



Social Sciences & Humanity Research Review



Artificial Intelligence for Enhancing Teaching and Learning Practices in Higher Education

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ARTICLE INFO

Keywords:

AI, Education, Challenges,
Sustainability, Higher
Education

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ABSTRACT

Artificial Intelligence (AI) has become a valuable tool in worldwide industries, and the field of higher education as well. The Emerging new challenges are pushing higher education institutes to adopt the modernization in their teachings, administration and overall system. The core focus of the study is to clarify whether AI can positively influence the quality of pedagogy, enrich the outcomes of learners and develop institutions. The problem facing universities, particularly those in the developing settings, is the lack of resources, inadequate teacher development, and the ethical issues that all stand and hinder the successful implementation of AI technologies. The empirical evidence points to the fact that AI-adaptive systems might increase student performance to 35 per cent, whereas intelligent tutoring systems might lower the rate of student dropouts to around 20 to 25 per cent. To teachers, AI saves the administrative load of the instructors by approximately 30 per cent, hence more time to teach. This is also beneficial to institutions, as predictive analytics help to increase student retention and, hypothetically, increase graduation. However, approximately 40 per cent of higher education institutions report issues with the implementation of AI related to lack of proper infrastructure, with nearly half of the educators indicating a lack of training. The level of ethical issues is high, as 60 percent of the respondents are concerned about privacy and algorithmic bias. Study concludes that that AI ought to act as a supplement to human teachers and not as their substitute. It is necessary to establish a collaborative approach between universities, governments, and technology providers that will allow AI deployment to be not only equitable but also responsible. When such measures are put

	in place, AI can enhance the quality of education and promote inclusiveness as well as support the sustainability of higher education.
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Introduction

There is massive global change in modern higher education. Technological innovation and globalization and alteration in society fueling the evolution. Traditional set up classrooms, textbooks and lecture-based teachings look inefficient for effective learning. The new generation's eagerness towards technological tools forcing the adoption of technological advancement in the learning strategies (Razia et al., 2023). Thus, globally it is time to integrate the digital tools within the education for the quick, easy and more interactive manner. The usage of Artificial Intelligence in the industries is growing in the industries thus, now is the time to integrate the AI in education for the better results and benefit for the society. AI adoption makes things easy and better; therefore, its usage cannot be refrained. With the aid of AI, students can enhance their degree of understanding and can access the good and potential materials related to their studies. Additionally, the passive role of AI in the assessment of learner 's ability is impressive. AI provides enormous solutions for the problems with the aid of deep learning, machine learning and predictive analytics. In the educational field, this architecture can be used to evaluate the performance of students in real-time, recommend learning materials depending on the proficiency level of the learner, provide real-time feedback, redesign entire curricula to satisfy a specific learner. Universities all over the world are already starting to incorporate AI in an array of applications that runs the line of intelligent tutoring systems, adaptive learning systems, automated grading systems, and academic chatbots (Mohd Rahim et al., 2022) . The main problem remains to be the persistence of the traditional method of pedagogical paradigm, which develops slowly; most universities still work in strictly organized lecture systems, which allow little flexibility or development of individualized guidance. In many instances, faculty members who have to teach, do research and work in the administration office, end up having little time to learn new technologies, in which case AI can be seen as another burden (unless the institutions provide the necessary facilities and training).Moreover, digital infrastructure is not evenly spread among the regions and institutions, and the possibility of biasness in the AI systems is an implicit threat; algorithms do not always possess the ability to identify what groups are to be prioritized, which results in unfair results (Helmiatin et al., 2024). These ethical issues support the necessity to implement stringent policies, increase transparency, and implement high-quality accountability measures to regulate the use of AI-based tools. Therefore, the relevant question is not the hypothetical ability of AI in improving higher education, but the most effective forms of applying it to be just, sustainable, and inclusive. This research aims to explore the transformational nature of Artificial Intelligence on teaching and learning in the university sector. It aims to understand how far AI can be exploited to customize learning, to assist instructional personnel, and to improve institutional effectiveness, but it also simultaneously recognizes the associated uncertainties that can also limit those gains (Michel-Villarreal et al., 2023; Rahim et al., 2022). The research aims to provide a thorough insight into the opportunities that AI can introduce to higher education and highlight its future, its pitfalls, and the conditions of its successful implementation. Both the potential and the critical issues will be discussed in the study, which will seek to develop a model that can be used by institutions to integrate AI in a way that would be ethical, inclusive, and sustainable. The focal point is to avoid AI being used as an alternative to teachers or traditional pedagogies but a co-creator of more flexible and

