The Effectiveness of Artificial Intelligence Technology in Achieving Quality Education for University Students in Jordan

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***Abstract*—The growing integration of Artificial Intelligence (AI) in higher education offers new opportunities to enhance teaching quality and personalize learning. This study examines the effectiveness of AI technologies in promoting quality education among university students in Jordan, where institutions face challenges of overcrowding and limited resources. Using a quantitative design, data were collected from 1,477 undergraduate students at the University of Jordan and Al-Zaytoonah University through a structured survey. Descriptive statistics and one-way ANOVA were employed to assess students' satisfaction with AI tools and differences across gender, age, academic year, and faculty. Results indicated high satisfaction levels, particularly regarding access to information and personalized learning, with significant variations among faculties favoring scientific disciplines. However, concerns emerged about insufficient training, reduced critical thinking, and data privacy. The study contributes to the literature by providing empirical evidence on AI's role in enhancing educational quality in developing contexts and highlights the need for responsible, discipline-specific AI integration strategies in higher education.**

***Keywords*—artificial intelligence, quality education, higher education, technology enhanced learning, Artificial Intelligence (AI) in quality education**

I. Introduction

The rapid advancements in Artificial Intelligence (AI) have revolutionized various sectors, including higher education. AI-powered solutions offer innovative approaches to teaching, learning, and student support [1, 2]. In Jordan, where the higher education system faces challenges such as limited resources, overcrowded classrooms, and the need to improve educational quality, AI integration presents a promising solution to enhance the overall student experience.

Higher education institutions in the 21st century are adapting their programs to keep pace with global changes, including the scientific and technological revolution. Many have introduced AI technologies to fulfill their educational missions. The Jordanian higher education system has taken tangible steps to improve education quality [3–5].

AI technology can address challenges in higher education, such as resource limitations and overcrowding, while aligning educational outcomes with labor market demands [6, 7].

AI has the potential to innovate teaching and learning practices and accelerate progress toward Sustainable Development Goal (SDG) 4. However, rapid technological advancements also bring risks and challenges. UNESCO supports member states in harnessing AI's potential for the Education 2030 Agenda, ensuring its application is guided by principles of inclusion and equity [8].

AI can revolutionize education through personalized learning, adaptive curricula, intelligent tutoring systems, and virtual learning environments [9]. It can adapt to individual student needs, preferences, and learning styles, providing personalized content, feedback, and assessments [10]. This approach has been shown to improve engagement, motivation, and academic performance [11, 12].

Additionally, AI facilitates collaboration and communication among students, fostering critical thinking and problem-solving skills. Tools like virtual tutors and collaborative platforms enhance peer-to-peer learning and knowledge exchange [1, 3].

AI's ability to analyze problems, provide accurate information, and streamline decision-making can significantly improve student achievement, a key indicator of university performance [10]. In Jordan, AI serves as a powerful tool for advancing education by offering personalized learning and performance analysis solutions. Over 26 Jordanian universities now offer AI-related courses at undergraduate and postgraduate levels, preparing students for the digital age. According to the International Monetary Fund (IMF), Jordan ranks 55th out of 193 nations in the Government AI Readiness Index 2023, up from 80th in 2021.

Several studies in Jordan have explored AI's potential to address educational challenges. Alqudah *et al.* [6] examined AI-powered chatbots and virtual assistants for student support, while Al-Hwayan [13] studied adaptive learning systems' impact on student performance and dropout rates.

Despite its benefits, AI implementation in higher education faces challenges, including infrastructure requirements, faculty training, and ethical considerations [9]. These must be addressed to ensure successful integration. AI tools should complement, not replace, human creativity and critical thinking, and educational programs should emphasize these skills alongside AI technologies [14, 15].

This study examines the use of AI techniques in higher education from the perspective of Jordanian university students, addressing the following questions:

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1) How can AI tools contribute to achieving quality learning from the students' perspective?
2) What are the main challenges in using AI tools for quality learning?
3) What policies and ethical principles should guide AI use in education?

The novelty of this study lies in its empirical focus on Jordanian higher education, a context that has received limited attention in AI-and-education literature. Unlike prior global or regional reviews, our research applies a large-scale quantitative survey (1,477 undergraduate students) to capture student satisfaction and perceived challenges across faculties. This approach not only highlights local cultural and infrastructural factors but also identifies discipline-specific differences (scientific vs. medical vs. humanities), which have rarely been systematically compared.

