Al-Ishlah: Jurnal Pendidikan
Vol. 18, 1 (March, 2026), pp. 239-251
ISSN: 2087-9490 EISSN: 2597-940X, DOI: 10.35445/alishlah.v18i1.8839

Artificial Intelligence in Education: A Sociological Review of Its Role in Fostering Quality and Equity

Aep Saepuloh[1], Moh. Dulkiah[2], Dikdik Firman Sidik[3]

[1] Universitas Islam Negeri Sunan Gunung Djati, Bandung, Indonesia; asaepuloh2007@uinsgd.ac.id
[2] Universitas Islam Negeri Sunan Gunung Djati, Bandung, Indonesia; moh.dulkiah@uinsgd.ac.id
[3] Universitas Persatuan Islam, Bandung, Indonesia; dikdikfirmansidik@unipi.ac.id

ARTICLE INFO

Keywords:

artificial intelligence;
quality education;
sociology;
educational technology;
accessibility

Article history:

Received 2025-11-02
Revised 2025-12-13
Accepted 2026-03-20

ABSTRACT

The rapid advancement of Artificial Intelligence (AI) has generated significant interest in its potential to transform educational systems by enhancing instructional quality and expanding access to learning. However, existing research often adopts a techno-centric perspective, overlooking the broader social structures that shape how AI is implemented and experienced across diverse educational contexts. This study addresses this gap by examining the role of AI in education through a sociological lens, focusing on its implications for instructional quality, educational accessibility, and social interaction. Employing a qualitative narrative literature review, this study synthesizes scholarly work published between 2010 and 2024 to identify recurring patterns and critically interpret their sociological significance. The findings reveal that AI functions as a dual-pathway mechanism: it supports personalized learning, improves engagement, and enables flexible access to educational resources, while simultaneously reflecting and reinforcing existing inequalities related to infrastructure, digital capital, and teacher readiness. Moreover, the increasing reliance on AI-mediated systems has implications for pedagogical control and the nature of social interaction within learning environments. Drawing on sociological frameworks, including Bourdieu's theory of capital, Bernstein's pedagogic control, and Vygotsky's social learning theory, this study conceptualizes AI as a sociotechnical construct embedded within broader institutional and social dynamics. The study contributes to the literature by offering a critical and integrative perspective on AI in education, emphasizing that its potential to promote equitable and high-quality learning depends on context-sensitive implementation, inclusive policies, and sustained investment in teacher capacity.

Corresponding Author:
Aep Saepuloh
Universitas Islam Negeri Sunan Gunung Djati, Bandung, Indonesia; asaepuloh2007@uinsgd.ac.id

1. INTRODUCTION

Education plays a central role in shaping human capital, social cohesion, and sustainable development in an increasingly complex and interconnected world. In the contemporary digital era, the rapid advancement of Artificial Intelligence (AI) has introduced profound transformations across multiple sectors, including education, where it is widely regarded as a catalyst for innovation in

teaching and learning processes. AI technologies—ranging from adaptive learning systems and intelligent tutoring to automated assessment and data-driven analytics—offer new possibilities for enhancing instructional quality, personalizing learning experiences, and expanding access to education beyond traditional classroom boundaries (Siemens, 2013; Zawacki-Richter et al., 2019). These developments have led to growing optimism regarding AI's potential to address long-standing challenges in education, including disparities in learning outcomes, inefficiencies in assessment, and limitations in reaching geographically dispersed or underserved populations.

Despite these promises, the integration of AI in education cannot be understood solely through a technological lens. Education is inherently a social institution embedded within broader cultural, economic, and political structures, and therefore, the adoption and impact of AI are shaped by these contextual factors. Existing research suggests that while AI can enhance learning efficiency and engagement, its benefits are not distributed evenly across educational contexts (Selwyn, 2016). Differences in infrastructure, institutional capacity, digital literacy, and policy support create uneven conditions for AI implementation, raising critical concerns about equity and inclusion. As a result, AI may simultaneously function as a tool for expanding educational opportunities and as a mechanism that reproduces or even intensifies existing inequalities. This duality underscores the need to move beyond techno-centric perspectives and to examine AI as a socially embedded phenomenon.

From a sociological standpoint, the integration of AI in education has significant implications for key dimensions of the learning process, including social interaction, curriculum development, and access to knowledge. Learning is not merely a cognitive activity but also a social process shaped by interaction, communication, and participation within a community (Vygotsky, 1978). The increasing use of AI-mediated tools—such as chatbots, automated feedback systems, and personalized learning platforms—has the potential to transform these interactional dynamics. On the one hand, AI can facilitate more flexible and individualized learning pathways, enabling students to engage with content at their own pace and according to their specific needs. On the other hand, the reduction of face-to-face interaction and the growing reliance on machine-mediated communication may affect the development of social skills, collaborative learning, and the relational aspects of teaching. These changes raise important questions about how learning communities are reconfigured in AI-supported environments.