purposeful learning experiences. In this regard, AI is an opportunity and a challenge to higher education. On the one hand, it grants unprecedented access to customization of instruction, improves accessibility, efficiency, and puts students and teachers into a stronger position. Conversely, it results in the necessity of the essential questions of fairness, morality, and preparedness that have to be answered.

Materials and Methods

The current research was developed, to investigate the contribution of Artificial Intelligence to the development of pedagogical and learning activities in post-secondary educational institutions. Considering the scope of the field, which deals with the integration of digital technologies into academic settings. The study used qualitative and descriptive data based on the secondary data sources. The methodology was well conceived to provide a clear, detailed and systematic analysis of the adoption of AI tools, the levels of advantages that come with the use of AI tools, and the issues that come along. The researchers used peer-reviewed academic publications, institutional reports, policy documents, and electronic-based resources, all of which outlined the implementation of AI in education. This material was synthesized and critically appraised, and a systematic review was carried out as the analytical processes, the goal of which was to identify insights that could guide and inform the overall objectives of the study. The qualitative design was selected since the research aimed at discovering trends, experiences, and views, but not quantifying. Unlike quantitative studies that generally make use of metrics, surveys, or experiments, this question demanded a subtle understanding of the way AI is changing pedagogy and learning. The qualitative framework used in the investigation involved both descriptive and interpretive approaches: the first involved documenting the AI applications currently used in higher education, and the latter examined the impact of the applications on the student engagement, overall workload of the faculty, inclusiveness, and institutional productivity. A secondary source of data was used to obtain materials to be used in the study. These were peer-reviewed journal articles, conference proceedings, scholarly monographs, university adoption reports, technology organizations white papers, and policy recommendations of international organizations like UNESCO and the OECD. The literature selection was limited in terms of time to recent publications, mainly published after 2015, since the field of AI in the education sector has witnessed a strong pace over the last decade. However, some of the seminal works on artificial intelligence and educational technology published in previous times were also included to offer the needed background and historical context. The literature inclusion criteria included: (1) topicality of the literature to higher education, (2) direct mention of use of AI applications or issues, and (3) literature validity. There was an exclusion of materials that were centered on either primary or secondary education but did not provide transferable lessons to higher studies. A systematic approach was taken in method of literature review. First, the search keywords used were artificial intelligence in higher education, artificial intelligence, and learning, artificial intelligence and teaching, adaptive learning platforms, intelligent tutoring systems, artificial intelligence and assessment, and artificial intelligence and ethics in education in the academic databases Scopus, Web of Science, IEEE Xplore, and Google Scholar. More than 200 sources were first found. Following screening of abstracts and titles, about 80 sources were shortlisted to be analyzed. They were also grouped into themes of AI applications, the advantages of AI, issues of AI, ethical concerns, and the future. Each source was noted, and similarities were found. Results were then collated into general statements which are consistent with the study goals. The thematic analysis was chosen as the methodology of analysis because it showed its effectiveness in identifying and understanding the common themes in large qualitative data. The thematic

analysis process consisted of six steps: familiarizing with the data; coding; emergence of initial themes; reviewing themes; defining and naming of themes; synthesizing the final story. As an example, such codes as personalized feedback, student autonomy, and adaptive learning were observed when reviewing the literature related to AI tutoring systems. These codes were then summarized into a theme as personalized learning through AI. Similarly, the codes like faculty workload, grading automation, or virtual assistants were rolled into one theme, efficiency in teaching practices. The theme was barriers and ethical issues and included such issues as data privacy, algorithmic bias, and digital divide. The subsequent taxonomy enabled an organized understanding of the current situation of AI in tertiary education.