AI is essential for fostering development, innovation, and achieving the United Nations' SDGs, particularly in education. As a pillar of the Fourth Industrial Revolution, AI integration is a necessity for sustainable development. This study contributes to understanding AI's application in higher education and provides insights for developing effective strategies in Jordan.

Building on this context, the study further explores students' satisfaction with AI tools, whether satisfaction varies across demographic and academic variables (gender, age, faculty, academic year), and the challenges students face when using AI tools.

II. Literature Review

The integration of Artificial Intelligence (AI) technology in higher education has been extensively studied in recent years, with researchers exploring its transformative potential, practical applications, and associated challenges. This section synthesizes key findings from the literature, focusing on AI's role in enhancing personalized learning, improving student outcomes, facilitating collaboration, and addressing implementation barriers in higher education.

A. AI and Personalized Learning

One of the most significant contributions of AI in education is its ability to deliver personalized learning experiences. AI-powered adaptive learning systems analyze student performance in real time, tailoring content to individual needs, preferences, and learning styles [16]. Atieh *et al.* [17] found that AI-driven platforms provide customized feedback and assessments, leading to increased student engagement and motivation. Similarly, Luan *et al.* [10] demonstrated that AI-based tools adjust instructional materials dynamically, ensuring that students receive support precisely when needed. Studies by Kanan *et al.* [11] and Kim [12] further confirms that personalized AI interventions correlate with improved academic performance, particularly in STEM disciplines.

Beyond individualized instruction, AI fosters collaborative learning environments. Virtual tutors and intelligent agents facilitate peer-to-peer interactions, enabling students to exchange ideas and solve problems collectively [1, 3]. Crompton and Burke [9] highlight AI's role in developing critical thinking skills by simulating real-world scenarios where students must analyze data, evaluate solutions, and make evidence-based decisions. Atieh *et al.* [17] observed that AI-powered discussion forums and chatbots encourage active participation, particularly among students who may hesitate to engage in traditional classroom settings.

Several studies have examined AI's direct impact on learning outcomes. Research by Atieh *et al.* [17] in Palestinian universities found that AI-enhanced teaching methods significantly improved academic achievement. In Jordan, Al- Muqeeti *et al.* [18] reported that adaptive learning systems reduced dropout rates by identifying at-risk students early and providing targeted interventions. Comparable findings were noted in Saudi Arabia, where Alshahrani [19] linked AI-based tutoring to higher exam scores and course completion rates. These studies collectively suggest that AI can bridge gaps in educational equity by offering scalable support to diverse student populations.

Despite its benefits, AI adoption in higher education faces several obstacles. Infrastructure limitations, such as inadequate technological resources and internet access, hinder widespread implementation, particularly in developing regions [20, 21]. Faculty resistance and a lack of training further complicate integration, as educators may struggle to adapt to AI-driven pedagogies [9]. Ethical concerns, including data privacy, algorithmic bias, and the potential for AI to replace human instructors, remain contentious [14, 15].

Özer [22] conducted a SWOT analysis of generative AI tools like ChatGPT, revealing trade-offs between efficiency gains and risks such as academic dishonesty. Similarly, Popenici *et al.* [23] cautioned against over-reliance on AI, arguing that it should augment—not replace—human judgment in education.

Tiwari's [24] systematic review of AI in education identified key trends, including the growing use of machine learning for predictive analytics and automated grading. However, the study also noted disparities in institutional readiness, with wealthier universities more likely to adopt advanced AI tools. Xu and Ouyang [25] focused on AI-powered virtual tutors in STEM education, demonstrating their effectiveness in small-scale trials but underscoring the need for broader, long-term studies.

In the Jordanian context, Alqudah *et al.* [6] explored AI chatbots for student support, while Al-Hwayan [13] evaluated adaptive learning systems. Both studies emphasized AI's potential to address local challenges, such as overcrowded classrooms and uneven resource distribution.

Ka'bi [26] examined the growing influence of artificial intelligence in higher education, particularly its capacity to transform teaching and learning practices. It focuses on how AI can enhance student engagement, improve efficiency, and enrich the overall learning experience. The authors introduce a novel model designed to strengthen students' cognitive abilities and compare its performance against existing algorithms, demonstrating superior outcomes and highlighting its innovative contribution. In addition, the paper addresses critical challenges such as algorithmic fairness and data privacy, thereby contributing to the ongoing debate on the ethical use of AI in education.