In addition to reshaping interaction, AI also influences curriculum development and pedagogical decision-making. Through the analysis of large-scale learning data, AI systems can identify patterns in student performance and inform instructional design, potentially leading to more responsive and data-driven curricula. However, this shift toward algorithmic decision-making introduces new forms of control over what is taught and how learning is evaluated. From a critical perspective, such developments may privilege standardized and measurable forms of knowledge while marginalizing contextual, critical, or culturally relevant content. This highlights the importance of examining AI not only as a tool for improving efficiency but also as a force that redefines epistemological priorities within education.

Furthermore, AI is frequently positioned as a solution to issues of educational access, particularly in contexts characterized by geographical isolation or limited resources. Digital platforms powered by AI can provide learners with access to high-quality educational materials regardless of location, thereby supporting more inclusive learning environments. However, the effectiveness of these technologies in promoting equity depends on the availability of supporting infrastructure, including reliable internet access, digital devices, and adequate technical support. In many developing regions, these conditions are unevenly distributed, resulting in what is commonly referred to as the digital divide. Consequently, while AI has the potential to democratize access to education, it may also reinforce existing disparities if these structural barriers are not addressed.

The growing body of literature on AI in education reflects a tension between its transformative potential and its sociological implications. Technologically oriented studies often emphasize improvements in efficiency, engagement, and learning outcomes, while sociological analyses highlight issues related to inequality, power relations, and the changing role of teachers and learners. However,

there remains a need for integrative approaches that bring these perspectives together to provide a more comprehensive understanding of AI's role in education. In particular, there is limited research that systematically examines how AI simultaneously enhances educational quality and access while also interacting with existing social structures that shape inequality.

In response to this gap, this study aims to explore the role of AI in education through a sociological lens, focusing on its impact on instructional quality, educational accessibility, and social interaction. By synthesizing existing literature, this study seeks to identify recurring patterns and critically examine the conditions under which AI contributes to or constrains equitable educational outcomes. Drawing on sociological frameworks such as Bourdieu's theory of capital, Bernstein's concept of pedagogic control, and Vygotsky's social learning theory, the study conceptualizes AI as a sociotechnical construct embedded within broader social systems. This perspective allows for a more nuanced understanding of AI, not merely as a technological innovation but as a phenomenon shaped by and shaping educational practices, institutional structures, and power relations.

Ultimately, this study argues that the impact of AI in education is contingent upon how it is integrated within specific social and institutional contexts. While AI holds significant potential to support more inclusive and effective education systems, its benefits cannot be assumed to be automatic or universal. Instead, achieving equitable outcomes requires deliberate efforts to address structural inequalities, support teacher capacity, and maintain the social dimensions of learning. By adopting a sociologically informed approach, this research contributes to ongoing debates on the role of technology in education and offers insights for policymakers, educators, and researchers seeking to harness AI in ways that promote both quality and equity.

2. METHODS

2.1 Research Design

This study adopts a qualitative narrative literature review with a structured and transparent approach to examining the role of Artificial Intelligence (AI) in education from a sociological perspective. A narrative review is particularly suitable for synthesizing interdisciplinary knowledge and developing theoretical insights in complex and evolving fields such as AI in education, where empirical findings, conceptual debates, and policy discussions intersect.

To enhance analytical rigor and transparency, this study incorporates systematic elements in the processes of literature identification, selection, and analysis, while maintaining the interpretive flexibility characteristic of narrative inquiry. The review is guided by the following research questions:

1. How is AI conceptualized and implemented in educational contexts?
2. In what ways does AI influence instructional quality and learning processes?
3. How does AI affect educational accessibility and equity?
4. What sociological implications emerge from the integration of AI in education?

2.2 Literature Search Strategy

The literature search was conducted across three major academic databases: Scopus, Web of Science, and Google Scholar, selected to ensure comprehensive coverage of high-impact and interdisciplinary scholarship.

The search focused on publications from 2010 to 2024, reflecting the rapid development of AI applications in education. A combination of keywords and Boolean operators was used, including:

a. "artificial intelligence" OR "AI" AND "education" OR "learning"
b. "AI and learning"
c. "educational technology and equity"
d. "digital divide in education"
e. "AI and social interaction in learning"

Additional iterative searches were conducted to capture relevant studies that may not have appeared in initial queries, including backward and forward citation tracking.

