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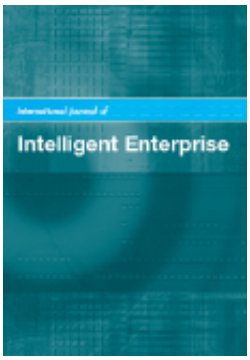

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Ethical considerations of AI integration in academic environments: balancing innovation and student privacy in Jordan

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Ethical considerations of AI integration in academic environments: balancing innovation and student privacy in Jordan

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Abstract: This study examines the ethics of AI-powered systems that gather and analyse students' personal data, academic performance, and actions. Exploring the ethical implications of AI integration in Jordanian academic environments, examining data privacy mechanisms in AI-driven academic systems, and presenting ethical recommendations for responsible AI integration were the three aims. The ethical framework in this research promotes a well-balanced strategy that maximises AI benefits while protecting student privacy. The report recommended thorough data protection, open AI use, and clear permission processes. Thus, the study found a significant correlation between the ethical concerns of integrating artificial intelligence (AI) into academic settings in Jordan, data privacy precautions and AI-driven academic systems, and offered ethical standards for proper AI integration in Jordan. The study found that ethical issues surrounding the use of artificial intelligence (AI) in academic settings, particularly the difficult balance between innovation and student privacy in Jordan, shed light on the vital intersection of technology and education. This study highlights the necessity for a comprehensive approach to integrate artificial intelligence (AI) into educational institutions while considering ethical issues.

Keywords: ethics and AI integration; academic environments and innovation; students privacy; academic environments; personal information; academic achievements; natural language processing.

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Biographical notes: Firas Tayseer Mohammad Ayasrah is a PhD graduate in Educational Technologies – Malaysia in 2017. He has the rank of Assistant Professor at Al Ain University – UAE, teaching various courses in educational technology. He has considerable experience in many Jordanian, Saudi, and Malaysian universities, teaching at the Bachelor's and Master's levels. He also has extensive experience in modern topics in educational technology – educational platforms – digital learning environments – virtual and augmented reality – challenges of educational technologies – and other related topics. He has a collection of research papers published in educational technology. He has been published in different international and Scopus-indexed journals.

1 Introduction

In recent years, artificial intelligence (AI) has presented various opportunities, including education. AI is becoming more commonplace in academic settings, strengthening teaching techniques, reducing administrative procedures, and providing more individualised learning for students. The emergence of technology in education raises important ethical questions that call for an in-depth investigation and a careful strike of a balance to guarantee that the pursuit of innovation and the protection of student privacy may coexist peacefully. Almusaed et al. (2023) carried out a thorough empirical investigation. Integrating technology into educational settings creates various difficult moral conundrums for professors, school administrators, those in charge of formulating educational policies, and students. AI encompasses various technologies, including machine learning, natural language processing, and data analytics. These technologies have made significant inroads in education, promising innovative solutions to some age-old academic challenges. The utilisation of AI in academic environments extends to various areas.

Personalised learning in educational platforms can adapt content and resources to individual student needs, enabling a more personalised learning experience (Viberg et al., 2021). Through data analysis, AI algorithms can identify areas where students struggle and offer tailored interventions, ultimately improving learning outcomes. According to Ng (2019), AI can automate administrative tasks, such as registration, scheduling, and record-keeping, allowing educators to redirect their time and energy towards teaching and research. This enhances operational efficiency and reduces the administrative burden on academic staff. In academic research, AI assists in data analysis, literature reviews, and even hypothesis generation. It accelerates the research process and can contribute to groundbreaking discoveries in various fields (Kaplan and Haenlein, 2020). Academic contexts in Jordan raise various ethical problems and present several obstacles. Within the framework of the era of digital technology, the protection of the students' constitutionally protected right to personal privacy should be one of the key concerns (Adekola and Aribisala, 2023).

It is necessary to strike a fine balance between employing AI to develop more compelling educational environments and protecting students' privacy (Ghozali et al., 2022). This is a challenge that must be met. Consequently, members of the academic community who are experts in fields related to AI are obligated to do exhaustive research on the processes through which AI systems gather, alter, and assess data (Aravind et al., 2023). Concerns have been raised over the volume of data being collected, the nature of the permission processes being used, the data storage safeguards being implemented, and the potential implications of data breaches or illegal access to the mentioned work (Ghozali, 2022). In addition, the ethical considerations surrounding AI go deeper than the surface level, including worries about protecting personal information, the assumption of responsibility, and reducing bias (Buchem et al., 2021). The complete documentation, comprehensibility, and impartiality of these systems must be prioritised as the integration of AI systems into the decision-making processes of educational institutions continues to grow (Rajest et al., 2023). This is necessary to minimise the possible amplification of educational injustices that are already present (Jasper et al., 2023). In pursuing innovation and improved educational outcomes, academic institutions in Jordan may face the temptation to over-rely on AI-driven solutions (Ghozali et al., 2021). There is a need to balance the benefits of AI integration and preserve traditional, human-centric educational

values. While AI can provide valuable insights and assistance to educators, it should not replace the role of teachers and human interaction in the learning process. The danger of over-reliance on AI systems is that they can reduce the human element in education, degrading the quality of the student-teacher relationship and the development of critical thinking and interpersonal skills (Al-Harbi et al., 2021).