While prior studies have provided valuable insights into AI's potential in higher education [13, 17, 24], most have focused on specific tools, limited samples, or technologically

advanced contexts. Few have critically compared outcomes across academic disciplines or examined how contextual factors in developing countries (such as resource constraints and institutional readiness) shape students' perceptions and satisfaction [6, 22]. The present study addresses these gaps by providing empirical evidence from Jordanian universities, comparing variations among faculties, and analyzing both the benefits and perceived risks of AI integration. By linking global trends with local realities, it contributes a nuanced understanding of how AI can be implemented responsibly to enhance educational quality in resource-limited environments [18, 23].

III. Materials and Methods

This study employed a quantitative research design using a large-scale survey administered during the spring semester of the 2023/2024 academic year. The initial survey was distributed to 2,611 undergraduate students from the University of Jordan and Al-Zaytoonah University of Jordan. After excluding 1,134 students who reported not using AI technologies, the final analytical sample consisted of 1,477 students.

The purpose of the study was to explore how AI tools are utilized within higher education and to generate insights that support innovation and technological advancement. The survey instrument was structured into two main sections: the first gathered demographic information (Table 1), and the second measured students' satisfaction with AI tools and their perceived benefits and challenges (Table 2). The findings aim to inform educators, administrators, and policymakers on how AI can be effectively integrated into existing educational frameworks.

Table 1. Sample demographics

		Frequency	Percent
Gender	Female	954	65%
	Male	523	35%
	Total	1477	100%
Age	18-24	1402	95%
	>=25	75	5%
	Total	1477	100%
Faculty	Medical	383	26%
	Scientific	559	38%
	Humanities	535	36%
	Total	1477	100%
Academic Year	First Year	865	59%
	Second Year	497	34%
	Third Year	63	4%
	Fourth Year	52	4%
	Total	1477	100%

Table 2. Mean, standard deviation, and category of satisfaction level item

Number	Item	Mean	Std. Deviation	Category
S1	AI tools facilitate access to information in learning.	4.0433	0.9860	S
S2	AI tools contribute to providing a personalized educational experience that meets my learning needs.	3.9377	0.9493	S
S3	AI tools contribute to making education more comprehensive and diverse	3.9255	0.9231	S
S4	AI tools are effective in helping me to learn and improve my language skills.	3.8334	0.9395	S
S5	The using of AI has increased my motivation to actively participate in the educational process	3.7569	0.9972	S
S6	Using AI techniques in education are equitably available to all students	3.5741	1.0723	M

The sample comprised 954 female students (65%) and 523 male students (35%). The majority of participants (95%) were aged 18–24, with the remaining 5% aged 25 or older. The distribution across academic years was as follows: 59% first-year students, 34% second-year students, and 4% each for third- and fourth-year students. Faculty representation included 26% from medical fields, 38% from scientific disciplines, and 36% from humanities.

A 5-point Likert scale was used, ranging from "Strongly Agree" (5) to "Strongly Disagree" (1). The data were analyzed using SPSS version 21.

A. Reliability

The research instruments are filled out employing a structured questionnaire, with discussion and experts' appraisal, and content analysis. Construct validity was supported by aligning the measurement items with established scales used in previous studies. Internal consistency was evaluated using Cronbach's alpha coefficient [27]. The results, presented in Table 3, indicate acceptable reliability for research purposes [28–30].

Table 3. Study tools

Item	Cronbach Alpha
Satisfaction	0.831
Challenges	0.858
Policy	0.903

B. Statistical Equation

Satisfaction levels were classified using the following equation [31, 32].

$$\frac{(\text{upper limit of scale} - \text{lower limit of scale})}{\text{number of required categories}} = \frac{(5-1)}{3} = 1.33$$

The Satisfaction levels were classified as follows:
Weak (W): 1–2.33.
Medium (M): 2.34–3.67.
Strong (S): 3.68–5.

IV. Study Results and Analysis

In response to the first research question, "What does the extent of implementation of AI technology in Jordanian universities enhance students' academic performance and learning outcomes?", the authors conducted an in-depth analysis, calculating both the mean and standard deviation of the items designed for this purpose, as presented in Table 2. The overall mean satisfaction of students with regard to AI tools was approximately 3.85. This score reflects a strong level of satisfaction among students toward AI tools. Notably, the highest mean score, at 4.04, corresponded to the item stating that "AI tools facilitate access to information in learning". This indicates students' awareness of modern

technology, their interest in it, and their keenness to benefit from it in the field of learning. Following that, the item indicating "AI tools contribute to providing a personalized educational experience that meets my learning needs", with a mean score of 3.94.

