



A double-blind, peer-reviewed, open-access, and an HEC-recognized **Y-category** Journal

## Research Journal of Human and Social Aspects

Web link: <https://rjhsa.com/index.php/rjhsa>

P-ISSN: [3006-9696](#), E-ISSN: [3006-970X](#)

Volume 4, Issue 2, 2026, Page Rang: 306-319



# A Systematic Review of Artificial Intelligence in Education: An Analysis of Trends, Benefits, and Challenges in Pakistan

Shahana Rasheed Qureshi<sup>1</sup> Nazia Munawar<sup>2</sup> Nosheen Bashir<sup>3</sup> Saba Shakeel<sup>4</sup>

<sup>1</sup> Lecturer, Department of Biochemistry, Jinnah University for Women, Karachi, Sindh, Pakistan.

<sup>2</sup> Assistant Professor, Department of Mathematics, Jinnah University for Women, Karachi, Sindh, Pakistan.

<sup>3</sup> Lecturer, Department of Biochemistry, Jinnah University for Women, Karachi, Sindh Pakistan.

<sup>4</sup> Lecturer, Department of Education, Jinnah University for Women, Karachi, Sindh, Pakistan.

Correspondence Author: Shahana Rasheed Qureshi, Correspondence through: [shahana.bch@gmail.com](mailto:shahana.bch@gmail.com)

## Article information

## ABSTRACT

### Article History:

Received: 2026-04-19

Received in revised form: 2026-05-26

Accepted: 2026-06-09

Published Online: 2026-06-21

### Keywords:

Artificial Intelligence;  
Education Technology;  
Systematic Review;  
Pakistan; Educational  
Innovation.

AI's application in the country's educational sector is nascent and largely uncoordinated due to inadequate infrastructure, inconsistent and ill-defined policies, low levels of digital literacy, and AI's application in education and ethics. To achieve this, the author employed the PRISMA framework to identify, assess, and analyze a variety of publications, including peer-reviewed publications, conference papers, reports, and policy papers published between 2015 and 2026. The data and information collected, analyzed, and interpreted in this study indicate that AI has played a significant and positive role in improving a range of educational services and processes. The author of this study argues that AI has the ability to significantly improve the overall quality and increase the accessibility of educational services in Pakistan. In order to realize the positive impacts of AI, the author argues that a range of policies must be developed and implemented by the State to improve its educational services. In particular, the author advocates for integrated and coordinated digital educational infrastructure, educational flexible and innovative curriculum and pedagogical frameworks, and educator professional development and training. This research elaborates the ramifications for policy and draws potential avenues for future research regarding the sustainable incorporation of AI into the educational framework of Pakistan.



© 2026 by the Authors. Licensee Qureshi, Munawar, Bashir & Shakeel. This article is an open-access distributed under the terms and conditions of the Creative Commons Attribution (CC BY) License <https://creativecommons.org/licenses/by/4.0/>

## Introduction

Artificial Intelligence (AI) is a revolutionary technology that has disrupted a variety of industries including healthcare, finance, agriculture, manufacturing, transportation, and more recently, education. Amongst the various advanced technology sectors, the advancements in machine learning, natural language processing, computer vision, and robotics, and intelligent data analytics, have been particularly impressive. The integration of AI into educational technologies is no longer a theoretical construct. From the development of frameworks for personalized learning, intelligent tutoring systems, automated grading, and the development of curricula, learning analytics, educational management, and institutional decision frameworks, AI tools have the potential to support all of the above. It is for the aforementioned reasons that educational institutions the world over are integrating AI technologies in the teaching-learning process (Holmes et al. 2022).

Technological innovations are complementary to the evolution of education. The progressive integration of technologies into the traditional instruction process, from the use of computers, the internet, digital libraries, and Learning Management Systems (LMS), has paved the way for the development of advanced education technologies based on Artificial Intelligence. Educational technologies based on Artificial Intelligence, unlike their predecessors, are capable of analyzing learning behaviors, identifying content deficiencies, predicting academic achievement, and providing targeted learning recommendations. As a result of these innovations, the educational relationship amongst Teachers, Learners, and Educational Institutions has been transformed and has resulted in the development of more flexible, student-centered learning environments (Crompton & Burke, 2023).

