

A Study on AI and the Digital Divide and its Impact on Education

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Abstract

The rapid integration of Artificial Intelligence (AI) into educational systems is reshaping teaching methodologies, learning experiences, and institutional management worldwide. However, the expansion of AI-driven technologies has also intensified concerns regarding the digital divide—the gap between individuals and communities with adequate access to digital tools, infrastructure, and skills and those without.

This study examines how AI influences educational equity, focusing on disparities in access to devices, high-speed internet, digital literacy, and AI-powered learning platforms. While AI technologies such as adaptive learning systems, intelligent tutoring systems, and predictive analytics offer personalized instruction and improved academic outcomes, their benefits are often concentrated in well-resourced schools and regions. Marginalized populations, including low-income, rural, and underrepresented communities, risk further exclusion due to limited technological infrastructure and insufficient policy support.

The study analyzes existing literature and policy frameworks to evaluate both the transformative potential of AI and the structural inequalities it may reinforce. It concludes by proposing strategic interventions—such as equitable infrastructure investment, inclusive AI design, digital literacy initiatives, and ethical governance frameworks—to ensure that AI serves as a tool for educational inclusion rather than a driver of inequality.

Keywords: Digital Divide, Adaptive Learning Systems, Equitable, Digital Literacy Initiatives, and Ethical Governance Frameworks.

Introduction

One of the most revolutionary technologies of the twenty-first century, artificial intelligence (AI) is changing healthcare, education, governance, and economy. AI is the term for computing systems that can carry out tasks like learning, reasoning, problem-solving, perception, and decision-making that call for human intellect.

The continuing disparities in access to digital infrastructure—often referred to as the “digital divide”—coincide with the growth of AI technologies. Disparities in access to information and communication technology (ICT), internet connectivity, digital devices, and digital literacy abilities among individuals, households, communities, and countries are referred to as the “digital divide.” While many rural, low-income, and marginalized populations struggle with poor connectivity, antiquated infrastructure, and a lack of technical skills, developed regions enjoy high-speed broadband access and sophisticated digital ecosystems.

Large datasets, cloud computing, digital infrastructure, and constant internet connectivity are critical components of AI systems. As a result, people and organizations without digital access cannot take advantage of AI-enabled advancements in public services, employment, healthcare, and education. This leads to a paradox: whereas AI promises inclusion, efficiency, and personalization, if access is still unequal, it may also exacerbate structural inequality.

Physical devices access and internet connectivity are the focus of the first-level digital divide. Disparities in digital skills and usage abilities are related to the second-level divide. The capacity to profit significantly from digital technology particularly AI-powered tools, is a third developing stage.

For instance, whereas students in rural areas rely on conventional teaching techniques, students in technologically savvy metropolitan institutions may have access to AI-driven adaptive learning systems. In a similar vein, companies using AI analytics have an advantage over small businesses without digital infrastructure.

Review of Literature

Warschauer, M. (2004)

Book: *Technology and Social Inclusion: Rethinking the Digital Divide*.

Findings: Warschauer's research provides foundational theory on the digital divide, showing that access alone is not enough — digital inclusion requires enabling skills and community support systems. His findings underline the importance of socio-economic and contextual factors in digital education adoption.

Rose Luckin (2018)

Journal: *AI in Education: Promise and Implications for Teaching and Learning* (UCL Knowledge Lab Publication).

Findings: Luckin highlighted that AI technologies can provide customized feedback and adaptive support for diverse learners. Her findings suggest that AI has strong potential to support inclusive education, especially for students with special educational needs. However, she warned that without equitable digital access and teacher training, AI implementation may widen existing digital divides.

Neil Selwyn (2019)

Journal: *Should Robots Replace Teachers? AI and the Future of Education* (Polity Press)

Findings: Selwyn critically examined the commercialization of AI in education. He found that AI-driven tools are often adopted by well-funded institutions, potentially reinforcing socio-economic inequalities. He emphasized the need for ethical governance and public policy intervention to prevent AI from exacerbating educational exclusion.

Wayne Holmes et al. (2019)

Journal/Source: *Artificial Intelligence in Education: Promise and Implications for Teaching and Learning* (Report by UNESCO)

Findings: Holmes and colleagues examined the role of AI in transforming educational systems through adaptive learning platforms, intelligent tutoring systems, and learning analytics. The study found that AI can significantly enhance personalized learning and student engagement. However, it emphasized that unequal access to digital infrastructure may prevent disadvantaged students from benefiting equally, thereby reinforcing educational disparities.

World Bank. (2020)

Report: Remote Learning, Digital Technologies and Equity in Education

Findings: This study investigates remote and digital learning during the COVID-19 pandemic and finds that students without reliable internet or devices experienced significant learning loss. The report highlights that digital divide factors directly affect students' ability to benefit from AI-based and online education initiatives.