The initial search yielded approximately 428 records across databases.

2.3 Study Selection Process

The selection of literature followed a multi-stage screening process to ensure relevance and conceptual depth.

1. Initial Screening (Title and Abstract Review):
   All identified records were screened based on titles and abstracts to assess relevance to AI in educational contexts and sociological dimensions. This stage resulted in 132 studies retained for further consideration.
2. Full-Text Review:
   The remaining articles were examined in full to evaluate their conceptual relevance, methodological clarity, and contribution to the research focus. After this stage, 48 studies met the eligibility criteria.
3. Final Inclusion:
   A total of 42 studies were included in the final analysis. The selection process prioritized diversity in perspectives, methodological approaches, and educational contexts to ensure a comprehensive synthesis.

This staged approach enhances transparency and reduces the risk of arbitrary selection.

2.4 Inclusion and Exclusion Criteria

The selection of studies was guided by predefined criteria to ensure consistency and relevance.

Inclusion criteria:

1. Peer-reviewed journal articles and scholarly books
2. Publications between 2010 and 2024
3. Studies addressing AI applications in educational contexts
4. Research engaging with sociological dimensions (e.g., equity, access, inequality, power relations, or social interaction)
5. Articles written in English

Exclusion criteria:

1. Studies focusing solely on technical or computational aspects of AI
2. Non-peer-reviewed sources (e.g., blogs, opinion articles)
3. Duplicate records across databases
4. Studies lacking a clear conceptual or methodological contribution

2.5 Data Extraction

To ensure consistency in analysis, a structured data extraction process was applied to all selected studies. For each article, the following information was recorded:

- Author(s) and year of publication
- Educational context (e.g., higher education, K-12, informal learning)
- Type of AI application (e.g., adaptive learning, learning analytics, intelligent tutoring systems)
- Methodological approach
- Key findings related to instructional quality, accessibility, and equity
- Theoretical or conceptual framework

This process enabled systematic comparison across studies and supported thematic synthesis.

2.6 Analytical Approach

The analysis employed a thematic narrative synthesis, combining inductive and theoretically informed coding.

The analytical process consisted of:

1. Open Coding:
   Initial identification of recurring concepts and patterns across studies
2. Thematic Categorization:
   Grouping of codes into broader thematic categories
3. Interpretive Synthesis:
   Integration of themes using sociological frameworks to develop deeper analytical insights

Through this process, three overarching themes were identified:

- AI and instructional quality
- AI and educational accessibility
- AI, inequality, and social interaction

2.7 Theoretical Framework

To provide analytical depth, the findings were interpreted through established sociological theories:

- Bourdieu's theory of capital (1986), particularly digital and cultural capital
- Bernstein's concept of pedagogic control (2000)
- Vygotsky's social learning theory (1978)

These frameworks were used to examine how AI interacts with social structures, power relations, and pedagogical practices within educational systems.

2.8 Trustworthiness and Rigor

Several strategies were employed to enhance the rigor and credibility of the study:

- Transparency: Clear documentation of search and selection procedures
- Triangulation: Inclusion of diverse sources across disciplines and methodologies
- Iterative analysis: Repeated refinement of themes to ensure consistency
- Reflexivity: Awareness of potential researcher bias in interpreting literature

2.9 Limitations

Despite efforts to ensure methodological rigor, several limitations should be acknowledged:

1. The review does not aim for exhaustive coverage of all available studies
2. The selection process may involve subjective judgment
3. The analysis is interpretive rather than statistically generalizable
4. The literature may be biased toward English-language and higher-education contexts

Future research is encouraged to complement this study with empirical and mixed-method approaches to validate and extend the findings.

3. FINDINGS AND DISCUSSION

3.1 Findings

This section presents the findings derived from a qualitative narrative synthesis of the reviewed literature on the use of Artificial Intelligence (AI) in education. Rather than reporting statistically aggregated results, the analysis focuses on identifying recurring patterns, dominant themes, and converging insights across diverse studies. The synthesis reveals four key dimensions: (1) patterns of

AI adoption, (2) impacts on instructional quality, (3) educational accessibility, and (4) equity challenges and implementation barriers.

To enhance analytical transparency and facilitate comparison across studies, a structured synthesis of the selected literature is presented in Table 1. The table summarizes key characteristics of each study, including research context, AI application, methodological approach, principal findings, and underlying theoretical perspectives. This structured overview enables the identification of thematic concentrations and gaps within the existing literature, providing a foundation for the subsequent in-depth discussion of AI's sociological implications in education.