The widespread use of AI technology in educational institutions has increased available cutting-edge instructional methods and time-saving administrative practices (Varmann et al., 2023). However, a significant ethical challenge has emerged over how educational institutions in Jordan may successfully manage the advantages of AI-driven developments while protecting students' privacy and adhering to ethical values (Saxena et al., 2023). To understand the ethical concerns and possible solutions, it is necessary to seek the opinions of all important stakeholders, such as educators, learners, lawmakers, and technologists (Tripathi and Al-Zubaidi, 2023). This is necessary for a comprehensive awareness of the issues. The primary objective of this research is to provide insights that may assist the academic community in Jordan in formulating appropriate norms and regulations that effectively address the transformative capabilities of AI while safeguarding people's entitlements to privacy, transparency, and fairness (Zittrain, 2020).

The secondary objective of this research is to provide insights that may assist the academic community in Jordan in formulating appropriate norms and regulations that effectively address the transformative capabilities of AI (Padmanabhan et al., 2023). Our investigation aims to promote fruitful conversations that will establish a framework for the moral integration of AI, as well as to protect the students' basic rights and maintain their dignity in an era when everything is being digitised (Jeba et al., 2023). The problem of implementing AI technology into educational settings in Jordan is the difficulty of successfully using AI to improve the overall quality of education while at the same time guaranteeing the confidentiality of students' personal information (Vidigal-Chaves, 2019). However, integrating AI in academic environments in Jordan is essential for enhancing educational outcomes (Joshi et al., 2023). However, it must be accompanied by robust ethical considerations to safeguard student privacy and foster trust. Innovative solutions, such as anonymising data and transparent AI algorithms, are pivotal in striking the delicate balance between innovation and ethical responsibility.

1.1 Research objectives

- To explore the ethical implications of AI integration within academic environments in Jordan.
- To analyse the data privacy mechanisms in AI-driven academic systems.
- To propose ethical guidelines for responsible AI integration in Jordan's academic settings.

1.2 Research questions

- What are the ethical implications of AI integration within academic environments in Jordan?
- What are the data privacy mechanisms in AI-driven academic systems in Jordan?

- What ethical guidelines are for responsible AI integration in Jordan's academic settings?

2 Literature review

2.1 Concept of artificial intelligence in education

Machine learning, sometimes called AI, is frequently used as a substitute for AI in several domains. Machine learning is a computational methodology for categorising and characterising data across many domains. This particular subject matter is included within the broader topic of AI and is classified as one of its sub-disciplines. This approach may be used to examine written assignments to identify patterns and assess the probability of a student attaining or not attaining a certain level of success in a particular educational program or admissions procedure. IT engages in cognitive activities, such as acquiring knowledge and resolving problems, which are often attributed to human brains (Linardatos, 2020). The prevailing perspective is that 'AI' does not denote a specific technological entity. One might argue that contemporary educational institutions function as 'accelerated learning environments' that possess the capacity to provide superior outcomes within a compressed timeframe.

In the contemporary context, examining the viability of accelerated educational programs, often known as 'short courses,' and determining if their practicality remains intact or necessitates a paradigm shift in our approach to them is imperative. Given the impending arrival of the 22nd century, a significant discourse has emerged on the suitability of education for facilitating the dissemination of knowledge, fostering critical thinking skills, and promoting metacognitive abilities. Should allocating resources prioritise adapting current systems to align with the demands of the new period, or should it provide equal resources for creating entirely new systems? How may students use AI to preserve their distinct emotional and social attributes while effectively capitalising on the possibilities a technologically sophisticated educational system offers? Policymakers and industry stakeholders are expected to prioritise these issues soon. Indeed, ongoing discussions are now exploring the potential of AI as a viable substitute for educators.

One of the primary applications of AI in education is the ability to provide personalised learning experiences. AI algorithms can analyse individual student data, including their learning preferences, strengths, and weaknesses, to tailor educational content and pace. Vygotsky (2019) reported that personalised learning significantly enhances students' engagement and academic performance. Intelligent tutoring systems (ITS) are AI-powered platforms that simulate human tutors. These systems offer instant feedback, adapt to students' progress, and provide additional resources when needed. Anderson (2020) explores the effectiveness of ITS in various learning settings. The research findings suggest that ITS can enhance learning outcomes by offering continuous support and guidance to students, making learning more efficient and effective. According to Johnson (2021), AI is not limited to improving students' learning experience but also streamlining administrative tasks. Educational institutions can use AI for admissions, scheduling, and resource allocation. In the administrative processes, AI-driven systems can optimise staff allocation and resource utilisation. This reduces costs and enables institutions to allocate more resources to educational purposes. Predictive analytics powered by AI can identify students at risk of falling behind

academically. This information allows institutions to intervene and provide necessary support early on. Brown and Smith's (2021) research showed that early interventions based on AI-generated predictions can significantly improve student retention rates.

2.2 Advantages of artificial intelligence in the field of education

The widespread use of AI and its associated technologies has proven advantageous to the field of education, much like its impact on other disciplines within academia. Consequently, higher education institutions and educators are equipped with innovative methodologies to enhance student learning outcomes.