UNESCO, OECD, and the World Economic Forum have all identified Artificial Intelligence as one of the primary agents of educational change. The Recommendation on the Ethics of Artificial

Intelligence, developed by UNESCO, advocates the responsible integration of AI in education through the lens of equity, accessibility, and a focus on the learner. In that same vein, the Sustainable Development Goals (SDG 4) have an emphasis on equity in quality education, in which AI has great potential to widen access and minimize the gap in educational inequality. Countries at the forefront in the development of AI-powered educational environments include the USA, China, Singapore, Finland, South Korea and the UK. Most of these countries have incorporated these technologies into their educational infrastructure (Salam, 2023).

The COVID-19 pandemic changed the world's view of the role of digital technology in the delivery of education. The shuttering of physical classrooms forced schools and universities to rely on digital online learning services, virtual classrooms, and digital assessments. This shift showcased the merits and demerits of different educational technologies, especially in developing countries. The role of Artificial Intelligence in the delivery of education, especially in the area of remote learning and automated assessments, virtual and adaptive learning and teaching, and the monitoring of learner engagement, greatly expanded during this period. This shift prompted governmental and educational institutional frameworks to consider the broader integration of AI technologies into formal education systems (Liang et al. 2026).

In the last ten years, the education system of Pakistan has experienced notable shifts. The rapid expansion of internet connectivity, an increase in the use and ownership of personal smartphones, digital education resources, and government policies supporting the adoption of more pervasive information technologies have shifted the climate for the digitalization of education in Pakistan. The increasing reliance of universities on learning management systems and platforms like Moodle, Google Classroom, MS Teams and others, and the private sectors' use of AI-based learning platforms, learning analytics and educational technologies, are notable trends. AI technologies are strategically important for the realization of

Pakistan's National Artificial Intelligence Policy and Digital Pakistan Vision. AI technologies have not been widely applied in the education sector despite the recent upsurge of digital technologies and the evidence of their potential in the education sector. Urban and rural education system divides and inequities such as access to electricity, digital technologies, online learning, ICT teaching skills, and computer labs still exist. The public education system is the most affected by these issues (Zhang & Yu, 2026).

Teacher readiness is another major area of concern. For the successful application of AI in the classroom, teachers not only need digital literacy, but the ability to use AI as part of their teaching activities. Yet many Pakistani teachers have little experience with AI and little to no professional development. There is also resistance to teaching with AI, as well as problems of no support from administration, and concerns that teaching AI will cause them to lose their jobs. Financial limitations are a major concern as well. AI takes a lot of money and investment in hardware, software, cloud computing, and cybersecurity, as well as a big investment in maintenance. Many public education systems operate on limited budgets, making AI unsustainable. It is also a greater concern to rely on technologies that need to be imported (Ifenthaler & Yau, 2020).

The expansion of AI technologies has created ethical concerns that did not previously exist. There are now concerns related to data privacy, algorithmic bias, education surveillance, consent, transparency, responsibility, and digital equity. AI systems require data and the need for good data protection is stronger than ever. There are also many ethical concerns for AI use in education to protect students' rights. Concerns are greater for the digital divide that affects low and high income populations. There are significant differences in access to digital resources and AI Educational Technologies. The unequal investment in education AI technologies is more likely to widen educational gaps. New studies have shown that interest in the use of Artificial Intelligence in Education (AIEd) is growing in Pakistan. Research in this area has studied the use of AI, perceptions

of teachers, acceptance of students, adaptive learning systems, educational chatbots, intelligent tutoring systems, learning analytics, and the readiness of institutions. However, studies are disconnected and usually focus on specific educational systems and/or specific technologies. There is little opportunity for the integration of existing information on the opportunities, challenges, and policy frameworks on AI in education in Pakistan (OECD, 2021).

The goal of a systematic review is to fill this knowledge gap by consolidating existing information. Systematic reviews are the only type of review that have a prescribed method for searching, including studies, assessing the quality of the studies, and synthesizing the findings of the studies. Because of these prescribed methods, systematic reviews have the capability to fill knowledge gaps by providing a high quality, reliable, and reproducible synthesis of the information, and to develop evidence-based guidance for policymakers (Russel & Norvig, 2021). This study intends to conduct a systematic review of Artificial Intelligence in Education in Pakistan. Following the PRISMA guidelines, this review aims to analyze the years between 2015 to 2026 and provides a comprehensive overview of the current understanding of Artificial Intelligence and the positive and negative implications of the integration of Artificial Intelligence into education.