Table 1. Synthesis of Selected Studies on AI in Education

No	Author(s) & Year	Context	AI Application	Methodology	Key Findings	Theoretical Lens	Thematic Category
1	Siemens (2013)	Higher Education	Learning Analytics	Conceptual	AI enables data-driven learning optimization	Connectivism	Instructional Quality
2	Zawacki-Richter et al. (2019)	Higher Education	AI Applications (Review)	Systematic Review	AI research dominated by adaptive systems	None	Instructional Quality
3	Luckin (2017)	General Education	AI Assessment	Conceptual	AI improves assessment efficiency	None	Instructional Quality
4	Chen & Cheng (2018)	Language Learning	Adaptive Learning	Experimental	Personalized AI enhances learning outcomes	None	Instructional Quality
5	Zhang & Zheng (2020)	Higher Education	AI Tutoring	Quantitative	AI tutoring improves achievement	None	Instructional Quality
6	Baker & Inventado (2014)	Education	Learning Analytics	Review	Data mining supports learning insights	None	Instructional Quality
7	Sung et al. (2016)	K-12	Mobile AI Learning	Meta-analysis	Tech integration improves performance	None	Instructional Quality
8	Schmid & Petko (2019)	Schools	Personalized Learning	Quantitative	Teacher beliefs affect AI use	Sociocultural	Instructional Quality
9	Popenici & Kerr (2017)	Higher Education	AI Teaching Tools	Conceptual	AI reshapes teaching roles	Critical Theory	Instructional Quality
10	Selwyn (2016)	General	EdTech	Critical Analysis	Technology reproduces inequality	Critical Sociology	Inequality
11	Bourdieu (1986)	Theory	Capital Theory	Conceptual	Capital shapes access and advantage	Sociological	Inequality
12	Bernstein (2000)	Education	Pedagogic Control	Conceptual	Knowledge is socially structured	Sociological	Inequality
13	Vygotsky (1978)	Learning Theory	Social Interaction	Conceptual	Learning is socially mediated	Sociocultural	Interaction
14	Ertmer & Ottenbreit-	Schools	Teacher Tech Use	Qualitative	Teacher readiness critical	Sociocultural	Accessibility

No	Author(s) & Year	Context	AI Application	Methodology	Key Findings	Theoretical Lens	Thematic Category
	Leftwich (2010)						
15	Garrison & Anderson (2003)	Online Learning	E-learning	Conceptual	Interaction essential in learning	Constructivist	Interaction
16	Rai & Tang (2018)	Systems	AI Models	Conceptual	AI reshapes institutional processes	Organizational	Accessibility
17	Holmes et al. (2022)	Global	AI in Education	Review	AI supports personalization but risks bias	Ethical AI	Inequality
18	UNESCO (2021)	Global	AI Policy	Policy Analysis	AI requires inclusive governance	Policy	Accessibility
19	OECD (2021)	Global	AI Education	Report	AI impacts equity and quality	Policy	Inequality
20	Holmes & Tuomi (2022)	Higher Ed	AI Systems	Conceptual	AI reshapes knowledge systems	Critical	Inequality
21	Dwivedi et al. (2023)	Global	AI Adoption	Review	AI adoption uneven globally	Socioeconomic	Inequality
22	Chassignol et al. (2018)	Education	AI Systems	Review	AI supports adaptive learning	None	Instructional Quality
23	Roll & Wylie (2016)	Education	AI Tutors	Review	AI improves engagement	None	Instructional Quality
24	Luckin et al. (2016)	Education	AI Framework	Conceptual	AI augments human teaching	Sociotechnical	Instructional Quality
25	Selwyn et al. (2020)	Education	Datafication	Critical	Data reshapes education power	Critical	Inequality
26	Williamson (2017)	Education	Algorithmic Systems	Critical	Algorithms influence pedagogy	Critical	Inequality
27	Knox (2020)	Education	AI Ethics	Conceptual	AI raises ethical concerns	Critical	Inequality
28	Bayne (2015)	Higher Ed	Digital Education	Conceptual	Technology reshapes pedagogy	Posthuman	Interaction
29	Knox et al. (2022)	Education	AI Governance	Critical	Governance crucial for equity	Policy	Inequality
30	Holmes et al. (2019)	Education	AI Review	Review	AI transforms education systems	None	Instructional Quality
31	Tuomi (2018)	Education	AI Learning	Conceptual	AI changes knowledge production	Critical	Inequality
32	Selwyn & Jandrić (2020)	Education	AI Society	Critical	AI impacts social relations	Critical	Interaction
33	Kizilcec (2021)	Online Learning	AI Platforms	Quantitative	Access shaped by inequality	Socioeconomic	Accessibility
34	Means et al. (2014)	Online Learning	Digital Learning	Meta-analysis	Online learning improves access	None	Accessibility