There is a potential expectation that implementing an autonomous learning monitoring system on the platform might potentially enhance students' academic performance. Ahmad et al. (2024) claim that this technology combines an immersive environment with a tailored curriculum, and the concept might be described as 'integrative.' AI can use machine learning algorithms to analyse students' daily activities and comprehensively assess performance. The strategy outlined in the study conducted by Fraihat et al. (2023) has been shown to enhance instructors' ability to effectively cater to the individualised needs of students, taking into account their distinct range of experiences, viewpoints, and obstacles.

The USA first pioneered the technique of adaptive learning in the early 1990s. Many distinguished educational institutions provide adaptive learning opportunities. Examples of such software include Knewton and cognitive tutor. Adaptive learning techniques in China lagged behind those of the USA. China's adaptive education technology has had a gradual pace of development. The expansion of this industry has been seen throughout the last decade. These enterprises prioritise providing English language instruction to kindergarten through twelfth-grade pupils. The integration of AI inside educational settings can alleviate instructors' time constraints, enabling them to allocate more attention to addressing the unique requirements of their pupils. In contemporary educational settings, educators spend a substantial amount of their time evaluating student assignments and examinations. The daily obligations detract from allocating time and focus toward instructional activities, educational pursuits, and scholarly endeavours within the educational setting. AI technologies are streamlining previously labour-intensive processes, such as grading assignments and examinations, enhancing the efficiency and convenience of instructors. AI technologies may also assist instructors by assuming responsibility for communication tasks. This allows instructors to allocate their time to other tasks.

Consequently, more pupils will be able to avail themselves of pertinent information. Integrating AI into educational settings facilitates allocating more time for interpersonal engagement between teachers and learners. This phenomenon facilitates the development of children's physical, cognitive, and socio-emotional aspects. In contemporary educational settings, educators are more compelled to multitask.

On the contrary, it is suggested that educators assume the role of facilitators, providing guidance and support to their pupils. The impetus for this transition is rooted in educational institutions' desire to focus on the welfare and requirements of their student body. The educational system had a pivotal role in driving this cultural transformation. The advent of AI has brought about a significant transformation in the fields of education and administration. Technical methods have achieved these modifications. Ensuring campus security, monitoring the impact of instructional sessions, and recording

attendance are all critical tasks. The current implementation exhibits the capacity to reduce administrative costs while simultaneously improving the educational experience for both students and educators. Monitoring visitors is a significant challenge due to the substantial population of the student house.

Educators and carers are increasingly using AI technology such as facial identification, human body analysis, and image recognition to enhance their ability to evaluate the academic advancement of their pupils. These technologies may be used to monitor students' attention, well-being, and mobile phone usage inside the classroom setting. The ability of technology to observe and analyse instructional practices is also crucial. AI plays a crucial role in attaining educational equity. As nations undergo economic development and encounter geographical limitations, a significant disparity arises in the accessibility and quality of educational opportunities. Students in low-resource settings, such as rural regions, frequently exhibit worse academic performance than their urban peers. There is a prevailing optimism over the potential of AI to mitigate disparities and achieve more equity. The scope of distance education is increasing. This emerging pattern implies that implementing an online course led by a single instructor might provide advantages for students in socioeconomically disadvantaged regions. Consequently, persons situated in one geographical area have the opportunity to acquire knowledge from their counterparts located in a different region.

Teacher feedback on student work across many subject areas might be enhanced by intelligent homework correction based on AI and automated aggregation of instructional data. By using adaptive learning methodologies, this technology facilitates increased engagement between remote professors and their students. Distance educators' use of both digital and conventional teaching techniques has the potential to facilitate career advancement and improve student accomplishment.

2.3 Challenges associated with the integration of artificial intelligence

The growing disparity in algorithmic distribution, akin to the fragmentation of internet connectivity that has led to the division of states, poses a potential threat to equitable access to educational advantages offered by AI. The development and implementation of AI algorithms are mostly concentrated in economically advanced nations, posing challenges for their adoption and use in poorer countries. The education industry has several obstacles in developing AI, notably the scarcity of technological resources and infrastructure.

This study investigates the ethical and security implications of data collection, analysis, and dissemination. AI ethics include several aspects, such as personalised student guidance, data gathering, safeguarding data privacy, ensuring responsibility, and determining algorithm ownership. Public discourse is crucial in addressing the ethical, accountability, and safety concerns about AI technology and its associated products.

AI provides educators with the necessary training and knowledge to effectively use AI technologies in educational settings. In order to effectively transform education, educators must acquire novel digital pedagogical abilities that enable them to harness the potential of AI. In order to provide effective solutions, makers of AI education products must possess a comprehensive understanding of the methods used by teachers.

The increasing significance of individual studies might be attributed to evolving instructional methodologies. AI is anticipated to give students a competitive advantage in

their education. Given the emphasis on independent learning abilities in customised learning, educators must focus on developing these skills.

Effective communication among students is of paramount importance. Integrating AI-powered learning platforms and the increasing emphasis on computer-related topics in educational discussions may give rise to apprehensions over developing students' interpersonal skills. It is important for undergraduate students to actively foster and advocate for the advancement of peer learning and support within their academic community. The potential use of AI and web-based learning can effectively tackle this issue. Students can engage in remote learning and participate in group activities, such as attending camps with their fellow students.

