Ayanwale et al., 2024; Alshorman, 2024). Tertiary educators face more complex challenges, including technological difficulties, unclear policies, personal resistance, and ethical concerns (Ahmed et al., 2022; Fernández-Miranda et al., 2024; Oyetola et al., 2024). Across all levels, the impact of AI on students' learning behaviors and social development highlights the need for enhanced digital and ethical literacy (Daskalaki et al., 2024).

4.4 Barriers to AI Adoption by Theoretical Models
Table 4 below shows the systematic review of barriers to aI technology adoption by theoretical models.

Table 4: Key barriers to AI technology adoption by theoretical models

Author(s)	Theoretical Models Used	Key Barriers
Rahiman & Kodikal (2024)	TAM, UTAUT	Perceived risk
Cheng & Wang (2023)	TAM	External: lack of clear AI curriculum, complex AI tools, no consensus on AI systems, insufficient PD, unclear AI ethics policies, time constraints Internal: limited AI knowledge, low mastery, lack of confidence
Ayanwale et al. (2024)	TAM, Theory of Academic Resistance	AI-related anxiety, lack of confidence due to low ICT skills
Alshorman (2024)	Self-Determination Theory	Scarcity of AI tools, poor internet connectivity, data privacy/security concerns, low readiness for AI use
Oyetola et al. (2024)	Library Services Innovative Conceptual Framework	Educators' attitudes, low competency, unreliable information sources, institutional negativity, poor connectivity
Torres et al. (2025)	Theories of Technology-Mediated Learning	Lack of knowledge among teachers
Ahmed et al. (2022)	None	Technological: system complexity, platform incompatibility, insufficient infrastructure; Institutional: lack of resources, administrative support, unclear policies; Personal: computer anxiety, resistance to change, low confidence
Abdelaal and Sawi (2024)	None	Difficulties understanding AI algorithms, financial costs, data privacy concerns, fear of role obsolescence, dehumanization of teaching
Daskalaki et al. (2024)	None	Lack of student critical thinking, exposure to biased/harmful content, misuse of AI-generated content, emotional attachment to AI
Fernández-Miranda et al. (2024)	None	Ethical concerns related to AI integration

4.4.1 Studies Using TAM (Technology Acceptance Model)

Cheng and Wang (2023) outline external structural barriers including lack of clear curriculum guidance, complicated AI tools, absence of consensus on AI systems, insufficient teacher professional development, lack of ethical AI guidelines, and limited time for training. Internally, teachers face significant knowledge gaps, limited mastery of AI technologies, and low confidence in integrating AI into their teaching. Ayanwale et al. (2024) further highlight psychological barriers such as AI-related anxiety and lack of confidence stemming from low ICT skills.

4.4.2 Studies Using UTAUT (Unified Theory of Acceptance and Use of Technology)
Rahiman and Kodikal (2024) emphasize that perceived risk is a major factor negatively affecting teachers' attitudes toward AI adoption. Concerns over performance reliability and security contribute to reluctance in embracing AI technologies.

4.4.3 Studies Using Combined TAM and Other Models
Ayanwale et al. (2024) combine TAM with the Theory of Academic Resistance to explore how resistance is rooted in anxiety and low ICT skills, offering deeper insights into academic culture and psychological factors that hinder AI integration.

4.4.4 Studies Using Alternative Frameworks
Alshorman (2024), using Self-Determination Theory, points to a lack of autonomy, competence, and resource availability—such as scarce AI tools, poor internet connectivity, and data privacy worries—that diminish teachers' motivation and readiness to adopt AI. Oyetola et al. (2024), through the Library Services Innovative Conceptual Framework, identify sector-specific barriers like educators' attitudes, low AI competency, unreliable information, institutional negativity, and poor connectivity, which impede AI adoption in academic support services. Torres et al. (2025), drawing from Theories of Technology-Mediated Learning, focus on foundational barriers such as insufficient knowledge and digital literacy, limiting effective AI integration in education.

TAM-based studies primarily highlight psychological and knowledge-related barriers to AI adoption, such as anxiety, low confidence, and skill deficits among teachers. These internal challenges are compounded by structural issues, including the absence of clear curricula and insufficient professional development opportunities. Complementing this perspective, UTAUT-based research sheds light on how perceived risks and the presence or absence of facilitating conditions significantly influence educators' attitudes toward adopting AI technologies.