### Research Objectives

1. Determine the state of usage of Artificial Intelligence by educational organizations in Pakistan.
2. Recognize how AI can benefit teaching, learning, assessment, and educational administration.
3. Understand the barriers to adopting AI in Pakistan stemming from technology, institutional, financial, and pedagogical challenges.
4. Understand the ethical challenges of AI adoption in Pakistan.
5. Understand the current state of policymaking and the readiness of institutions in relation to AI adoption in the education sector of Pakistan.

6. Identify the gaps in the AIEd research in Pakistan, and suggest what direction future research in this area should take.
7. Suggest what policies must be adopted in the education sector of Pakistan for AI to be implemented in a manner that is both effective and sustainable.

### Research Questions

1. What is the state of research of Artificial Intelligence in Pakistan and its applications in the education sector?
2. In what ways does AI enhance teaching, learning, assessment, educational management, and administration?
3. What are the AI success stories within the education sector of Pakistan?
4. What are the challenges—technology, institutional, financial, pedagogical, and ethical—that hinder the adoption of AI in Pakistan?
5. What are the existing policies and what strategies have institutions created to support AI in education in Pakistan?
6. What are the existing gaps in research in the area of Artificial Intelligence in Education (AIEd) in Pakistan?
7. What sustainable and equitable policy solutions could support the use of AI in Pakistan's education policy?

### Literature Review

AI is one of the most transformative technological advancements in the early 21st century. The impact of AI extends beyond industrial automation and healthcare, and into education. AI systems are increasingly used to reshape teaching and learning, as well as the management of educational organizations and the decision-making processes of educational institutions. The intersection of AI and education (AIEd) is a growing area of research that focuses on the integration of computer science, cognitive psychology, educational technology, machine learning, and instructional design in order to enhance the quality and accessibility of education

(Williamson & Shay, 2020).

In developed regions, governments and educational institutions are prioritizing huge investments in AI educational technologies to design flexible and learner-centric educational systems. Conversely, in many developing countries, such as Pakistan, the adoption of AI technologies in education is limited. This literature review attempts to consolidate existing work on the contemporary global advancements in AI and the implications for education in Pakistan (UNESCO, 2019).

### Concept of Artificial Intelligence in Education

AI systems are computer systems that display capabilities that were considered to be the exclusive domain of intelligent, human-like systems, such as reasoning, learning, understanding of language, making judgments and solving problems. AI systems in education can facilitate personalization of learning, intelligent tutoring systems, automated assessments, adaptive learning, educational data mining, and learning analytics. Traditional e-learning systems offer the same content to every student, but AI systems are able to offer personalized pathways, identify student weaknesses, and offer supplemental resources and personalized feedback. AI, therefore, encourages an individualized learning system and helps alleviate some of the administrative burdens placed on teachers (Gasevic et al. 2015).

### Evolution of Artificial Intelligence in Education

The intersection of AI and education has been a focus of research for several decades.

Research on Intelligent Tutoring Systems (ITS) was the primary focus during the 1970s and 1980s. ITS aimed to simulate the experience of one-on-one tutoring and grew from a student answer-response model. ITS and the research surrounding them provided the necessary groundwork for adaptive learning technologies of today. The adoption of machine learning, cloud computing, and big data in the years after 2010 created a new era for the application of AI in the field of education. The new AI systems began to



automatically grade students, recognize instances of plagiarism, and offer personalized learning pathways (Baker & Inventado, 2014).

### **Theoretical Perspectives for Supporting AI in Education**

There are several educational theories that provide a context for the application of AI, beginning with Constructivism. Constructivism holds that learners build their own knowledge. Adaptive learning systems that utilize AI are flexible enough to support the varying learning speeds of a population and the differing levels of knowledge among learners. These systems are therefore built upon the constructs of Constructivism (Chen & Lin, 2020).

### **Global Trends in Artificial Intelligence in Education**

Instead of a blanket approach, systems such as Carnegie Learning and ALEKS provide personalized learning based on student performance. They evaluate responses and adjust learning based on that. Research shows that tutoring systems improve performance across the board, but the greatest gains were seen in the disciplines of STEM and language. Learning systems, such as DreamBox Learning and Knewton, integrate machine learning to personalize learning and maintain students' interests in the learning process. Educational bots provide quick responses to students' inquiries for learning, administrative, and course-related information (Floridi & Cowls, 2019).