The study combined thematic analysis with a comparative method of analysis and studied the experiences of AI implementation in a variety of geographical and institutional environments. The results showed that academic documentation about technology is mostly in technologically advanced countries- United States, United Kingdom and Singapore, unlike the reports produced by developing countries, such as India, Pakistan and other sub-Saharan Africa states. Such a comparative lens sheds light on the digital divide and highlights the unfairness of access to AI resources. The comparative outcomes thus provide an international view on the relevance of and issues related to AI in higher education. The methods are also considered case study analysis. Selected case studies of universities that had integrated AI into their systems were reviewed to provide concrete examples of how AI tools are applied in practice. For example, some universities have adopted AI-powered chatbots for student support, while others have implemented adaptive learning platforms in online courses. Reviewing these cases gave practical insights into both the opportunities and difficulties of implementation. These case studies were chosen from published reports and academic articles to ensure credibility. Another important methodological element was the inclusion of ethical analysis. Since AI use in education raises questions of privacy, transparency, and fairness, the study devoted attention to ethical frameworks discussed in literature. The analysis included reviewing ethical guidelines by UNESCO, the European Union, and other policy organizations that are working on responsible AI adoption. This ethical analysis provided an additional dimension to the methods by ensuring that the study does not only highlight the technical and pedagogical aspects but also considers moral and social responsibilities. The selective inclusion of credible, peer reviewed, and verifiable sources guaranteed reliability and validity. The use of triangulation was introduced by comparing the results obtained with the help of various types of materials, such as scholarly research, institutional documents, and policy reports; cross-checking increased the credibility of the conclusions obtained. There was also transparency in that the inclusion and exclusion criteria used in the selection of the sources was clearly defined. Although the research was carried out mainly through secondary data, it also clearly stated its methodological framework hence becoming a guide to future empirical research. As an example, a survey that was extended into fieldwork would be informed by the themes and codes mentioned herein to create interview guides or survey instruments to collect primary data on students and the faculty, which makes the current methodology not only a substantive contribution but also a starting point of the research. The choice of a qualitative, exploratory design was explained by the dynamism of the field of artificial intelligence in the educational field, where there are many unexplored issues. Quantitative measures, e.g., adoption rates per se, cannot be used to measure the overall effects of AI on pedagogical practices comprehensively. The subtle perception of educators regarding AI, the interaction of learners with AI tools, and institutional management of the ethical issues in the field also require interpretive analysis. Consequently, the closer and thorough analysis of

research problem became due to the use of qualitative framework. Lastly, the research was based on a conceptual framework approach. The framework was structured to focus on three main areas, namely, the use of AI in teaching and learning; (2) the advantages of AI in higher education; and (3) the problems and ethical considerations related to the use of AI. This framework was used as a guide in the data collection process, analysis and presentation of findings. It made sure that the investigation followed the objectives of the research and did not go into other unrelated technological areas. The methodology has helped in keeping the study concise, well-organized and coherent by arranging the analysis in a way that followed this framework.

Results and Discussion

The results of this study validate that Artificial Intelligence (AI) plays more significant roles in the improvement of higher education. According to empirical data, AI-enabled tools can promote the student learning outcomes, reducing the probability of dropouts, reducing the workload of instructors, and strengthening institutional management. However, there are major setbacks to the implementation of these technologies which exist in the form of lack of adequate infrastructure, training gaps and ethical issues. These remarks support previous studies that state that AI can significantly enhance teaching and learning, but it depends on contextual readiness and the responsible management of those systems (Fowler, 2023; Saaida, 2023).

Table 1 Observed impacts of AI tools in higher education

AI Application	Observed Benefit	Numerical Impact
Adaptive Learning Systems	Personalized learning pathways, faster mastery	Up to 35% improved outcomes
Intelligent Tutoring Systems	Targeted support, early identification of weak learners	20–25% reduced dropout risk
Automated Assessment Tools	Quicker grading, real-time feedback	30% reduction in workload
Predictive Analytics	Improved retention and student success rates	15–18% higher graduation rates
Institutional Management Systems	Better resource allocation, tracking student needs	Significant time savings

The presented data provide empirical support, which states that artificial intelligence has a measurable impact on higher education. As an example, adaptive learning platforms shift instructional content depending on the performance of learners, thus supporting the idea of personalized instructions. These findings support pre-existing evidence implying that personalized pedagogies increase engagement and motivation by learners (Aler Tubella et al., 2024; Shahzad et al., 2024) . In a similar way, intelligent tutoring systems provide additional support to struggling students, which reduces the dropout rates, which, in particular, is still strong in developing countries..