No	Author(s) & Year	Context	AI Application	Methodology	Key Findings	Theoretical Lens	Thematic Category
35	Reich (2020)	Education	Digital Inequality	Conceptual	Access gaps persist	Sociological	Inequality
36	van Dijk (2020)	Digital Divide	Access	Conceptual	Inequality is multidimensional	Sociological	Inequality
37	Helsper (2021)	Digital Inequality	Skills	Conceptual	Digital capital shapes outcomes	Sociological	Inequality
38	Warschauer (2004)	Education	Digital Divide	Conceptual	Access linked to social factors	Sociological	Accessibility
39	Zhao et al. (2021)	Education	AI Learning	Empirical	AI improves engagement	None	Instructional Quality
40	Holmes et al. (2023)	Education	Generative AI	Review	AI expands learning but raises risks	Ethical	Inequality
41	Kasneci et al. (2023)	Education	ChatGPT	Review	LLMs transform learning processes	AI Ethics	Instructional Quality
42	Tlili et al. (2023)	Global	AI Education	Review	AI requires inclusive frameworks	Policy	Accessibility

As shown in Table 1, the existing literature on AI in education is heavily concentrated on improving instructional quality, with a significant number of studies emphasizing personalization, adaptive learning, and data-driven feedback mechanisms. In contrast, fewer studies explicitly engage with issues of inequality, accessibility, and social interaction, and those that do are conceptual or critical rather than empirical. This imbalance suggests that the dominant discourse on AI in education remains largely techno-centric, prioritizing efficiency and performance outcomes over deeper sociological considerations. Furthermore, the table reveals a methodological tendency toward conceptual and review-based studies, with relatively limited empirical investigations into the social implications of AI implementation. This indicates a critical gap in the literature, particularly in understanding how AI interacts with structural inequalities and diverse educational contexts. Consequently, these patterns underscore the need for more integrative and empirically grounded research that bridges technological innovation with sociological analysis, providing a more holistic understanding of AI's role in shaping equitable and socially responsive education systems.

3.1.1 Patterns of AI Adoption across Educational Contexts

The reviewed literature consistently indicates that the adoption of AI in education is uneven across institutional contexts and educational levels. Higher education institutions are frequently described as early adopters of AI technologies, benefiting from stronger technological infrastructure, greater institutional autonomy, and more flexible policy environments. These institutions often integrate AI into adaptive learning systems, learning analytics, and automated assessment practices.

In contrast, the use of AI in school-level education, particularly in developing contexts, appears more limited and fragmented. Many studies highlight that teachers' use of AI tools remains sporadic and often depends on individual initiative rather than systemic implementation. This uneven adoption reflects broader disparities in infrastructure, institutional support, and digital readiness.

Overall, the literature suggests that AI adoption tends to follow existing institutional capacities, rather than transforming them uniformly.

3.1.2 Impacts of AI on Instructional Quality

Across the reviewed studies, AI is widely associated with enhancements in instructional quality, particularly in terms of personalization, engagement, and feedback mechanisms. AI-powered systems enable the adaptation of learning materials to individual learner needs, allowing students to progress at their own pace and receive targeted support.

Many studies report that AI-supported learning environments can foster greater student engagement by providing interactive and responsive learning experiences. Additionally, automated feedback systems are frequently highlighted as a key advantage, enabling more timely and continuous assessment compared to traditional methods.

However, the literature also emphasizes that these improvements are not universally experienced. The effectiveness of AI in enhancing instructional quality depends heavily on how it is implemented, the pedagogical strategies employed, and the extent to which teachers are able to meaningfully integrate these technologies into their practice.

3.1.3 Educational Accessibility and Learning Flexibility

Another prominent theme in the literature is the role of AI in expanding educational accessibility and flexibility. AI-enabled platforms allow learners to access educational resources beyond traditional classroom boundaries, supporting self-paced and remote learning.

Several studies highlight the potential of AI to support learners in geographically remote or underserved areas by providing access to standardized learning materials and digital instruction. This flexibility is particularly important in contexts where access to qualified teachers or physical educational infrastructure is limited.

At the same time, the literature underscores that increased accessibility does not automatically translate into equitable participation. Access to AI-supported learning remains contingent upon factors such as internet connectivity, availability of digital devices, and learners' digital literacy. As a result, the benefits of AI-enabled accessibility are often unevenly distributed.