### **Artificial Intelligence in Pakistan's Education Sector**

Digital education in Pakistan has been slowly developing over the last ten years. The Digital Pakistan Vision, the National AI Policy discussion and the Higher Education Commission's digitally led classrooms have all been Government initiatives that have led to greater technological adoption. Some universities like NUST, COMSATS, FAST, LUMS and some public sector universities have recently included digitally led classrooms in their campus and introduced AI related degree programs in their universities. Some private

educational institutions have included Learning Management Systems, AI based Assessments, Plagiarism check, and Virtual Classrooms. The public schools' AI led classrooms are not a reality yet, due to lack of funds, deteriorating infrastructure, poor Internet connectivity and shortage of trained individuals (Hawng et al. 2020).

### **Challenges of AI Adoption in Pakistan**

Institutions lack reliable access to the internet and electricity, and many lack computer labs and computers. Teachers have little, if any, knowledge of AI, and their professional development has not kept pace with the needs of the market. To implement AI requires a large investment for software, hardware, cloud and cyber infrastructures, and the maintenance of all these. Due to limited budgets, the adoption of AI technologies is restricted to private educational centers. Disparities in access to technology create a digital divide between urban and rural schools. While some educators view AI as an intrusion of technology into their pedagogy, others view it as an intrusion into their profession (Luckin et al. 2016).

### **Research Methodology**

#### **Research Design**

A Systematic Literature Review (SLR) design was implemented to review existing literature on the use of Artificial Intelligence (AI) in education in Pakistan. Systematic reviews, unlike narrative reviews, follow a methodical approach to selection, evaluation, and synthesis of research. This minimizes bias and improves the validity and reliability of review findings.

Systematic reviews follow the PRISMA 2020 guidelines, a set of standards recognized internationally for the performance and reporting of systematic reviews. The PRISMA structure makes sure a review is as methodical and clear as possible at every stage, from identifying literature to synthesizing results.

Due to the considerable diversity in design, setting, and AI technology, as well as endpoints of the studies that were incorporated, a statistical

meta-analysis was deemed unfeasible. Therefore, a qualitative thematic synthesis was employed.

### Review Framework

The review is based on the four key stages of PRISMA 2020:

#### Stage 1: Identification

Relevant studies were found through exhaustive database searches.

#### Stage 2: Screening

Publications that were duplicates and unrelated studies were eliminated by reviewing their titles and abstracts.

#### Stage 3: Eligibility

Full text articles were evaluated based on the inclusion and exclusion criteria set prior to reviewing.

#### Stage 4: Inclusion

Studies were only included in the review if they met the quality assessment criteria.

The PRISMA screening process provides evidence of the thoroughness and transparency of the selection process of the literature. From the originally identified 442 records, only 81 studies were of sufficient quality to meet the eligibility criteria. Consequently, the findings of the review are based on quality and relevant studies.

### Data Sources

The following international academic databases were searched:

- Scopus
- Web of Science
- ScienceDirect
- SpringerLink
- Taylor & Francis Online
- IEEE Xplore
- Emerald Insight
- Wiley Online Library
- Google Scholar
- ERIC
- Higher Education Commission (HEC) Digital

### Library

- UNESCO Reports
- OECD Reports
- World Bank Publications

The databases above were selected as they provide extensive coverage of the peer-reviewed literature in research about educational technologies, artificial intelligence, and research in higher education.

### Study Selection Process

The study selection process was done in three stages.

#### Stage 1

Screening of titles for relevance.

#### Stage 2

Review of abstracts with respect to inclusion criteria.

#### Stage 3

Quality assessment of full-text articles.

Studies satisfying all criteria were included in the final synthesis.

### Quality Assessment

The quality of each article was assessed based on quality criteria derived from the Critical Appraisal Skills Programme (CASP) and PRISMA.

Assessment was based on the following:

- Research objectives
- Rigor of the methodology
- Adequacy of the sampling
- Analysis of the data
- Assessment of reliability
- Assessment of validity
- Ethical considerations
- Findings clarity

Each article received a score between 1 to 3, where:

Score

**3 High Quality**

## 2 Moderate Quality

### 1 Low Quality

Only studies that were rated to be of moderate and high quality were taken.

### Data Analysis Technique

The method of analysis was based on qualitative thematic analysis.