2.4 Ethical implications of AI integration within academic environments

The growing disparity in algorithmic distribution, similar to the fragmentation of internet connectivity that has led to the division of states, poses the potential threat of limiting the accessibility of AI's educational advantages to a significant portion of the population. The development and implementation of AI algorithms are mostly concentrated in economically advanced countries, posing challenges for their adoption and use in developing nations. The education industry has several obstacles in developing AI, notably the scarcity of technological resources and infrastructure. Ai ethics encompasses several aspects, such as personalised student guidance, the acquisition and protection of data, the establishment of responsibility, and the ownership of algorithms. Public discourse is crucial in addressing the ethical, accountability, and safety concerns around AI technology and its products.

AI provides educators with the necessary training to effectively integrate AI technologies into educational settings. In order to effectively use AI to transform the field of education, educators need to acquire novel digital pedagogical competencies. In order to provide effective solutions, makers of AI education products must possess a comprehensive understanding of the methods used by teachers. The increasing significance of individual studies might be attributed to evolving instructional methodologies. There is a prediction that AI will give students a competitive advantage in their educational pursuits.

Given the emphasis on independent learning abilities in customised learning, educators must focus on developing these skills. Effective communication among students is of paramount importance. Integrating AI-powered educational platforms and the increasing emphasis on computer-related topics in educational discussions may give rise to apprehensions over developing students' interpersonal skills. It is important for undergraduate students to actively foster and advocate for the cultivation of peer learning and support within their academic community. The challenge at hand may be mitigated by using AI and web-based learning. Students can engage in remote learning and participate in group activities such as attending camps with their fellow students.

2.5 Integration of artificial intelligence and practices and data privacy

AI-driven educational systems must protect personal data from students, instructors, and administrators. In order to defend individual rights, foster trust, and adhere to legal and ethical principles, these systems need to use robust privacy measures throughout the acquisition, processing, and analysis of extensive data.

The increasing significance and use of AI have engendered a multifaceted discourse around the issues of data privacy and AI. AI systems require individual data to function well because they can collect and interpret substantial volumes of information. The extent of data accessibility gives rise to concerns over potential infringements on privacy, biases, and discriminatory practices, as well as the exploitation of data (Tyagi, 2023).

AI systems' use of individual data points substantially threatens data privacy. In order to achieve optimal performance, AI systems need substantial quantities of data, including names, addresses, and other identifying particulars. The use of data by the AI system facilitates the assessment, prediction, and identification of patterns and trends. AI systems are widely involved in processing sensitive data, hence giving rise to issues over privacy. The enhanced data processing capabilities of AI systems exacerbate the risks associated with humans' limited capacity to manage and comprehend the use of their data effectively (Tyagi, 2023).

Tyagi (2023) states that AI has the potential to perpetuate biases and discriminatory practices, thereby impacting the preservation of individuals' data privacy. In essence, when the data used for training an AI system exhibits bias or discrimination, the resulting judgments made by the AI system will also reflect prejudice and discrimination. When an AI system is trained with data that contains inherent prejudices, such as biases against certain racial or gender groups, the resulting predictions and behaviours of the system are influenced by these biases. This phenomenon can potentially result in discriminatory practices and reinforce pre-existing disparities.

Data misuse in AI systems raises serious concerns about potential privacy infringement. The ability of AI systems to efficiently handle and interpret large volumes of data, particularly user-provided data, makes them vulnerable to exploitation. AI systems for financial data analysis can assess loan applications, credit ratings, and insurance rates by leveraging sensitive data. According to Tyagi (2023), inadequate data storage or use practices may lead to privacy breaches, such as the accidental exposure of personal information.

There has been a notable increase in worry over data privacy to AI among individuals, institutions, and governments globally. In order to effectively address the proliferation of AI technology, data privacy norms and regulations must undergo the necessary adaptations. In order to safeguard privacy in the era of AI, policymakers may find it necessary to scrutinise existing legal frameworks and regulations, establish novel legislation, and establish consistent standards (Tyagi, 2023).

2.6 Integration of artificial intelligence and promotion of transparency

Promoting openness inside academic institutions that use AI technology is crucial in guaranteeing the accessibility, comprehensibility, and accountability of AI-assisted decisions and processes. Transparency has a crucial role in fostering trust, facilitating ethical decision-making, and enhancing the understanding of educators, students, and administrators about the impact of AI on education. Furthermore, it is important to note that various academic disciplines place differing levels of importance on the advantages of openness. According to economics, political science, and law scholars, transparency has been shown to enhance several aspects, such as market efficiency, political engagement, and the credibility of administrative processes. In the field of social sciences, it was determined that enhancing the level of transparency in AI systems has the potential to bolster public trust in this particular technology. The results reported by

Galassi and Vittorini (2021) were comparable; establishing trust between students and teachers is crucial for the successful use of automated grading techniques. According to the author, the promotion of transparency and trust is facilitated by explainability.