To address the second research question, which explores whether the level of satisfaction among students at The University of Jordan and Al-Zaytoonah University of Jordan differs based on various independent variables such as gender, age, academic year, and faculty. The results, as presented in Table 4, display the mean and standard deviation scores reflecting the satisfaction levels of students within each of these independent variables. Upon closer examination, the authors identified significant differences in the mean satisfaction levels among students based on these independent variables. To explore these differences in more detail, a one-way ANOVA test was employed, and the outcomes are summarized in Table 4. The research concerned some variables in two groups and in others, in more than two groups. For the purpose of methodological consistency and allowance for flexibility regarding the possible extensions of the analysis, rather than a mixture of t-tests and ANOVA, ANOVA was systematically applied for all comparisons. A predefined level of significance, or alpha, set at 0.05, was used as the threshold to evaluate the statistical significance of these differences.

Table 4. One-way ANOVA: Gender, age, academic year, and faculty

		Sum of Squares	df	Mean Square	F	Sig.
Gender	Between Groups	0.106	1	0.106	0.188	0.665
	Within Groups	828.770	1475	0.562		
	Total	828.876	1476			
Age	Between Groups	0.013	1	0.013	0.022	0.881
	Within Groups	828.863	1475	0.562		
	Total	828.876	1476			
Academic Year	Between Groups	0.402	3	0.134	0.238	0.870
	Within Groups	828.474	1473	0.562		
	Total	828.876	1476			
Faculty	Between Groups	6.717	2	3.358	6.021	0.002
	Within Groups	822.159	1474	0.558		
	Total	828.876	1476			

Table 5. Faculty post hoc test

(I) faculty	(J) faculty	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Medical	Scientific	−0.11050*	0.04954	0.026	−0.2077	−0.0133
	Humanities	0.04190	0.04999	0.402	−0.0562	0.1400
Scientific	Medical	0.11050*	0.04954	0.026	0.0133	0.2077
	Humanities	0.15240*	0.04517	0.001	0.0638	0.2410
Humanities	Medical	−0.04190	0.04999	0.402	−0.1400	0.0562
	Scientific	−0.15240*	0.04517	0.001	−0.2410	−0.0638

*. The mean difference is significant at the 0.05 level.

Table 6. Mean, standard Deviation of challenges of using AI tools

Number	Item	Mean	Std. Deviation
C1	I need more training to successfully integrate AI tools into education	3.6242	0.99267
C2	I fear that relying on AI in education will reduce my critical and creative thinking	3.6195	1.07766
C3	I need more technical support to successfully integrate AI tools into education	3.5884	0.99311
C4	The using of AI tools may reduce social interaction between students.	3.5633	1.04224
C5	I am concerned about the privacy of my data when using AI tools in education.	3.4766	1.06319
C6	I feel that the quality of education and the accuracy of the content may be negatively affected due to reliance on AI.	3.4557	1.07078

The results, as shown in Table 4, reveal that gender, age, and the academic year did not exert a statistically significant influence on students' satisfaction levels (sig >0.05). However, in contrast, faculty was found to have a significant impact on students' satisfaction levels (sig <0.05). To delve deeper into these variations, a post hoc test was subsequently conducted and, its outcomes are presented in Table 5.

Post Hoc Test presented in Table 5 reveals statistically significant differences the scientific faculties.

Regarding the third research question "What are the challenges of AI tools from Students' Perspective?". The results are shown in Table 6. The students have many concerns, where the highest concern related to the training of AI tools in education (3.6242), followed directly by worry that if AI tools handle tasks traditionally requiring analytical or creative input, students may become overly reliant on automated solutions, potentially stifling their ability to think critically, explore diverse perspectives, and generate original ideas (3.6195).

In summary, these findings demonstrate that while students generally show high satisfaction with AI tools, their perceptions vary across academic disciplines. Scientific faculties report stronger acceptance and benefits, possibly due to greater exposure to digital and data-driven learning environments. In contrast, students in the humanities and medical fields express more concerns related to limited training and overreliance on automation. These differences highlight the need to tailor AI integration strategies according to faculty needs and readiness. Furthermore, future analyses could explore predictive relationships (such as how training level, faculty type, or prior digital experience predict satisfaction or learning outcomes) using regression or interaction models. Such analyses would deepen understanding of how contextual and individual factors

jointly shape students' experiences with AI in higher education.

V. Discussion

The scope of this study centers on students' engagement with AI-powered applications rather than on the technical design of new models. The findings of this study shed light on critical aspects of AI integration in higher education, particularly within Jordanian universities. By examining student satisfaction levels, faculty-specific disparities, and perceived challenges, this research contributes to ongoing discussions about the role of AI in modern pedagogy. Below, we explore these dimensions in greater depth, aligning our results with existing literature and proposing practical implications.