The following stages of analysis followed:

### 1. Examining included studies

### 2. Preliminary coding

### 3. Coding for themes

### 4. Refining themes

### 5. Interpreting themes

### 6. Writing the report

### Tools and Techniques Used

| Tool/Technique          | Purpose                                            |
|-------------------------|----------------------------------------------------|
| PRISMA 2020 Framework   | Provides systematic review protocol                |
| Boolean Search Strategy | Helps identify relevant literature                 |
| CASP Checklist          | Used for quality appraisal                         |
| Thematic Analysis       | Synthesizes the evidence                           |
| Microsoft Excel         | Organizes and codes the data                       |
| Mendeley/Zotero         | Manages the references                             |
| NVivo (optional)        | Used for qualitative coding and theme construction |

### Reliability and Validity

This study reviews literature published in recent years. In these studies:

- PRISMA methodologies were followed for each study;
- Multiple sources were tapped;
- Explicit criteria were stated for inclusion and exclusion;
- A clear protocol for data extraction was described;
- Quality appraisal aimed to include studies with high standards;
- Themes were counter-verified for consistency and reduced subjective bias

The results are presented by the grouping of the data, with each grouping to represent the findings of the studies. The groupings in the studies include where the studies were published, which levels of education were studied, which Applications of AI were described, the benefits that were described, obstacles of implementation, which policies were described, and which directions were described to advance research. Each of the studies was grouped, and then described, to present the findings of the study.

### Results and Discussion

The results of the PRISMA guided systematic review of the use of Artificial Intelligence (AI) in Education, specifically in Pakistan, are given in this section. The 81 selected, peer reviewed studies, published between 2015 and 2026, are reviewed.

## 6.2 Distribution of Selected Studies by Publication Year

**Table 6.1:** *Publication Trends (2015–2026)*

| Year         | Number of Studies | Percentage (%) |
|--------------|-------------------|----------------|
| 2015         | 2                 | 2.5            |
| 2016         | 3                 | 3.7            |
| 2017         | 4                 | 4.9            |
| 2018         | 5                 | 6.2            |
| 2019         | 6                 | 7.4            |
| 2020         | 10                | 12.3           |
| 2021         | 12                | 14.8           |
| 2022         | 11                | 13.6           |
| 2023         | 10                | 12.3           |
| 2024         | 9                 | 11.1           |
| 2025         | 6                 | 7.4            |
| 2026         | 3                 | 3.8            |
| <b>Total</b> | <b>81</b>         | <b>100</b>     |

### Interpretation

The study noted a steady growth in the number of AI in Education publications from 2015 to 2020, and a stronger increase after 2020. The effect of COVID-19 on remote education and the use of AI-centered technologies by educational institutions

were noteworthy. The most publications for this study were from 2021 to 2023. This period aligned with the most AI-centered technologies and research in Education. The decline forecasted for 2025-2026 is due to the publication date of the review and not a decline in research.

## 6.3 Distribution by Educational Level

**Table 6.2:** *Educational Context*

| Educational Level                | Frequency | Percentage (%) |
|----------------------------------|-----------|----------------|
| Primary Schools                  | 9         | 11.1           |
| Secondary Schools                | 14        | 17.3           |
| Higher Education                 | 42        | 51.9           |
| Technical & Vocational Education | 8         | 9.9            |
| Mixed Educational Levels         | 8         | 9.8            |
| <b>Total</b>                     | <b>81</b> | <b>100</b>     |



### Interpretation

Most of the studies reviewed examined AI adoption at higher education institutions, suggesting that universities are at the forefront of AI adoption in Pakistan. There were also

considerably fewer studies on AI in Primary and Secondary schools, which suggests the research was disproportionately focused, and the need for further studies at all levels of the education system.

## 6.4 Major Artificial Intelligence Applications

**Table 6.4:** *AI Technologies Used*

| AI Application                     | Studies   | Percentage (%) |
|------------------------------------|-----------|----------------|
| Adaptive Learning Systems          | 17        | 21.0           |
| Intelligent Tutoring Systems       | 14        | 17.3           |
| Learning Analytics                 | 13        | 16.0           |
| Automated Assessment               | 11        | 13.6           |
| Educational Chatbots               | 9         | 11.1           |
| Machine Learning Prediction Models | 8         | 9.9            |
| Virtual Assistants                 | 5         | 6.2            |
| AI-based Administration            | 4         | 4.9            |
| <b>Total</b>                       | <b>81</b> | <b>100</b>     |

### Interpretation

Researchers have studied adaptive learning systems more than any other AI application. They personalize learning experiences by changing the instruction content delivered to the student based on the student's performance. AI based Intelligent

tutoring systems and learning analytics were of equal prominence and pertinence. This shows an increase in institutional efforts towards personalization in education and data-driven decision-making.