Explainable AI pertains to elucidating AI systems' inner workings and decision-making processes. This paper elucidates the methodologies an AI algorithm uses to enhance the confidence level in the technology Ni et al. (2023) is actively engaged. Using explicit design and post-hoc explanations may enhance the effectiveness of explainable AI. The first description pertains to the internal mechanics of the AI model. This technology enables the visualisation of the internal activities of the 'black box'. The latter elucidates AI's rationale and veracity. This research highlights the need to include Explainable AI to address the concerns of AI users and those impacted by AI decision-making processes. The study was conducted by the Xu group in 2019. According to the study conducted by Ahmad et al. (2024), there is a limited amount of research available on the topics of transparency and explainability. Research shows a growing consensus that AI systems should include transparency and understandability.

2.7 Propose ethical guidelines for responsible AI integration in education

Ethical considerations must guide AI development, implementation, and usage to protect human rights and values. This paper recommends ethical AI integration.

3 Transparency and accountability

Explain AI systems' functions and decisions to ensure transparency. Make AI developers, deployers, and users accountable for AI system results. According to Aslan and Kizilcec (2020), AI systems in education must be transparent and provide understandable explanations for their decisions and actions. Educators, students, and stakeholders should have access to information about how AI algorithms work, the data they use, and the criteria they employ to make recommendations. Transparency fosters trust and helps prevent biases from going unnoticed.

3.1 Fairness and non-discrimination

Avoid biases and discriminatory practices in AI development using representative and diverse datasets to train models. Regularly monitor AI systems for biases and correct any disparities in their predictions or outcomes. Barocas et al. (2019) added that AI integration should ensure fairness and equal opportunities for all students. The AI systems should not perpetuate biases based on race, gender, socioeconomic status, or other demographic factors. Educational institutions must regularly audit AI algorithms for fairness and take necessary actions to rectify any disparities.

3.2 Privacy and data security

Prioritise user privacy and protect sensitive data throughout the AI lifecycle, from data collection to storage and processing. Implement strong data security measures to prevent unauthorised access and ensure compliance with data protection regulations. AI systems must likely adhere to strict data protection standards and not infringe upon the privacy of

students or educators. Personal data should be collected only for legitimate educational purposes and not shared with third parties without explicit consent (Liu et al., 2017).

3.3 Beneficence and human well-being

Develop AI systems that prioritise human well-being, safety, and empowerment and enhance human capabilities rather than replace them. Ensure AI applications contribute positively to society by addressing real-world challenges and creating value for individuals and communities. Brynjolfsson and McAfee (2021) stressed that AI should be used to enhance lifelong learning and develop critical thinking skills rather than as a replacement for educators. The focus should be on using AI to supplement educational experiences, not replace them.

3.4 Continual monitoring and evaluation

Regularly assess the impact of AI systems on society, individuals, and the environment and iterate on their design to address emerging issues. Proposing ethical guidelines for responsible AI integration in education and continual monitoring and evaluation is essential. Prioritise data privacy, inclusivity, and transparency. Regularly assess AI's impact on student learning and well-being. Collaborate with stakeholders to ensure ethical and equitable AI practices (Williamson, 2021).

3.5 Safeguard against abuse

Implement measures to prevent the malicious use of AI technology that could cause harm, infringe on rights, or compromise security. Educators must consider potential bias and discrimination in AI systems (Noble, 2018) while adhering to ethical AI principles and fostering digital literacy (Floridi et al., 2018). Proper oversight, regular audits, and continuous improvement are crucial (Jobin et al., 2019). These guidelines can safeguard against AI abuse, protect student rights, and enhance the educational experience.

3.6 Human-AI collaboration

Promote the design of AI systems that facilitate collaboration between humans and machines, emphasising the augmentation of human abilities rather than their replacement. Smith et al. (2021) suggested principles encompassing transparency, fairness, privacy, accountability, and inclusivity. Educators should align AI tools with learning objectives, ensuring equitable access. Ongoing research and feedback mechanisms will aid continuous improvement, while ethical oversight committees (Mittelstadt, 2019) can evaluate and refine these guidelines, fostering responsible AI use in education.

4 Theoretical framework

The technology acceptance model (TAM) is a widely recognised theoretical framework used to understand and predict how individuals, particularly users of information technology, adopt and accept new technologies. Developed by Fred Davis in 1986 and later extended by Fred Davis and Richard Bagozzi in 1989, TAM is based on the premise

that perceived ease of use (PEOU) and perceived usefulness (PU) are two key determinants of an individual's intention to use technology, which, in turn, influences their actual usage. The core components of the TAM are as follows:

- PU: PU refers to the extent to which a person believes that using a particular technology will enhance their job performance or make their life easier. It's a subjective assessment of the technology's utility.
- PEOU: PEOU refers to the extent to which a person believes that using a technology will be free from effort or that it will be easy to learn and operate. It measures the user's perception of how user-friendly the technology is.
- Behavioural intention (BI): BI is the individual's willingness and intention to use the technology. It serves as a direct precursor to actual usage.
- Actual system use (or technology usage): This represents the actual adoption and use of the technology in real-world scenarios.

TAM posits that PU and PEOU directly influence an individual's BI, which, in turn, directly affects their actual system use. External factors, such as social influence and facilitating conditions, may also impact PU and ease of use, further influencing an individual's technology adoption decision.