Moreover, when TAM is combined with other theoretical frameworks, such as the Theory of Academic Resistance, it provides a deeper understanding of the psychological and cultural resistance factors that hinder AI integration. This combined approach reveals how anxiety, institutional culture, and reluctance to change contribute to the overall resistance educators face in embracing AI in education.

4.5 Strategies to Overcome Barriers and Support AI Adoption in Teaching and Learning
The literature consistently recommends multi-faceted approaches to AI adoption, focusing on comprehensive training, infrastructure enhancement, robust ethical policies, practical curriculum integration, and continuous research to support sustainable and effective AI use in education.

4.5.1 *Training and Professional Development*
Many studies highlight the critical need for targeted AI training programs for educators. Ahmed et al. (2022) emphasize providing AI training to build

competence, while Rahiman and Kodikal (2024) recommend updating teacher training curricula to better prepare educators for AI integration. Abdelaal and Sawi (2024) and Daskalaki et al. (2024) also underscore building digital confidence and equipping teachers with practical skills through comprehensive training. Oyetola et al. (2024) further support this by suggesting specialized workshops and programs for academic staff to master basic and advanced AI concepts.

4.5.2 Infrastructure and Technological Support
Improving technological infrastructure is another common theme. Ahmed et al. (2022) and Alshorman (2024) call for upgrading infrastructure to ensure educators and students can access reliable AI tools and digital resources. Alshorman (2024) also stresses the need for seamless integration of AI through enhanced school infrastructure. Torres et al. (2025) focus on institutional environments adapting to new AI-enabled teaching and learning modalities.

4.5.3 Ethical and Policy Frameworks
Several studies emphasize the importance of ethics and policy in AI adoption. Cheng and Wang (2023) recommend reinforcing ethical guidelines and enhancing AI system explainability. Daskalaki et al. (2024) highlight the necessity of embedding ethical safeguards and involving teachers in policy design. Fernández-Miranda et al. (2024) call for anticipatory and strategic action by institutions and developers to address AI's ethical challenges. Alshorman (2024) proposes establishing supportive policies on data privacy, equitable access, and responsible AI use.

4.5.4 Curriculum Integration and Practical Application
Ayanwale et al. (2024) recommend integrating Generative AI into curricula through pilot programs and clear use cases, enabling educators and students to experience AI's practical benefits. Rahiman and Kodikal (2024) also emphasize curriculum updates to reflect the evolving digital landscape.

4.5.5 Research and Continuous Improvement
Alshorman (2024) advocates for ongoing empirical research to assess the long-term effectiveness of AI integration strategies and explore innovative solutions to emerging barriers.

5. Conclusions

This systematic review confirms that a complex interplay of demographic, institutional, and contextual factors shapes educators' acceptance of Artificial Intelligence (AI) in education. While mid-career educators dominate the literature, younger teachers generally demonstrate stronger AI competencies, whereas older educators face greater barriers, underscoring the need for age-responsive interventions. Gender also plays a nuanced role: male educators tend to report higher AI usage.

In contrast, female educators report lower anxiety, highlighting the importance of inclusive, differentiated approaches to training and support. Across all educational levels, barriers such as limited infrastructure, insufficient professional development, ethical concerns, psychological resistance, and low digital

confidence remain pervasive. However, these challenges differ by context: in developing countries, infrastructural limitations and foundational skill gaps are more prevalent, while in developed contexts, educators grapple with pedagogical misalignment, ethical ambiguity, and concerns over autonomy and the psychological impact of AI on students.

Theoretical models such as the Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT), Self-Determination Theory, and the Theory of Academic Resistance have provided insight into the cognitive, motivational, and institutional variables influencing AI adoption. These models highlight the centrality of perceived usefulness, institutional support, risk perception, and professional identity. However, emerging constructs—such as trust, emotional response, ethical alignment, and cultural context—remain underexplored and should be more systematically integrated into future studies.

6. Recommendations

To synthesize the multifaceted findings of this review, a conceptual framework below was developed that classifies barriers into three primary dimensions: (1) human capital factors, including age, gender, beliefs, and personal digital competencies; (2) contextual factors, such as country classification and institutional type; and (3) structural factors, encompassing infrastructure access, ethical policies, training availability, and administrative support. This framework is a practical and theoretical tool for informing intervention design and policy formulation.