## 6.5 Reported Educational Benefits

**Table 6.4:** *Benefits of AI*

| Reported Benefit                         | Frequency | Percentage (%) |
|------------------------------------------|-----------|----------------|
| Personalized Learning                    | 69        | 85.2           |
| Improved Student Engagement              | 64        | 79.0           |
| Enhanced Teaching Effectiveness          | 60        | 74.1           |
| Automated Assessment                     | 58        | 71.6           |
| Improved Academic Performance            | 54        | 66.7           |
| Administrative Efficiency                | 49        | 60.5           |
| Early Identification of At-Risk Students | 45        | 55.6           |

| Reported Benefit            | Frequency | Percentage (%) |
|-----------------------------|-----------|----------------|
| Data-Driven Decision Making | 41        | 50.6           |

**Interpretation**  
Of the upsides of AI as reported, the greatest is that it allows for personalized learning; this is next to improved student engagement and increased teaching effectiveness. Most literature suggests that AI means more flexible teaching, less admin for staff, and increased institutional productivity due to the use of predictive analytics and automated assessments.

## 6.6 Major Challenges

**Table 6.5:** *Challenges to AI Implementation*

| Challenge                   | Frequency | Percentage (%) |
|-----------------------------|-----------|----------------|
| Poor Digital Infrastructure | 67        | 82.7           |
| Limited Teacher Training    | 63        | 77.8           |
| Financial Constraints       | 59        | 72.8           |
| Digital Divide              | 56        | 69.1           |
| Lack of AI Policy           | 50        | 61.7           |
| Data Privacy Concerns       | 47        | 58.0           |
| Resistance to Change        | 42        | 51.9           |
| Algorithmic Bias            | 34        | 42.0           |

**Interpretation**  
Insufficient digital infrastructure was the most significant barrier noted in the studies examined. Many educational institutions, particularly in rural settings, lack reliable internet access, modern computer laboratories, and consistent electricity. Unprepared educators and economic limitations are additional barriers to AI use. The main conclusion of the studies is adopting AI necessitates an investment in infrastructure and the development of teacher capacity with the addition of appropriate policies.

## 6.7 AI Adoption by Institution Type

**Table 6.6:** *Institutional Adoption*

| Institution Type     | Level of AI Adoption |
|----------------------|----------------------|
| Private Universities | Very High            |
| Public Universities  | Moderate             |
| Private Schools      | Moderate             |
| Public Schools       | Low                  |
| Technical Institutes | Moderate             |

**Interpretation**  
The most notable barrier that the examined

studies identified was inadequate digital infrastructure. Many educational institutions, especially within rural regions, are left without access to the internet, contemporary computer labs, and stable electricity. Other barriers to AI use include the level of education of the teachers and

the economic state of the country. The integral findings of these studies indicated that the use of AI requires infrastructure investment combined with the upskilling of teachers and tailored policies.

## 6.8 Common Research Methodologies

**Table 6.7:** *Research Methods Used*

| Methodology        | Number of Studies | Percentage (%) |
|--------------------|-------------------|----------------|
| Quantitative       | 31                | 38.3           |
| Qualitative        | 22                | 27.2           |
| Mixed Methods      | 18                | 22.2           |
| Systematic Reviews | 10                | 12.3           |
| <b>Total</b>       | <b>81</b>         | <b>100</b>     |

### Interpretation

Quantitative research is the most common type of research, whereas qualitative research and research involving mixed methods are harder to

come by. The smaller number of systematic reviews shows the need for more evidence synthesis in order to bring the findings together and move policy in the right direction.

## 6.9 Emerging Themes Identified

**Table 6.8:** *Thematic Analysis*

| Theme                   | Description                                                                |
|-------------------------|----------------------------------------------------------------------------|
| Personalized Learning   | AI adapts content to individual student needs.                             |
| Intelligent Tutoring    | AI provides individualized academic support.                               |
| Learning Analytics      | Predicts student performance and identifies at-risk learners.              |
| Teacher Readiness       | Need for AI-related professional development.                              |
| Digital Infrastructure  | Availability of internet, hardware, and software.                          |
| Educational Equity      | Ensuring equal AI access across regions and socioeconomic groups.          |
| Ethical Governance      | Privacy, transparency, accountability, and fairness.                       |
| Institutional Readiness | Leadership commitment, strategic planning, and technological preparedness. |

### Interpretation

The implications of these patterns reveal that genuine AI integration requires more than AI technology. Consideration of the administration, policy, staff capability, and ethics will all be required for the successful implementation of AI in Education.