4.1 Methods and materials

Many scholarly investigations exploring AI in remote education have used quantitative research methodology. The questionnaire is well recognised as a prominent tool for assessing research material of this kind. Based on the aforementioned previous studies, a survey instrument was developed (Wang et al., 2023). The research instrument had three distinct components. In Part A, the respondents' information was presented. Section B evaluated the various components of AI integration, specifically focusing on aspects such as novelty and the preservation of student anonymity. Each variable was scored from 0 to 4 on an internal scale with answer options. 'Strongly agree' (SA), 'agree' (A), 'disagree' (D), and 'strongly disagree' (SD) when the question was formulated positively. Items that were written in a negative tone received higher scores.

- Validity: The education department of Jerash University double-checked the questionnaire for face validity. The researchers have taken into consideration all of their suggestions for improvements.
- Reliability: 20 students outside of the study's sample took the exam two weeks apart to ensure the study's dependability. The Pearson correlation value of 0.82, calculated from the collected data and student replies, meets the criteria for the present research.
- Sample of the study: At Jerash University, 183 students participated in a survey. The study's sample includes 102 male and 81 female college students. Participants aged 18 to 24 represented all academic departments at their respective universities. In this research, we employed a basic random sampling approach to ensure that gender and teaching experience were well represented.
- Data analysis: Descriptive statistics were used on study topics, and Pearson product moment correlational analysis assessed the null hypothesis.

5 Data analysis

- Research question one: What are the ethical implications of AI integration within an academic environment

Summary ethical implications statistics are in Table 1 and Figure 1. The mean values were 6.32, 7.25, 5.61, 6.61, and 7.21, while the standard deviations were 1.042, 1.091, 824, 913, and 1.0881. All variables in this study have means that exceed their standard deviations. This suggests the variables matter. For Jordanian academics to integrate AI, student data protection and security, equity and accessibility, and instructor AI training are needed. Skewness values indicate that variables are positively skewed toward normalcy. Because they all have positive skewness. Analysis kurtosis values suggest that the variables are not leptokurtic.

- Research question two: What are the data privacy mechanisms in AI-driven academic systems in Jordan?

Table 1 Descriptive Analysis of ethical implications of AI integration within an academic environment

No.	*Variables*	*X*	*SD*	*Skewness*	*Kurtosis*
1	Prioritisation of student data privacy and security	6.32	1.042	0.158	–1.171
2	Equity and accessibility	7.25	1.091	0.205	–1.311
3	Human-AI interaction	5.61	0.824	0.130	–0.622
4	AI training for teachers	6.61	0.913	0.337	–0.994
5	AI integration can worsen educational inequalities	7.21	1.081	0.252	–1.279

Note: Legend: X = mean; SD = standard deviation; N183.

Figure 1 Pie chart on RQ1 (see online version for colours)

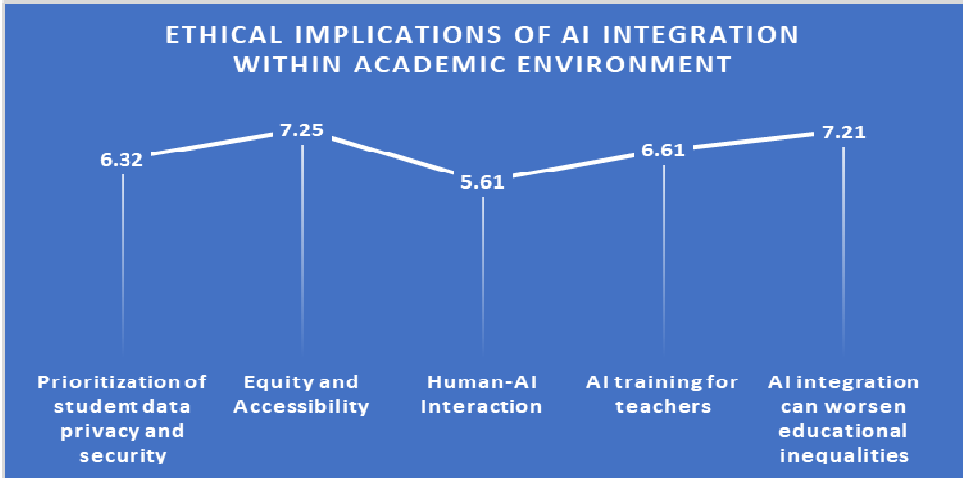


Table 2 and Figure 2 summarise data privacy statistics. The mean values were 6.28, 7.21, 5.57, 6.57, and 6.74, while the standard deviations were 1.030, 1.081, 8.22, 0.904, and 1.243. All variables in this study have means that exceed their standard deviations. This suggests the variables matter. Thus, Jordanian AI-driven academic systems need awareness and transparency, consent and control, data security and encryption, third-party access and sharing, and data retention and deletion. Skewness values indicate that variables are positively skewed toward normalcy. Because they all have positive skewness. Analysis kurtosis values suggest that the variables are not leptokurtic.

