Babylonian Journal of Artificial Intelligence
Vol. **(2023)**, 2023, **pp**. 83–90
DOI: https://doi.org/10.58496/BJAI/2023/012 ISSN: 3006-5437
https://mesopotamian.press/journals/index.php/BJAI

Research Article

Role of Artificial Intelligence (AI) in Improving Educational Quality for Students and Faculty

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ARTICLE INFO

Article History
Received 16 Sep 2023
Accepted 19 Nov 2023
Published 08 Dec 2023

Keywords
AI
Personalized Learning
Educational Quality
Student Performance
Faculty Efficiency
Real-time Feedback
Adaptive Learning Environment

ABSTRACT

AI in education is the new groundbreaking innovation that seeks to improve efficiency of addressing students, faculty and university administration needs, in delivering high quality of educational services. In order to reveal the impact of application of AI on the educational outcomes of Al-Mustansiriyah University, Baghdad, Iraq has to be examined. Quantitative case study research was conducted collecting data from students, faculty, and university administration officials across the study programs and added information from the faculty members. The study objectives will seek to establish the effectiveness of AI in improving the student performance, faculty productivity and quality of education. AI has made learning more personalized and interactive, timely feedback, real time teaching and learning adjustments enabling all makes learning enjoyable, fun and inclusive. Further, the study assesses the generally recommended approaches for integrating AI technology, existing concerns and risks, and associated ethical issues. In this study, the authors fully explain the features and benefits that AI provides for learners, educators, and administrative staff by showing how the technology can modify and improve the educational process to increase its efficiency and usefulness to students, teachers, and those who manage universities.

1. INTRODUCTION

Education is one of the areas that has seen substantial modifications globally due to technology breakthroughs driven by Artificial Intelligence. The role of AI in education is diverse, encompassing technology and tactics employed in both student instruction and administrative functions. This study seeks to examine the practical and theoretical dimensions of AI in education, emphasizing its advantages and problems.In the present century, technological growth has permeated nearly all aspects of human existence, including education. Modern educational procedures are enhanced and altered by new technologies, with artificial intelligence being a prominent example. Integrating AI into education transcends mere task automation; the objective is to establish a highly adaptable and interactive learning environment [1].

AI in education is a broad domain that incorporates diverse technologies and methodologies used to enhance learning resources and administrative systems. Artificial intelligence provides several advantages to address enduring challenges impacting the efficacy of the education sector, such as individualized learning and workplace automation[2]. Intelligent agents customize education to the specific requirements, preferences, attributes, experiences, and knowledge of the student, educator, and university administration by modifying educational content accordingly. This adaptable strategy aids in pinpointing areas in education that necessitate specific attention and involves students, professors, and university administrators. Promising artificial intelligence tools that improve learning and teaching indicate that student performance data enables platforms to create lessons and practice sessions tailored to individual strengths and weaknesses[3].

AI assists in reallocating certain administrative tasks from school administrators, allowing instructors to focus more on instruction. Facilitating tools, such an automated grading system and an AI-recommended schedule, alleviate the workload of grade correction and enhance the efficacy of educational endeavors [4]. Figure 1 illustrates the diverse applications of AI in education.

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Fig. 1. Applications of AI in education.

This study aims to provide a thorough overview of AI in education by examining both practical applications and theoretical frameworks. The aim is to highlight the benefits and challenges associated with the use of AI in educational settings. The paper seeks to demonstrate how AI might enhance educational quality for students and instructors through the analysis of case studies and recent advancements.

1.1. Research Objectives and Purposes

The general purpose of this study is to investigate the applicability of AI in improving educational quality ,with a focus on the students, professors and university executives in the engineering sector. It is in this context that the present work seeks to contribute insights that are useful not only to the engineering education community but for all educational environments and advanced technology systems.

AI's impact on engineering education includes personalizing learning experiences, enhancing student engagement and academic performance, streamlining administrative tasks, allowing personalized interactions, and tailoring instructional strategies. It also reviews current AI applications in educational settings and discusses potential challenges and ethical considerations with AI use in education.

1.2. Research Questions

1. How does AI impact student learning outcomes in engineering education?
2. What ways does AI integration enhance faculty efficiency and instructional effectiveness?
3. What are the best practices for implementing AI in engineering education?
4. What are the potential challenges and ethical considerations associated with AI in education?
5. How do students, faculty, and university administrators perceive the use of AI in their educational environment?