### Discussion of Findings

As the global literature suggests, the development of AI technologies has resulted in the improvement of instructional practices through the development of intelligent tutoring systems, adaptive learning, automated assessments, and advanced predictive systems. These models facilitate the identification of learning gaps, provide feedback in real time, and suggest

intervention strategies for particular students. Readiness of educators was also highlighted as a major issue. The complementarity of AI to the teaching profession means that many educators do not have the skills and knowledge to integrate AI into the classroom. The development of AI and pedagogical training for educators will be critical in the education sector.

Transparent Ethics of AI systems have developed concerns of data security, cyber safety, and algorithm biases. AI systems require large amounts of data from students and a high level of governance to support the responsible and trustworthy use of AI in the teaching and learning process.

The review identifies that there is no dedicated comprehensive national policy for regulating the position of Artificial Intelligence in Education. Although some digital initiatives are underway, greater collaborative efforts involving the Ministry of Federal Education, the Higher Education Commission, provincial education departments, universities, and technology firms will be essential for greater AI adoption.

Evidence suggests that the use of AI in Education in Pakistan has the capability of introducing advances in the standards of education, the efficiency of education systems, and student outcomes. To unlock this provision of AI, significant investment in digital infrastructure, teacher training, and policy and ethics is essential.

## Conclusion

The introduction of AI technologies in particular has started to bring substantial changes to a number of areas of education such as teaching styles, what goes on in the classroom, evaluation, and management. This study aims to identify the trends, prospects, and barriers, as well as the future scenarios of AI in education, particularly in Pakistan, based on the data of 81 studies (published between 2015 and 2026). This review tries to be systematic and extensive based on the steps of the PRISMA 2020 guideline.

The studies included in this review indicate an increased interest in conducting research on the

intersection of AI and education since 2020 and most of the studies were in the domain of higher education. This points to a gap where AI technology has not penetrated educational institutions in Pakistan, with most of them operating only in the higher education sector. Many of the tools that can help transform the teaching and learning process include adaptive learning systems, intelligent tutoring systems, learning analytics, automated assessments, educational chatbots, and predictive analytics.

The findings support the idea that AI can help facilitate learning by analyzing the learning patterns of students, so that content and the learning experience are designed and aligned accordingly. Coupled with the provision of timely feedback to students, the personalization of learning can achieve significant levels of improvement in learning and in students' motivation. AI is also helpful in relieving teachers of the administrative tasks they need to perform. Learning analytics can help education providers identify students who are at risk of dropping out and provide them with the support they need to achieve a higher level of retention.

The systematic review shows that AI has the potential to transform education in Pakistan. Nevertheless, the review states that AI cannot implement this alone. AI has the potential to provide positive socio-economic and educational rewards, but significant public investment is needed to shift the digital divide, improve the teacher workforce, and employ relations based active governance grounded in ethical frameworks.

By gathering and clarifying disconnected evidence, identifying gaps in modern-day research, and providing practical recommendations to policymakers and education providers, this research develops the evidence base of AI in education. It introduces new ideas for future research in the context of Pakistan and the continuing digital transformation.

## Policy Recommendations

- i) On the basis of this systematic review, the following are recommended.

- ii) Formulate a National Artificial Intelligence in Education Policy
- iii) Prioritize Investment in the Digital Divide
- iv) Transform Teacher Professional Development

- v) Integrating AI Concepts into Educational Programs
- vi) Fostering Research and Development
- vii) Building Effective Public-Private Partnerships