OECD (2021)

Report: Digital Education Outlook 2021

Findings: The OECD report found that schools with strong digital infrastructure and trained educators were more capable of integrating AI tools effectively. It stressed the importance of national digital strategies, teacher training, and equitable funding to bridge digital learning gaps.

Junard P. Duterte

Journal: Advancement of AI and ChatGPT in Globalizing Education

International Journal of Research and Innovation in Social Science (2024)

Findings: This review highlights the rapid rise of AI technologies such as ChatGPT in education, noting benefits like personalized learning, real-time feedback, and administrative automation. However, it also emphasizes critical risks including data privacy concerns, algorithmic bias, and the risk of exacerbating the digital divide unless digital infrastructure and equitable access are strengthened.

Dorit Hadar Shoval (2025)

Journal: Education Sciences - Artificial Intelligence in Higher Education: Bridging or Widening the Gap for Diverse Student Populations?

Findings: This 2025 study explores how AI impacts inclusion among first-generation and minority students. It finds that although AI has potential to support diverse learners, disparities in access and AI literacy may actually widen educational gaps unless targeted interventions are introduced to support marginalized groups.

The GenAI Divide Among University Students: A Call for Action (2025)

Journal: The Internet and Higher Education

Findings: This 2025 study identifies patterns of AI literacy and usage among students, showing that differences in AI knowledge reflect digital divides. Students with higher AI literacy tended to use generative AI more productively, while others remained cautious or marginally engaged, indicating the risk of widening educational gaps.

Research Gap

Few studies have thoroughly evaluated the relationship between AI integration and digital inequality within a single framework, despite the fact that several have looked at AI in education and others have individually investigated the digital divide.

Insufficient attention has been paid to how unequal access to devices, infrastructure and digital literacy affects the efficacy of AI driven education, especially in developing nations like India.

The majority of existing literature concentrates on the technological advantages of AI, such as personalized learning, automation, and adaptive assessment.

Additionally, there aren't many empirical studies using primary data that evaluate the actual experiences of teachers and students from various socioeconomic backgrounds.

Many studies don't measure actual educational outcomes; instead, they are conceptual or policy-oriented.

The necessity for context-specific, data-driven analysis on AI and the digital divide in education is thus highlighted by the substantial research gap in understanding how AI adoption may simultaneously foster educational innovation and worsen educational inequality.

Objectives

I have framed my research related to "A Study on AI and the Digital Divide and its Impact on Education" to two main objectives namely:

1. To investigate how artificial intelligence is changing the educational system's teaching and learning procedures.
2. To examine how students' academic performance and learning possibilities are impacted by the digital divide and how it affects fair access to AI-driven educational resources.

Sources of Data

PRIMARY DATA – Questionnaire was prepared and forwarded in the form of google form to 200 interested respondents

SECONDARY DATA – It was collected through internet and from the available published data

Data Analysis of 200 Respondents from the Questionnaire

Table 1 Awareness of AI in Education

Response	No. of Respondents	Percentage (%)
Yes	160	80%
No	40	20%
Total	200	100%

Interpretation

The majority (80%) of respondents are aware of AI tools used in education, indicating high general awareness. However, 20% still lack awareness, showing the need for more exposure and digital literacy initiatives.

Table 2 Usage of AI-Based Learning Tools

Response	No. of Respondents	Percentage (%)
Regularly	60	30%
Occasionally	70	35%
Rarely	40	20%
Never	30	15%
Total	200	100%

Interpretation

Only 30% use AI tools regularly, while 35% use them occasionally. A combined 35% (rarely/never) indicates limited practical usage despite high awareness.

Table 3 AI Improves Understanding

Response	No. of Respondents	Percentage (%)
Strongly Agree	70	35%
Agree	80	40%

Neutral	25	12.5%
Disagree	15	7.5%
Strongly Disagree	10	5%
Total	200	100%

Interpretation

75% of respondents agree that AI improves subject understanding, proving its effectiveness in enhancing learning experiences.

Table 4 Access to Digital Devices

Response	No. of Respondents	Percentage (%)
Yes	150	75%
No	50	25%
Total	200	100%

Interpretation

Although 75% have access to digital devices, 25% still lack access, indicating a significant digital divide.

Table 5 Internet Connectivity

Response	No. of Respondents	Percentage (%)
Always	90	45%
Sometimes	60	30%
Rarely	30	15%
Never	20	10%
Total	200	100%

Interpretation

Only 45% have reliable internet access. 25% experience rare or no connectivity, which directly affects AI-based learning participation.

Table 6 Financial Constraints Affect Access

Response	No. of Respondents	Percentage (%)
Strongly Agree	65	32.5%
Agree	70	35%
Neutral	25	12.5%
Disagree	25	12.5%
Strongly Disagree	15	7.5%
Total	200	100%

Interpretation

67.5% agree that financial issues limit access to AI tools, showing socio-economic factors strongly influence digital inequality.