6. Can AI provide early identification and intervention for students, faculty, and university administrators at risk of academic difficulties?
7. How does the use of AI in education influence overall educational quality and outcomes?
8. How does AI support collaborative learning and peer interaction in educational settings?
9. What role does AI play in enhancing remote and online learning environments?
10. How can AI-driven insights be used to personalize faculty professional development?
11. How does AI influence the design and delivery of curriculum content in engineering education?
12. What are the long-term impacts of AI on educational equity and access?
13. How does AI affect student motivation and self-regulated learning?
14. In what ways can AI improve the assessment and evaluation process in education?

2. LITERATURE REVIEW

2.1. Benefits of AI in Education

The results pointed out that the use of AI has the potential of enhancing the delivery of educational material by individual students. The adaptive learning platforms employ artificial intelligence to capture and parse student performance data in real-time learning. When used in this way, this approach increases engagement from students and the quality of learning achieved. Some of the more sophisticated approaches to adaptive learning include DreamBox and Knewton – systems that tailor their content by altering the level of the tasks offered and recommending materials based on the student's performance [1]. For instance, the DreamBox, the computer-adaptive math program described in this article, employed an AI to study problem-solving techniques and experienced tremendous learning progress in this area[2]

The latter suggests that use of AI can increase organizational effectiveness in the educational systems by providing options for automating various procedures and procedures. Some examples of such applications include the Gradescope that automatically grades students' works, relays the results and offers an opportunity to make a fair evaluation quickly[5]. It is also important to mention that PowerSchool also implements artificial intelligence for scheduling, performance controlling, and for the early sign of vulnerable student markers. In general, the application of AI leads to improving administration and optimising workflows in educational contexts[6].AI makes learning easy and enhances availability of quality teaching resources because the technologies make learning cheap and readily available irrespective of the region. This is important in integrating diversity as these students from different regions is benefited from taking AI driven platforms where the programs offered are personalized to suit the needs of the students from any remote or Zonal area.[2].
AI systems provide immediate feedback and constant evaluation and that will help the students to realize what is good for them and what is not. This dynamic learning process enables students to adapt their study mechanisms in relation to results obtained. For example virtual tutors such as IBM Watson Tutor offers students individualized help, enhances the student's comprehension of tough topics[7].

The use of Artificial Intelligence is taking new dimensions in techniques related with teaching methodology by offering individual help and online exercises. Applications such as IBM Watson Tutor provide recommendation to support understanding of specific topics among the learners[7]. AI like in Duolingo also help to improve performance and overall student engagement through chatbot interactions offering feedback on practice sessions as soon as the learner does them[8]. These teaching models are helping to revolutionalise the conventional teaching environment in the classroom. The figure 2 is self explainatory showing the benefits of AI in the field of education.

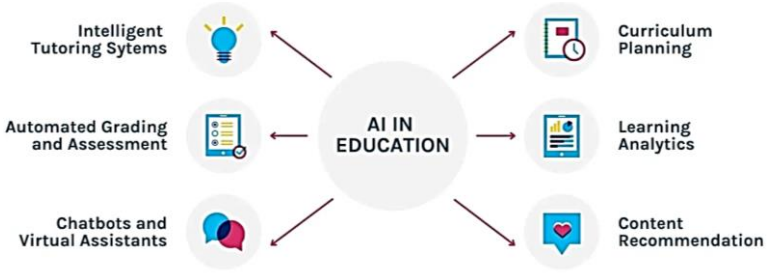

Fig. 2. Benefits of AI in Education.

Table 1 presents a comprehensive summary of the primary advantages of AI in education, and provides a review of how AI improves individualized learning, administrative efficiency, accessibility, continuous assessment, and new teaching methods.

TABLE I. SUMMARY OF BENEFITS OF AI IN EDUCATION.

Benefit	Description	Example	Reference
Personalized Learning	Tailoring educational content to meet individual student needs through real-time data analysis.	DreamBox, Knewton	[1]
Administrative Efficiency	Automating routine tasks to allow educators to focus more on teaching and interaction.	Gradescope, PowerSchool	[5][6]
Accessibility	Providing access to high-quality educational resources irrespective of economic or geographic barriers.	AI-driven educational platforms	[2]
Continuous Assessment and Feedback	Offering real-time feedback and continuous assessment to help students identify areas for improvement.	IBM Watson Tutor	Khan, 2018
Innovative Teaching Methods	Enhancing learning experiences through virtual tutors and chatbots.	IBM Watson Tutor, Duolingo	[7][8]

2.2. Challenges and Ethical Considerations of AI in Education

The use of intelligent technologies in learning has a number of advantages but also poses various problems and questions that should be answered to contribute to optimal use of AI. Such issues include data protection issues, issues of data bias, issues related to overreliance on the new technology, objectification of education and ethical usage of the AI systems respectively. Solving these considerations is critical for achieving enhanced incarnate, positive consequences of artificial intellect while lessening its negative output or cache. Table 2 explains each of them.