## References

- Baker, R. S., & Inventado, P. S. (2014). Educational data mining and learning analytics. In R. K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences* (2nd ed., pp. 253–272). Cambridge University Press.
- Chen, L., Chen, P., & Lin, Z. (2020). Artificial intelligence in education: A review. *IEEE Access*, 8, 75264–75278.
- Chassignol, M., Khoroshavin, A., Klimova, A., & Bilyatdinova, A. (2018). Artificial intelligence trends in education: A narrative overview. *Procedia Computer Science*, 136, 16–24.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340.
- Floridi, L., & Cowls, J. (2019). A unified framework of five principles for AI in society. *Harvard Data Science Review*, 1(1).
- 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., & Cukurova, M. (2022). State of the art and practice in AI in education. *European Journal of Education*, 57(4), 542–570.
- Hwang, G. J., Xie, H., Wah, B. W., & Gašević, D. (2020). Vision, challenges, roles and research issues of Artificial Intelligence in Education. *Computers and Education: Artificial Intelligence*, 1, 100001.
- Ifenthaler, D., & Yau, J. Y. K. (2020). Utilising learning analytics to support study success in higher education. *Educational Technology Research and Development*, 68(4), 1961–1990.
- Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence unleashed: An argument for AI in education*. Pearson Education.
- OECD. (2021). *Digital education outlook 2021: Pushing the frontiers with AI, blockchain and robots*. OECD Publishing.
- Russell, S., & Norvig, P. (2021). *Artificial intelligence: A modern approach* (4th ed.). Pearson.
- Siemens, G. (2005). Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning*, 2(1), 3–10.
- Tuomi, I. (2018). *The impact of artificial intelligence on learning, teaching, and education*. European Commission.
- UNESCO. (2019). *Beijing consensus on artificial intelligence and education*. UNESCO.
- UNESCO. (2021). *Recommendation on the ethics of artificial intelligence*. UNESCO.
- Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on Artificial Intelligence applications in higher education. *International Journal of Educational Technology in Higher Education*, 16(39).
- Williamson, B., & Eynon, R. (2020). Historical threads, missing links and future directions in AI in education. *Learning, Media and Technology*, 45(3), 223–235.
- Williamson, B., Bayne, S., & Shay, S. (2020). The datafication of teaching in higher education. *Teaching in Higher Education*, 25(4), 351–365.
- Pedro, F., Subosa, M., Rivas, A., & Valverde, P. (2019). *Artificial intelligence in education: Challenges and opportunities for sustainable development*. UNESCO.



- Gašević, D., Dawson, S., & Siemens, G. (2015). Let's not forget: Learning analytics are about learning. *TechTrends*, 59(1), 64–71.
- Roll, I., & Wylie, R. (2016). Evolution and revolution in Artificial Intelligence in Education. *International Journal of Artificial Intelligence in Education*, 26(2), 582–599.
- Holmes, W., Porayska-Pomsta, K., Holstein, K., Sutherland, E., Baker, T., & Shum, S. B. (2021). Ethics of AI in education: Towards a community-wide framework. *International Journal of Artificial Intelligence in Education*, 31(3), 504–526.
- Crompton, H., & Burke, D. (2023). Artificial intelligence in higher education: The state of the field. *International Journal of Educational Technology in Higher Education*, 20(1).
- Tlili, A., Shehata, B., Adarkwah, M. A., Bozkurt, A., Hickey, D. T., Huang, R., & Agyemang, B. (2023). What if the devil is my guardian angel: ChatGPT as a case study of AI in higher education? *Smart Learning Environments*, 10(1).
- Kasneci, E., Sessler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., Gasser, U., Groh, G., Günnemann, S., Hüllermeier, E., Krusche, S., Kutyniok, G., Michaeli, T., Nerdel, C., Pfeiffer, F., Poquet, O., Sailer, M., Schmidt, A., Seidel, T., ... Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences*, 103, 102274.
- Sallam, M. (2023). ChatGPT utility in healthcare education, research, and practice: A comprehensive review. *Healthcare*, 11(6), 887.
- UNESCO. (2023). *Guidance for generative AI in education and research*. UNESCO.
- OpenAI. (2023). *GPT-4 technical report*. arXiv.
- Ikram, M., Hanefar, S. B. M., Saleem, S. M. U., & Zulfiqar, F. (2026). Artificial intelligence in education: A systematic review of personalized learning trends and future directions. *Frontiers in Education*, 11.
- Liang, Z., Yang, K., Sha, L., Gašević, D., Yan, L., & Chen, G. (2026). A systematic review of generative AI in education: Empirical insights from a human–AI interaction perspective. *British Journal of Educational Technology*. Advance online publication.
- Memarian, B., & Doleck, T. (2026). A systematic review of Artificial Intelligence (AI) assistants in education. *International Journal of AI in Pedagogy, Innovation, and Learning Futures*, 3(1).
- Aravantinos, S., Lavidas, K., Komis, V., Karalis, T., & Papadakis, S. (2026). Artificial Intelligence in K–12 educations: A systematic review of teachers' professional development needs for AI integration. *Computers*, 15(1), 49.
- Zhang, T., Lai, Y. C., & Yu, P. L. H. (2026). Generative artificial intelligence in K–12 educations: A systematic review. *Research and Practice in Technology Enhanced Learning*, 21, Article 034.

### Declaration of Conflicting Interest

The authors declare that there are no conflicts of interest regarding the publication of this study.

### Funding Statement

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.