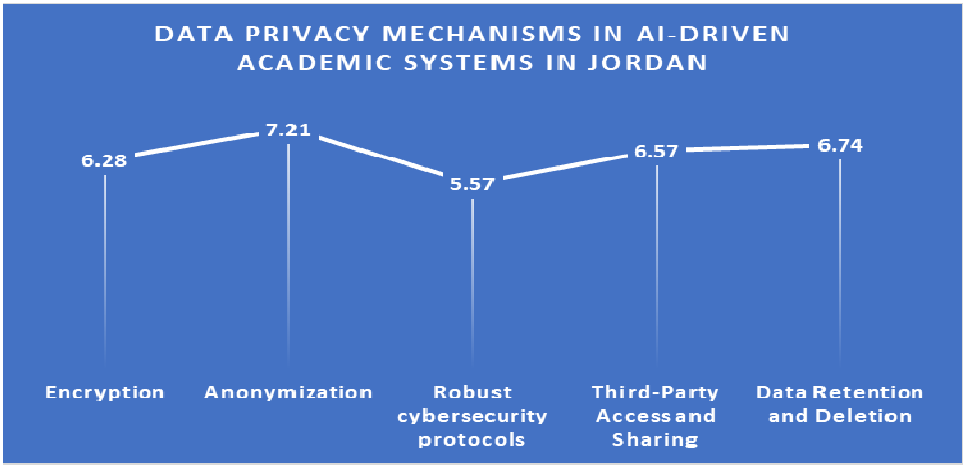
- Research question three: What ethical guidelines are for responsible AI integration in Jordan's academic settings?

Table 2 Descriptive analysis of data privacy mechanisms in AI-driven academic systems in Jordan

No.	*Variables*	*X*	*SD*	*Skewness*	*Kurtosis*
1	Encryption	6.28	1.030	0.198	–1.132
2	Anonymisation	7.21	1.081	0.252	–1.279
3	Robust cybersecurity protocols	5.57	0.822	0.169	–0.579
4	Third-party access and sharing	6.57	0.904	0.380	–0.900
5	Data retention and deletion	6.74	1.243	0.164	–0.778

Note: Legend: X = mean; SD = standard deviation; N183.

Figure 2 Pie chart on RQ2 (see online version for colours)



Summary statistics of the suggested ethical norms are in Table 3 and Figure 3. The mean values were 6.30, 7.24, 5.61, 6.60, and 7.22, and the standard deviations were 1.039, 1.083, 0.811, 0.901, and 1.079. All variables in this study have means that exceed their standard deviations. This suggests the variables matter. Data privacy and security, equity and inclusion, transparency and accountability, community participation, and human collaboration are needed for ethical AI integration in Jordan's academic environments. Skewness values indicate that variables are positively skewed toward normalcy. Because

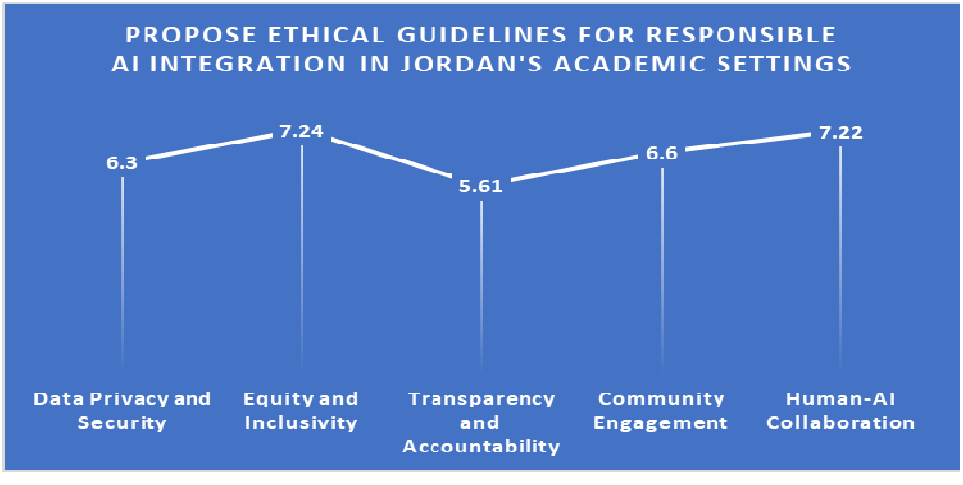
they all have positive skewness. Analysis kurtosis values suggest that the variables are not leptokurtic.

Table 3 Descriptive analysis of proposed ethical guidelines for responsible AI integration in Jordan's academic settings

No.	*Variables*	*X*	*SD*	*Skewness*	*Kurtosis*
1	Data privacy and security	6.30	1.039	0.173	–1.164
2	Equity and inclusivity	7.24	1.083	0.217	–1.292
3	Transparency and accountability	5.61	0.811	0.150	–0.592
4	Community engagement	6.60	0.901	0.376	–0.966
5	Human-AI collaboration	7.22	1.079	0.233	–1.282

Note: Legend: X = mean; SD = standard deviation; N183

Figure 3 Pie chart on RQ3 (see online version for colours)



5.1 Hypotheses testing

- Hypothesis one: There is no significant relationship between the ethical implications of AI integration within academic environments in Jordan.

The r-value is 0.916 in Table 4. This result was compared to the essential r-value (0.086) at 0.025 with 183 degrees of freedom to determine its relevance. The estimated correlation coefficient (r = 0.916) exceeds the threshold correlation coefficient (0.086). Results were statistically significant. In Jordan, the ethical challenges of integrating AI into academic contexts are strongly correlated.

- Hypothesis two: There is no significant relationship between data privacy mechanisms in AI-driven academic systems.