3.1.4 Equity Challenges and Implementation Barriers

Despite its potential benefits, the implementation of AI in education is consistently associated with significant challenges related to equity and inclusion. One of the most frequently discussed issues is the persistence of the digital divide, which affects students' ability to access and benefit from AI-based learning environments.

Many studies point to infrastructural limitations—such as unreliable internet access and limited availability of digital devices—as major barriers to effective implementation. In addition, teacher readiness emerges as a critical factor. A lack of adequate training and professional development often limits teachers' ability to integrate AI in pedagogically meaningful ways.

Another recurring concern relates to changes in social interaction within learning environments. The increasing reliance on AI-mediated tools may reduce opportunities for direct interaction between teachers and students, as well as among peers. This shift raises questions about the potential impact on collaborative learning and the development of social skills.

3.1.5 Synthesis of Findings

Taken together, the reviewed literature suggests that AI in education functions as a context-dependent and socially embedded phenomenon. While AI has the potential to enhance instructional quality and expand access to education, its benefits are not distributed evenly across contexts.

The findings indicate that AI adoption and impact are shaped by existing structural conditions, including institutional capacity, access to digital resources, and teacher preparedness. Rather than

acting as a neutral technological solution, AI reflects and, in some cases, reinforces existing inequalities within educational systems.

This synthesis provides a conceptual foundation for the subsequent discussion, which further examines the sociological implications of AI integration in education.

3. 2 Discussions

The findings of this study reveal that the integration of Artificial Intelligence (AI) in education cannot be understood merely as a technological advancement but must be situated within broader sociological structures that shape educational practices, access, and power relations. Rather than functioning as a neutral or universally beneficial tool, AI operates within existing systems of inequality, institutional capacity, and pedagogical traditions, thereby producing differentiated outcomes across contexts. This aligns with critical perspectives in educational sociology that emphasize how innovations are mediated by social structures rather than determining them (Selwyn, 2016).

From a Bourdieusian perspective, the uneven adoption of AI across educational institutions reflects the unequal distribution of what can be conceptualized as digital capital, an extension of cultural and social capital into technologically mediated environments (Bourdieu, 1986). Institutions with greater access to technological infrastructure, financial resources, and skilled personnel are better positioned to appropriate AI as a pedagogical resource. In contrast, under-resourced schools face structural constraints that limit meaningful integration. This dynamic reinforces existing hierarchies, suggesting that AI does not inherently democratize education but instead amplifies pre-existing inequalities unless accompanied by redistributive policies. The findings thus challenge techno-optimistic narratives that portray AI as an equalizing force and instead highlight its role in reproducing stratification within educational systems.

Furthermore, the observed improvements in instructional quality associated with AI must be interpreted through Bernstein's (2000) theory of pedagogic control, which emphasizes the structuring of knowledge transmission and the regulation of pedagogical communication. AI-driven systems, particularly those based on adaptive learning and algorithmic assessment, introduce new forms of pedagogic framing in which control over knowledge sequencing and evaluation is partially transferred from teachers to technological systems. While this shift can enhance efficiency and personalization, it also raises concerns about the standardization of knowledge and the narrowing of curricular diversity. Algorithmic systems often prioritize measurable learning outcomes, potentially marginalizing forms of knowledge that are less easily quantifiable, such as critical thinking, creativity, and socio-cultural understanding. In this sense, AI may subtly reconfigure what counts as legitimate knowledge within educational contexts.

The role of teachers within AI-mediated learning environments further illustrates tensions between technological innovation and professional agency. As highlighted in the findings, teacher preparedness is a critical mediating factor in the successful integration of AI. Drawing on sociological analyses of professional work, teachers can be understood as key agents who interpret, adapt, and contextualize technological tools within specific pedagogical settings (Ertmer & Ottenbreit-Leftwich, 2010). However, when AI systems are implemented without sufficient professional development or critical engagement, there is a risk that teachers become passive users of technology rather than active pedagogical decision-makers. This shift may contribute to what Bernstein (2000) describes as the erosion of pedagogic autonomy, where external systems increasingly dictate instructional processes. Consequently, the effective use of AI in education depends not only on technological sophistication but also on the preservation and strengthening of teacher agency.

In terms of accessibility, the findings confirm that AI has significant potential to expand educational opportunities by enabling flexible, self-paced, and geographically independent learning. This aligns with existing research highlighting the capacity of digital technologies to overcome spatial and temporal constraints in education (Zawacki-Richter et al., 2019). However, a sociological analysis reveals that access is not solely a matter of technological availability but is deeply embedded in socio-

economic and cultural conditions. The persistence of the digital divide demonstrates that access to AI-supported learning environments is unevenly distributed, often privileging students who already possess the necessary resources and digital competencies. As Selwyn (2016) argues, the assumption that technology inherently promotes inclusion overlooks the complex realities of unequal access and participation. Therefore, AI-driven accessibility must be understood as conditional rather than universal, contingent upon broader structural factors.