A. Demographic Neutrality in Satisfaction

Contrary to initial expectations, demographic variables such as gender, age, and academic year did not significantly influence students' satisfaction with AI tools. This finding aligns with recent studies, e.g., [12, 17, 18], which suggest that technological proficiency and accessibility often transcend traditional demographic divides. For instance:

Gender Neutrality: The near-equal satisfaction levels between male and female students (Table 4) may reflect broader societal shifts toward digital inclusivity, where technology adoption is less constrained by gender norms.

Age and Academic Year: The homogeneity in responses across age groups and academic years could indicate that AI tools are equally intuitive for both younger, digitally native students and older learners who may have adapted to technology through necessity.

In addition, this demographic neutrality raises important ethical considerations related to equity and inclusion. It suggests that when properly designed, AI systems can support fairness across diverse learner groups, but they can also unintentionally reinforce bias if underlying algorithms are not audited for fairness or if access to technology remains unequal [1, 8, 9].

Therefore, universities should not only ensure usability for all students but also develop ethical review mechanisms to monitor potential bias, accessibility gaps, and algorithmic discrimination.

Implication: Universities should prioritize universal design principles when implementing AI tools, ensuring interfaces and functionalities cater to all users regardless of background, while simultaneously embedding ethical auditing processes to guarantee fairness and inclusivity.

B. Faculty-Specific Disparities: A Divide in Relevance

The significant variation in satisfaction across faculties (*p* < 0.05, Table 5) underscores the discipline-dependent utility of AI.

Scientific Faculties (Highest Satisfaction):

Students in scientific fields (e.g., engineering, computer science) reported the highest satisfaction, likely because AI tools align seamlessly with their curricula—such as data analysis (Python/R), simulation software (MATLAB), or automated research tools. This resonates with studies by [11, 12, 25], who found that AI's quantitative applications are most valued in STEM disciplines.

Medical and Humanities Faculties (Lower Satisfaction):

Medical students may perceive AI as less integral to hands-on clinical training, despite its growing role in diagnostics (e.g., AI-assisted imaging). Similarly, humanities students might struggle to see AI's relevance in subjective domains like literature or philosophy, where human interpretation remains central. However, emerging tools (e.g., AI for text analysis or historical data mining) could bridge this gap if properly introduced.

Implication: Tailored workshops showcasing discipline-specific AI applications (e.g., NLP for humanities, diagnostic AI for medicine) could enhance engagement. Faculty training programs should also address pedagogical integration strategies.

From a pedagogical perspective, this finding highlights the need for contextualized instructional design that aligns AI tools with disciplinary learning objectives. Instructors should be encouraged to integrate AI activities that complement rather than replace human cognitive processes, such as reflective writing or ethical decision-making exercises [1, 2, 9, 17]. For example, AI-based diagnostic simulations can enhance critical reasoning in medical education, while AI text-mining tools can deepen interpretive engagement in the humanities.

Implication: Tailored workshops showcasing discipline-specific AI applications (e.g., NLP for humanities, diagnostic AI for medicine) could enhance engagement. Faculty training programs should also address pedagogical ethics, including how to transparently disclose AI-assisted instruction and encourage students to critically evaluate AI-generated content.

C. Student Concerns: Beyond Enthusiasm

While satisfaction levels were generally high, students voiced legitimate concerns (Table 6), mirroring global apprehensions about AI in education (UNESCO, 2023):

Training Deficit (Highest Concern: Mean = 3.62):

The demand for more training highlights a gap between AI's potential and students' ability to harness it. This echoes findings by Zhang *et al*. (2022), who identified "technical self-efficacy" as a critical predictor of AI adoption success.

Critical Thinking and Creativity (Mean = 3.62):

Fears about over-reliance on AI resonate with warnings from scholars like Selwyn (2021), who argue that unchecked automation risks reducing education to transactional interactions. For example, overuse of ChatGPT for essay writing may undermine original thought.

Data Privacy and Quality (Means = 3.48–3.57):

These concerns reflect broader societal anxieties about AI ethics. Jordan's lack of comprehensive AI governance frameworks (as noted by the Jordanian Ministry of Digital Economy, 2023) may exacerbate student unease.

Pedagogically, integrating "critical reflection" components—where students evaluate AI-generated outputs, identify biases, and compare them to human responses—can cultivate digital discernment and safeguard higher-order thinking [1, 2, 8, 33].