TABLE II. SUMMARY OF CHALLENGES AND ETHICAL CONSIDERATIONS OF AI IN EDUCATION.

Challenge	Description	Mitigation Strategy	Reference
Data Privacy	Risks of unauthorized access, data breaches, and misuse of personal information.	Implement robust data protection measures and comply with regulations (e.g., GDPR).	[9]
Algorithmic Bias	AI models may perpetuate biases present in training data, leading to unfair treatment of students.	Develop transparent AI systems and use bias detection algorithms.	[1]
Technological Dependency	Over-reliance on AI tools can erode critical thinking and interpersonal skills among students and educators.	Maintain a balance between AI-driven and traditional teaching methods.	[10]
Depersonalization of Education	The educational process may become too mechanized, affecting emotional and social development.	Ensure AI tools enhance rather than replace human interactions.	[11]
Ethical Use of AI	Ensuring AI applications respect students' rights and promote fairness and equity.	Establish ethical guidelines and continuously monitor AI systems.	[9]

2.3. Basic concepts about AI and Machine Learning

AI and Machine Learning are two fundamental tools without which modern technology cannot be built. Artificial Intelligence is a concept which means a machine or computer can mimic human behavior, abilities or actions that if carried out by a human, is considered intelligent[12]. This concept covers designing algorithms that make it possible for a computer to perform tasks that normally require the human intellect including natural language processing, decision making, and pattern recognition. Machine Learning being a sub field of Artificial Intelligence studies how to make the computer learn from the available data from the environment in one way or the other without any specific programming. Hearing and vision impaired patients are good candidates for computers as they are able to recognize patterns and make decision-making functions on the basis of the data received[13].

Categories of machine learning are first supervised learning, and then there is unsupervised learning, the last is reinforcement learning. Purity of the ideas of AI and machine learning has enabled a number of promising and innovative features that transform such spheres as car driving, virtual helpers, etc., influencing the further evolution of our relations with technologies and the entire world. The opportunity for enhancing man’s existence and accomplishing great objectives in various spheres as this information and modern technologies progress in this area are unlimited.

AI also still consists of, for example, natural language processing, facial recognition, computer vision as well as knowledge modelling concepts. Computational language processing enables computers to autocognize, analyze, and comprise human language. This makes information search, translation from one language to another, and natural interactions between human and machines. With facial recognition, computers are able to capture and examine objects, pattern, or features on the images

or videos being relayed to it; they useful in security, facial identification, and even object recognition in self-driving vehicles.

Knowledge modelling entails use of forms that could be understood and transformed by computers into models of knowledge and concepts for instance in form of ontologies or knowledge bases. Thus, we can extend the definitions of AI and expand the range of more complex and advanced technological applications such as big data and cloud computing in various fields ranging from health, finance, energy and the environment.

3. METHODOLOGY RESEARCH

This research paper pursues a qualitative research design to assess the boat that has been launched to enhance the quality of education for the students, the academics, and other university executives through Artificial Intelligence (AI). The study is a case-study design which provides further insight to how the use of AI is incorporated in the process of delivering student learning. Using a qualitative research approach was preferred because its goal is to give detailed and rich context on various issues. Such a design of the case study is suitable for this research because it enables one to focus on the implementation of AI peculiarities within a particular context of an educational institution. This design enables the examination of multiple aspects of how AI is integrated into educational processes and learners, as well as instructors. Figure 3 flowchart outlines the general plan of research methodology starting with identifying the method of research as being a qualitative one, moving to the conduct of interviews as well as observation and finally the analysis of the data.

Fig. 3. Research Methodology: Implementation of AI in Education.

3.1. Study Setting and Participants

The research was carried out in Al-Mustansiriyah University the largest and most developed university in Bagdad, Iraq with the most progressive educational techniques. Wikipedia defines the research population as being composed of students, faculty, and other university personnel registered at the university. A purposive sampling approach was used due to the need to adopt a diverse and inclusive sampling of 50 students, faculty, and university administrators I selected based on their active participation in learning with AI assistance, across the different study programs and at different levels of study. The purposive sample consists of students, faculties & university administrators with varying academic fields & experience using AI: thus, providing an inclusive representation & unique perception of AI on education. Therefore, a qualitative approach is particularly well-suited for this study due to the following reasons:

1. Depth of Understanding: This makes qualitative research useful, as students and teachers' experiences of integration of AI in education include engaging processes which may be missed by quantitative ways of research.
2. Contextual Insights: The use of case study approach is effective in allowing the exploration and analysis of the specific context of Al-Mustansiriyah University, which give rich understanding about the general concern of AI adoption.
3. Flexibility: Since, semi-structured interviews and participatory observation are quite flexible, researchers can easily follow the new topics and areas which have not been expected in the beginning of the investigation.