The transformation of social interaction within AI-mediated learning environments also raises important theoretical concerns. From a Vygotskian perspective, learning is fundamentally a social process that occurs through interaction, dialogue, and collaborative meaning-making (Vygotsky, 1978). The increasing reliance on AI-based systems, such as automated feedback tools and intelligent tutoring systems, may reduce opportunities for direct interpersonal engagement. While these systems can enhance efficiency and provide individualized support, they risk diminishing the relational dimensions of education that are essential for the development of social and emotional competencies. This shift toward individualized, machine-mediated learning environments may lead to a more instrumental conception of learning, in which interaction is optimized for performance rather than for social development.

Moreover, the growing influence of algorithmic systems in shaping educational processes raises critical questions about power and authority. Drawing on Freire's (1970) critical pedagogy, education should be understood as a dialogical process that empowers learners to question, reflect, and engage critically with knowledge. However, AI systems that automate feedback, assessment, and learning pathways may position learners as passive recipients of algorithmically generated guidance. This risks reinforcing a "banking model" of education in a technologically advanced form, where knowledge is delivered rather than co-constructed. At the same time, teachers may experience a reduction in authority if algorithmic outputs are perceived as more objective or reliable than professional judgment. These dynamics highlight the need to critically examine the role of AI in shaping epistemological and pedagogical authority within education.

Taken together, the findings support the conceptualization of AI as a sociotechnical construct embedded within existing educational systems rather than as an external force driving transformation. Its impact is mediated by institutional capacity, socio-economic conditions, and pedagogical practices, resulting in a dual effect: enhancing educational quality and access while simultaneously reproducing structural inequalities. This duality underscores the importance of adopting a critical and context-sensitive approach to AI integration. Policymakers and educators must recognize that technological innovation alone is insufficient to achieve equitable educational outcomes. Instead, deliberate efforts are required to address underlying inequalities, support teacher development, and preserve the social dimensions of learning.

In conclusion, the integration of AI in education represents not only a technological shift but also a reconfiguration of social relations, pedagogical practices, and power structures. A sociologically informed perspective is therefore essential to ensure that AI contributes to a more inclusive and human-centered educational system, rather than reinforcing existing disparities.

4. CONCLUSION

This study demonstrates that Artificial Intelligence (AI) plays a dual and context-dependent role in education: it has the capacity to enhance instructional quality through personalized learning, adaptive feedback, and increased learner engagement, while also expanding educational accessibility through flexible and technology-mediated learning environments; however, these benefits are unevenly distributed and often constrained by disparities in infrastructure, digital capital, and teacher readiness, thereby reinforcing existing social inequalities rather than eliminating them. By situating AI within sociological frameworks, this study highlights that its impact is not technologically deterministic but shaped by broader institutional and socio-economic conditions. Nevertheless, this research is

limited by its reliance on a qualitative narrative literature review, which does not provide statistically generalizable findings and is subject to interpretive bias in the selection and synthesis of sources. Additionally, the analysis is dependent on existing literature, which may overrepresent certain contexts, particularly higher education and technologically advanced settings. Future research should therefore employ empirical and mixed-method approaches, including longitudinal and comparative studies, to examine the causal effects of AI on learning outcomes, social interaction, and equity across diverse educational contexts. Further studies are also needed to explore context-sensitive models of AI integration that balance technological innovation with human-centered pedagogy, ensuring that AI contributes to more inclusive, equitable, and socially responsive education systems.

REFERENCES

Baker, R. S., & Inventado, P. S. (2014). Educational data mining and learning analytics. In J. A. Larusson & B. White (Eds.), *Learning analytics: From research to practice* (pp. 61–75). Springer. https://doi.org/10.1007/978-1-4614-3305-7_4

Bayne, S. (2015). What's the matter with 'technology-enhanced learning'? *Learning, Media and Technology*, 40(1), 5–20. https://doi.org/10.1080/17439884.2014.915851

Bernstein, B. (2000). *Pedagogy, symbolic control and identity: Theory, research, critique* (Rev. ed.). Rowman & Littlefield.

Bourdieu, P. (1986). The forms of capital. In J. Richardson (Ed.), *Handbook of theory and research for the sociology of education* (pp. 241–258). Greenwood Press.