Implication: Structured Training Modules: Partner with AI developers to create certified courses (e.g., "AI for Academic Research").

Critical Thinking Safeguards: Design assignments that combine AI tools with reflective components (e.g., "Use ChatGPT to draft an essay, then critique its limitations").

Policy Advocacy: Universities should collaborate with policymakers to establish clear guidelines on data usage, AI accountability, and academic integrity, in line with UNESCO's (2023) [8] global framework for responsible AI in education.

D. Comparative Context: Jordan vs. Global Trends

Jordan's results parallel trends in similarly developing educational ecosystems (e.g., Morocco, Malaysia), where AI integration is nascent but growing. However, contrasts exist with Western institutions:

Example: In U.S. universities, AI adoption is often accompanied by robust support infrastructures (e.g., MIT's "AI Literacy Week"), whereas Jordanian institutions may lack resources for comparable initiatives.

The pedagogical philosophy behind AI integration also differs. In developed systems, AI is increasingly viewed as a co-learner(a tool that supports inquiry, collaboration, and creativity), whereas in developing contexts, it often remains framed as a technological supplement [1, 8, 9, 22]. Encouraging educators in Jordan to adopt a co-learning model, where both teachers and students experiment with and reflect on AI together, could strengthen ethical awareness and pedagogical impact.

Implication: South–South collaborations (e.g., partnerships with universities in the UAE or India) could facilitate knowledge transfer and resource sharing. Furthermore, developing regional ethical frameworks and teacher training programs could ensure that AI adoption in Jordan remains culturally sensitive, equitable, and pedagogically sound.

Overall, this study advances theoretical understanding by connecting the practical adoption of AI in Jordanian higher education with broader international frameworks of technology acceptance and pedagogical innovation. Unlike previous studies that have focused narrowly on system usability or performance metrics [10, 11], our findings extend the discourse by emphasizing the socio-pedagogical dimensions of AI adoption, particularly equity, contextual readiness, and ethical awareness. This contextualized evidence from a developing-country perspective enriches global literature by demonstrating that AI's educational impact is not purely technological but deeply social, shaped by institutional capacity, policy support, and cultural adaptation. Future research should build on these insights by testing predictive models that integrate both cognitive and contextual variables to explain sustained AI engagement across disciplines.

VI. Conclusion

The findings of this study demonstrate that artificial intelligence plays an increasingly influential role in Jordanian higher education, with most students expressing positive experiences toward its use in accessing information, supporting personalized learning, and enhancing engagement. Although overall satisfaction was high, notable disciplinary differences emerged, with students in scientific fields reporting stronger perceived benefits than those in medical or humanities disciplines. These variations highlight that the academic and pedagogical context has a greater influence on AI acceptance than demographic characteristics, extending existing models of technology adoption and learning engagement.

The results also reveal the need to address challenges related to training, data privacy, algorithmic fairness, and concerns about overreliance on automation. These findings carry several implications for institutions and stakeholders. Universities should develop discipline-sensitive strategies for integrating AI tools into teaching and learning, ensuring that students in every faculty understand how AI can support their specific academic needs. Strengthening ethical guidelines, improving digital literacy, and providing structured capacity-building programs can help enhance responsible and effective AI usage across campuses. Policymakers can further support this process by establishing national standards for ethical AI deployment and by investing in partnerships that expand access to advanced technologies.

Based on these insights, universities are encouraged to promote professional development opportunities, create specialized AI support units, and monitor long-term outcomes to ensure sustainable implementation. Such efforts will help bridge disparities among disciplines and support a more equitable and informed adoption of AI in higher education. Although this study is limited to two institutions and relies on self-reported cross-sectional data, it offers valuable evidence for understanding students' perceptions in a developing-country context. Future research should incorporate longitudinal designs and broaden participation to include faculty and administrators, enabling a more comprehensive assessment of institutional readiness and the long-term effects of AI on learning and employability.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Areej Derbas contributed to the conceptualization and design of the study, supervised the research process, and participated in writing and revising the manuscript. Hani Y. Ayyoub led the data collection and preparation, designed and administered the research instruments, coordinated among co-authors, and contributed to writing, editing, and validating the manuscript. Tamara Almarabeh was involved in data analysis, interpretation of results, and contributed to writing and reviewing the manuscript. Adnan Hnaif contributed to the methodological framework, supported data validation, and participated in reviewing and refining the manuscript. all authors had approved the final version.

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