Table 7 Lack of Digital Skills

Response	No. of Respondents	Percentage (%)
Strongly Agree	55	27.5%
Agree	75	37.5%
Neutral	30	15%
Disagree	25	12.5%
Strongly Disagree	15	7.5%
Total	200	100%

Interpretation

65% believe that lack of digital skills limits effective AI usage, highlighting the need for digital literacy training.

Table 8 Rural Students Face More Challenges

Response	No. of Respondents	Percentage (%)
Strongly Agree	85	42.5%
Agree	70	35%
Neutral	20	10%
Disagree	15	7.5%
Strongly Disagree	10	5%
Total	200	100%

Interpretation

A significant 77.5% agree that rural students face greater challenges in accessing AI-based education, confirming the existence of a digital divide.

Table 9 Government Efforts to Reduce Digital Divide

Response	No. of Respondents	Percentage (%)
Strongly Agree	30	15%
Agree	50	25%
Neutral	40	20%
Disagree	45	22.5%
Strongly Disagree	35	17.5%
Total	200	100%

Interpretation

Only 40% believe government efforts are sufficient, while 40% disagree, indicating mixed opinions and perceived gaps in policy effectiveness.

Findings

1. High Awareness but Moderate Usage

Only 30% of respondents routinely utilize AI technologies in education, despite the fact that 80% of respondents are aware of them. This suggests a gap between awareness and actual application.

2. Favorable View of AI in Education

Strong support for AI based learning techniques is demonstrated by the majority's (75%) believe that AI enhances subject comprehension.

3. Individualized Learning is Valued

The majority of respondents concur that AI improves academic engagement and performance by offering individualized learning experiences.

4. Limited Device Access

A substantial access barrier is highlighted by the fact that 25% of respondents do not regularly have access to digital devices.

5. Problems with Internet Connectivity

Participation in AI-based education is directly impacted by the fact that only 45% of people have reliable internet connection and 25% experience infrequent or nonexistent connectivity.

6. Financial Constraints as a Major Barrier

According to 67.5% of respondents, access to AI-powered educational tools is hampered by financial constraints.

7. Insufficient Digital Proficiency

65% of respondents think that inadequate digital literacy hinders the efficient use of AI solutions, highlighting the necessity of training initiatives.

8. Rural-Urban Disparity

According to 77.5% of respondents, rural students have more difficulty receiving AI-based education than urban students.

9. Divergent Views on Government Efforts

Perceived policy inadequacies are evident in the fact that just 40% of respondents think government actions are adequate to close the digital divide.

10. AI Has Potential but Risk of Increasing Inequality

Although AI improves learning effectiveness and quality, unequal access to resources and infrastructure could increase educational inequality if it is not adequately addressed.

Conclusion

The study concludes that Artificial Intelligence (AI) has significantly enhanced the quality of education by improving understanding, enabling personalized learning, and supporting academic performance. However, the benefits of AI are not equally accessible to all students due to the persistent digital divide. Limited access to digital devices, unreliable internet connectivity, financial constraints, and lack of digital literacy—especially among rural and economically disadvantaged groups—continue to create educational disparities. Therefore, while AI holds great potential to transform education, inclusive policies, improved infrastructure, and targeted digital literacy initiatives are essential to ensure equitable access and prevent the widening of educational inequality.

Recommendations and Suggestions

1. Improve Digital Infrastructure

I suggest that the Governments should expand high-speed internet connectivity, especially in rural and remote areas, to ensure equal access to AI-based education.

2. Provide Affordable Digital Devices

Educational institutions and policymakers should introduce subsidy schemes or device distribution programs for economically weaker students.

3. Enhance Digital Literacy Programs

Regular training programs should be conducted for students and teachers to improve digital skills and effective use of AI tools.

4. Teacher Training in AI Integration

Institutions must organize workshops and certification programs to help teachers integrate AI tools effectively into teaching practices.

5. Promote Public–Private Partnerships

Collaboration between government bodies and technology companies can support affordable AI solutions for educational institutions.

6. Develop Inclusive Education Policies

Policymakers should design AI implementation strategies that specifically address the needs of rural and marginalized communities.

7. Ensure Data Privacy and Security

Strong regulations must be implemented to protect student data and ensure ethical use of AI in education.

8. Monitor and Evaluate AI Implementation

Regular assessment of AI-based programs should be conducted to measure their effectiveness and accessibility.

9. Financial Assistance and Scholarships

Special financial aid programs should be introduced to support students affected by the digital divide.

10. Encourage Community Learning Centres

Establish community-based digital learning hubs in rural areas to provide shared access to devices and internet facilities.

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