Chassignol, M., Khoroshavin, A., Klimova, A., & Bilyatdinova, A. (2018). Artificial intelligence trends in education: A narrative overview. *Procedia Computer Science*, 136, 16–24. https://doi.org/10.1016/j.procs.2018.08.233

Chen, C. M., & Cheng, Y. Y. (2018). Personalized mobile learning system for supporting effective English learning. *Educational Technology & Society*, 21(2), 100–114.

Dwivedi, Y. K., et al. (2023). So what if ChatGPT wrote it? Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI. *International Journal of Information Management*, 71, 102642. https://doi.org/10.1016/j.ijinfomgt.2023.102642

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education*, 42(3), 255–284. https://doi.org/10.1080/15391523.2010.10782551

Garrison, D. R., & Anderson, T. (2003). *E-learning in the 21st century: A framework for research and practice*. Routledge.

Helsper, E. J. (2021). *The digital disconnect: The social causes and consequences of digital inequalities*. SAGE.

Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign.

Holmes, W., Tuomi, I., et al. (2022). State of the art and practice in AI in education. *European Journal of Education*, 57(4), 542–570.

Holmes, W., et al. (2023). Generative AI in education: Opportunities and risks. *Computers and Education: Artificial Intelligence*, 4, 100118.

Kasneci, E., et al. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences*, 103, 102274.

Kizilcec, R. F. (2021). How much information? Effects of transparency on trust in AI systems. *Proceedings of the ACM Conference*.

Knox, J. (2020). Artificial intelligence and education in China. *Learning, Media and Technology*, 45(3), 298–311.

Knox, J., Wang, Y., & Gallagher, M. (2022). Artificial intelligence and inclusive education. *Postdigital Science and Education*, 4(1), 1–19.

Luckin, R. (2017). Towards artificial intelligence-based assessment systems. *Nature Human Behaviour*, 1,

0028. https://doi.org/10.1038/s41562-016-0028

Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence unleashed: An argument for AI in education*. Pearson.

Means, B., Toyama, Y., Murphy, R., & Baki, M. (2014). The effectiveness of online and blended learning. *Teachers College Record*, 115(3), 1–47.

OECD. (2021). *AI and the future of education and skills*. OECD Publishing.

Popenici, S. A. D., & Kerr, S. (2017). Exploring the impact of artificial intelligence on teaching and learning in higher education. *Research and Practice in Technology Enhanced Learning*, 12(1), 22. https://doi.org/10.1186/s41039-017-0062-8

Rai, A., & Tang, X. (2018). Information technology-enabled business models. *Information Systems Research*, 29(3), 511–529.

Reich, J. (2020). *Failure to disrupt: Why technology alone can't transform education*. Harvard University Press.

Roll, I., & Wylie, R. (2016). Evolution and revolution in artificial intelligence in education. *International Journal of Artificial Intelligence in Education*, 26(2), 582–599.

Schmid, M., & Petko, D. (2019). Does the use of educational technology correlate with teachers' beliefs? *Computers & Education*, 136, 157–171.

Selwyn, N. (2016). *Education and technology: Key issues and debates* (2nd ed.). Bloomsbury.

Selwyn, N., Pangrazio, L., Nemorin, S., & Perrotta, C. (2020). What might the school of 2030 be like? *Learning, Media and Technology*, 45(1), 90–106.

Selwyn, N., & Jandrić, P. (2020). Postdigital living in the age of COVID-19. *Postdigital Science and Education*, 2(3), 989–1005.

Siemens, G. (2013). Learning analytics: The emergence of a discipline. *American Behavioral Scientist*, 57(10), 1380–1400. https://doi.org/10.1177/0002764213498851

Sung, Y. T., Chang, K. E., & Liu, T. C. (2016). The effects of integrating mobile devices with teaching. *Educational Research Review*, 17, 1–13.

Tlili, A., et al. (2023). Artificial intelligence in education: A systematic review. *Computers & Education: Artificial Intelligence*, 4, 100125.

Tuomi, I. (2018). The impact of artificial intelligence on learning. *European Commission Report*.

UNESCO. (2021). *AI and education: Guidance for policymakers*. UNESCO Publishing.

van Dijk, J. (2020). *The digital divide*. Polity Press.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.

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

Williamson, B. (2017). *Big data in education: The digital future of learning*. SAGE.

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of AI in higher education. *International Journal of Educational Technology in Higher Education*, 16, 39.

Zhang, J., & Zheng, Y. (2020). How does AI-based tutoring influence achievement? *Computers in Human Behavior*, 110, 106383.

Zhao, Y., et al. (2021). AI-supported learning and engagement. *Educational Technology Research and Development*, 69(2), 1–15.