Table 2 AI Summary of Reported Benefits vs. Challenges of AI Adoption in Higher Education

Category	Aspect	Numerical Impact
Benefits	Improved student outcomes	+35%
	Reduced dropout rates	–25%
	Reduced teacher workload	–30%
	Higher retention/graduation rates	+18%

Challenges	Weak infrastructure	40% institutions affected
	Lack of teacher training	50% institutions affected
	Privacy and bias concerns	60% stakeholders concerned

Although artificial intelligence (AI) has obvious benefits in the sphere of higher education, it should be systematically reviewed and the challenges also touched upon. About forty percent of the universities used in the surveys mentioned complain of inadequate infrastructure. Such a disparity does not allow utilizing sophisticated AI applications that demand high-performance computing and access to trusted internet connectivity. Similarly, fifty percent of the interviewed instructional staff have not mastered the ability to use AI programs, which reduces the potential effectiveness of the technology. (Negri, 2023; Yuen & Schlote, 2024) . Teachers can also develop resistance to the use of AI due to a belief that it will reduce their role; however, AI is not meant to replace their functions but is supposed to provide them with an extra boost (Shwedeh et al., 2024; Sova et al., 2024). Ethical issues are even more acute as sixty per cent of stakeholder's express concerns related to privacy and algorithmic biasness. Such issues undermine trust, especially in those situations when the law of data protection is inadequate (Sharma et al., 2024; Yiling et al., 2025) . A clear dichotomy between the developed and the developing nations is further outlined in the discussion. Organizations located in developed economies have better funding and infrastructural options, which provide them with the opportunity to scale AI experimentation. Conversely, in the developing countries, universities are faced with limitations in terms of finances, staff development and computer resources. A typical case in point shows that although universities in the United States and Europe are starting to implement AI chatbots in student-advising systems, many institutions in South Asia still do not have sufficient internet connectivity. This gap indicates that digital inequity is a major hindrance to fair use of AI (UNESCO, 2023). Besides, the manuscript stresses the necessity that the implementation of AI should be reconciled with pedagogical ideologies. The overall aim of higher education is not just the delivery of content but the development of critical thinking, creativity and moral reasoning. (Crompton & Burke, 2023; Mohd Rahim et al., 2022; Sova et al., 2024).

Conclusion and Recommendations

This study suggests that artificial intelligence (AI) possesses immense potential to higher education by delivering individualized, effective, and encompassing learning opportunities. Adaptive learning tools, real-time feedback systems and constant support systems have been documented to both bring benefits to learners and at the same time relieve pedagogical strains on teachers. Beyond that, these technologies provide more insightful information about curriculum design and assessment practices based on data analytics. Predictive analytics are also useful in helping the institutions to reduce the rate of students dropping out and increase the quality of education. At the same time, that should not overshadow the salient difficulties, such as data privacy, algorithm bias, and digital illiteracy, which remain significant obstacles in developing countries, where infrastructure and resource shortages are the order of the day. These conclusions highlight the fact that no matter how powerful the artificial intelligence tool is, it will not be able to replace human educators; instead, AI must be introduced as a supporting mechanism that will complement the process of instruction delivery and learning.

Using these results, the study suggests that higher-education institutions and policymakers use AI responsibly by creating solid ethical standards and establishing extensive data-protection procedures. Further investments must be focused on training faculty and learners to become digital by providing additional training and developing critical thinking towards the use of AI

systems. Developing countries require targeted financial and infrastructural assistance especially to reduce inequality in the implementation of AI. Governments, universities, and technology providers urgently need to work together to make sure that AI expands the prospects of education, instead of eliminating them. With the right balance between innovation and accountability, AI could be used as a long-term facilitator of quality higher education that is inclusive and sustainable.

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