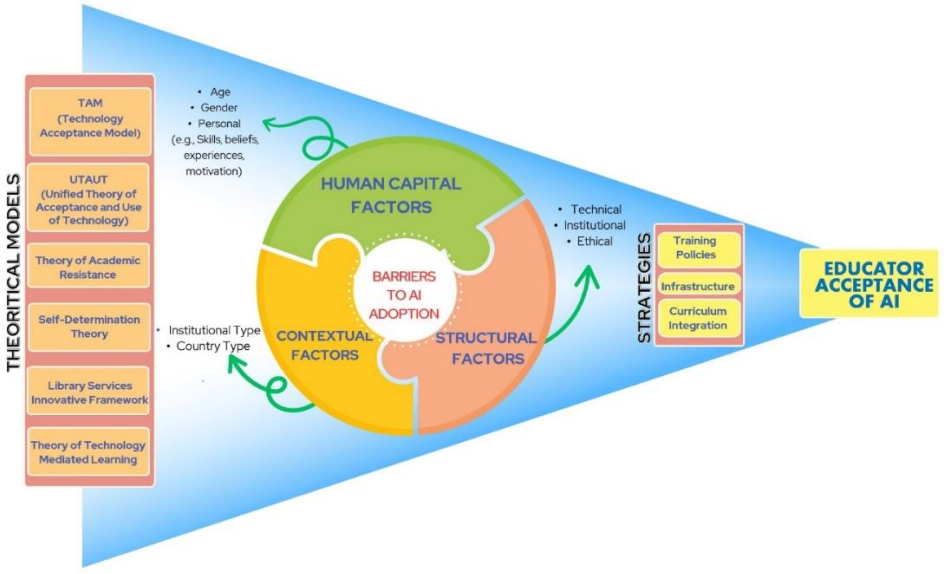

Figure 3: Framework for Understanding Barriers to Educator AI Acceptance

Based on the findings and this conceptual model, the following recommendations are proposed to guide practice, policy, and research. First, education systems should develop tiered and differentiated AI training modules tailored to educators' varying digital skill levels, experiences, and psychological profiles. These modules—delivered via flexible, blended learning formats—should move

beyond technical content to include ethical reasoning, pedagogical integration, and practical classroom applications. Training should include gender and age-specific needs, with continuous upskilling embedded into career-long professional development pathways.

Second, infrastructure development must be prioritized, especially in rural and underserved areas. This includes investments in stable internet connectivity, accessible AI tools, and real-time technical support. Institutional leaders should allocate time, resources, and incentives for educators to experiment with and adapt AI technologies within their instructional practice. Third, the establishment of transparent, localized ethical guidelines is imperative. Educators should be involved in co-developing these policies to ensure that concerns related to data privacy, algorithmic bias, and human oversight are addressed in ways that align with professional values and local realities. Ethical training must also be integrated into pre-service and in-service teacher education programs.

Fourth, multi-stakeholder collaboration is essential for AI's successful and sustainable integration in education. Educators, school leaders, policymakers, AI developers, and academic researchers must coordinate efforts to ensure that AI tools are pedagogically aligned, contextually relevant, and equitably implemented. Teachers should be empowered as co-creators and evaluators of AI applications to foster greater ownership, trust, and cultural relevance.

Fifth, national and institutional policies must be context sensitive. In developing countries, efforts should focus on foundational issues such as capacity building, access, and equity. In more technologically advanced settings, emphasis should shift toward addressing more complex challenges such as student overreliance on AI, ethical ambiguity, and pedagogical integration. Finally, the application of theoretical models should continue to guide strategic design. Frameworks like TAM, UTAUT, and Self-Determination Theory should be expanded to incorporate emotional, ethical, and cultural variables influencing educator behavior and attitudes.

While offering a comprehensive synthesis of current evidence, this study has limitations that signal opportunities for future research. The scope was limited to peer-reviewed empirical literature published in English between 2020 and 2025, excluding qualitative studies that may have provided richer, context-specific insights. The diversity in methodological approaches and outcomes among the included studies precluded formal meta-analysis, limiting statistical generalizability. Furthermore, most studies treated variables such as demographics, context, or institutional factors in isolation, rather than examining their interactions.

There is also a notable underrepresentation of research from low-income and culturally diverse regions and a lack of longitudinal designs that capture dynamic shifts in educators' attitudes toward AI. Finally, while theoretical models like TAM and UTAUT were widely used, newer constructs such as emotional response (Roberts & Chen, 2022), trust (Martinez & Wilson, 2022), ethical

alignment (Sharma & Johnson, 2023), and professional identity (Nguyen & Roberts, 2023) were inconsistently applied or insufficiently explored. Addressing these limitations offers an important path forward—enabling researchers to build more holistic, contextually grounded, and impactful models of AI acceptance in education.

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