Using a qualitative case study research design, this study therefore seeks to fill the gap by offering a rich account of the possibilities of AI towards the improvement of educational quality provision and consequently inform members of the engineering education community and other stakeholders.

3.2. Data Collection Methods

The selected primary research tools are face-to-face interviews and participant observation because they are most suitable when seeking unique and detailed qualitative information.

3.2.1. AI in Education: In-depth Interviews

a. Pre and post focus group data collected through semi structured interviews from students, lecturers and administrator.

b. Intended to capture realization, perception and evaluation of the effectiveness of AI tools.

c. Interviews served to address the usage, advantages, disadvantages and effect of AI tools on learning experience of the students.

d. interviews concerned the implementation of AI with faculty and administrators, and students' perceptions of AI, student performance, and institutional gains and losses.

3.2.2. AI Application in Education: Participatory Observations

a. Evaluation of actual experiences of utilization of AI to support learning in normal class settings.

b. Gives an account of Artificial Intelligence technologies' impact and issues from the side of direct users.

c. Defines interactions that happen in the classroom with or without AI support, the use of AI in assignments and management affairs.

d. Includes the incorporation of AI tools in teaching-delivery and students.

e. Analyzes how artificial intelligence is employed in facets such as grading, timetable generation, and student achievement surveilance.

The data collection process involved selecting 50 students, faculty, and university administrators from various AI study programs through purposive sampling. A structured interview guide was developed for consistency and depth of data, including open-ended questions and follow-up probes. An observation schedule was created for different times and contexts of AI usage in education. Primary data collection was conducted over a specified period, documented with consent.

3.3. Data Analysis

Responses from the interviews and notes from the participant observations were analyzed through emergent thematic analysis. This method was about coding data with the aim of categorising data and finding out patterns, themes and trends on how AI could enhance the quality of student learning processes. Qualitative data analysis of the research questions was

made a lot easier with the help of the thematic analysis as it provides structure and a way to derive conclusions on the impact of AI on the quality of education here at Al- Study.

a. Coding and Categorization: Identified significant themes and categories, organized into broader themes.

b. Pattern Identification: Identified patterns and trends through iterative analysis.

c. Thematic Synthesis: Provided insights into AI's impact on student engagement, learning outcomes, and faculty experiences.

4. CONCLUSION

This paper discusses how the integration of Artificial Intelligence (AI) can revolutionise quality education in a positive way for students, instructors, and university executives. Al-Mustansiriyah University affiliated the given research by carrying out a quantitative case study in in order to show to prove that the use of AI technologies bring forth positive impacts to students' performances, to the productivity of faculties, and to the educational quality. AI makes education more engaging, efficient, and inclusive through individual approach, interaction and feedback, and timely feedback during the learning-teaching process, as well as during learning-teaching process adjustments. Furthermore, the studyildiği shows the significance of a proper approach to integrating AI to prevent and overcome the problems like ethical question, data protection, and other technological issues. There are advantages that are inherent with AI such as the accomplishment of clerical activities, effective utilisation of faculty time, and the focused delivery of learning contents that cater to the needs of different learners than enables the establishment of AI in learning settings alongside strategic planning and ethical considerations. This study gives useful recommendations to the educators, school administrators and policy makers, who are interested in implementing AI into educational systems. When integrated effectively, AI plays an important role in changing and improving teaching and learning practices, promote innovation, and hoping to meet the learning needs of the academy in the ever advancing society. However, a mixture approach that taking into account of equity, transparency and ethical practices must be adopted to ensure that the ability of AI in education will unleash fully. Subsequent research may look into a more comprehensive intelligence of AI in other fields and create comprehensive models for large-scale AI integration for different eras of education.

Funding

The authors did not receive support from any organization for the submitted work.

Conflicts of Interest

To their knowledge, the manuscript's authors, "A Novel Integrated Learning Paradigm for Superior Predictive Modeling in Ecological Data Analysis, "declare no conflict of interest in the present work.

Data Availability Statement

All the data are collected from the survey form.

Acknowledgment

The author extends gratitude to the institution for fostering a collaborative atmosphere that enhanced the quality of this research.

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