Table 4 Correlation analysis of ethical implications of AI integration within academic environments in Jordan

Correlations		*Academic environments*	*Ethical implications of AI integration*
Academic environments	Pearson correlation	1	0.916**
	Sig. (2-tailed)		0.000
	N	183	183
Ethical implications of AI integration	Pearson correlation	0.916**	1
	Sig. (2-tailed)	0.000	
	N	183	
	DF	181	
	Significant at level	0.025	
	critical r–value	0.086	

Table 5 Correlation analysis of the relationship between data privacy mechanisms in AI-driven academic systems

Correlations		*AI-driven academic systems*	*Data privacy mechanisms*
AI-driven academic systems	Pearson correlation	1	0.819**
	Sig. (2-tailed)		0.000
	N	183	183
Data privacy mechanisms	Pearson correlation	0.819**	1
	Sig. (2-tailed)	0.000	
	N	183	183
	DF	181	
	Significant at level	0.025	
	critical r–value	0.086	

The r-value is 0.819 in Table 5. This result was compared to the essential r-value (0.086) at 0.025 with 183 degrees of freedom to determine its relevance. The correlation coefficient (r = 0.819) above the cutoff (r = 0.086). Results were statistically significant. The findings show a strong link between data privacy and AI-driven academic systems.

- Hypothesis three: No significant proposed ethical guidelines exist for responsible AI integration in Jordan's academic settings.

Table 6 shows the 914 r-value. This result was compared to the important r-value (0.086) at 0.025 with 311 degrees of freedom to determine its relevance. The computed correlation coefficient (r = 0.914) exceeds the threshold correlation coefficient (0.086). Results were statistically significant. The findings show a strong association between Jordan's suggested ethical principles for integrating AI into academia.

Table 6 Correlation analysis of the relationship between proposed ethical guidelines for responsible AI integration in Jordan's academic settings

Correlations		*AI integration in Jordan's academic settings*	*Propose ethical guidelines*
AI integration in Jordan's academic settings	Pearson correlation	1	0.914**
	Sig. (2-tailed)		0.000
	N	183	183
Propose ethical guidelines	Pearson correlation	0.914**	1
	Sig. (2-tailed)	0.000	
	N	183	183
	DF	181	
	Significant at level	0.025	
	critical r–value	0.086	

6 Discussion of the findings

The examination of Table 1 and its related Table 4 demonstrates that the ethical consequences associated with integrating AI in academic settings in Jordan are contingent upon a balanced interaction between innovation and ethical considerations. By adopting AI as a tool that may augment education while upholding values of openness, privacy, fairness, and accountability, Jordan has the opportunity to establish itself as a frontrunner in the responsible integration of AI. Educators must focus on developing these skills by emphasising independent learning abilities in customised learning. And that academic institutions need to define clear lines of responsibility for AI-driven decisions, especially when things go wrong. Identifying who is accountable for AI errors and addressing those issues ethically is essential (Jobin et al., 2019). Hence, the result of the analysis caused the null hypothesis to be rejected while the alternative one was retained.

The examination of Table 2 and its matching Table 5 reveals the presence of data privacy protections among AI-driven academic systems. The research also emphasises the need for technological steps to protect data privacy. Encryption, anonymisation techniques, and effective cybersecurity policies are crucial in mitigating the risk of unauthorised access to confidential data. It is important to regularly perform audits and vulnerability assessments to detect and rectify any possible vulnerabilities within the data security architecture of the system. The result is cognate to the findings of Tyagi (2023), who asserted that the use of data by the AI system facilitates the assessment, prediction, and identification of patterns and trends. AI systems are widely involved in processing sensitive data, hence giving rise to issues over privacy. The enhanced data processing capabilities of AI systems exacerbate the risks associated with humans' limited capacity to manage and comprehend the use of their data effectively. Obar et al. (2018) also agreed that AI systems in academic institutions may collect and process sensitive student and faculty data, including personal and academic information. Ensuring data privacy and security is essential to prevent breaches and unauthorised access. Hence, the result of the analysis caused the null hypothesis to be rejected while the alternative one was retained.

The examination of Table 3 and its related Table 6 presents a comprehensive analysis that puts forward a set of ethical principles aimed at ensuring responsible integration of AI into the academic landscape of Jordan. One crucial observation is the need for comprehensive ethical norms that effectively tackle the many issues of integrating AI. The rules should comprehensively address the areas of data privacy, algorithmic transparency, bias reduction, and accountability procedures. Educational institutions, politicians, and AI developers must jointly establish contextually appropriate norms for Jordan's distinct socioeconomic and cultural values. The result agrees with the research findings of Aslan and Kizilcec (2020), who noted that the ethical guidelines for responsible AI in academic settings in Jordan can have several significant effects and benefits. The impact of such guidelines can vary depending on the specific implementation, the extent of adoption, and the local context.

Moreover, AI systems in education must be transparent and provide understandable explanations for their decisions and actions. And that educators, students, and stakeholders should have access to information about how AI algorithms work, the data they use, and the criteria they employ to make recommendations. Brynjolfsson and McAfee (2021) also stressed that AI should be used to enhance lifelong learning and develop critical thinking skills rather than as a replacement for educators. The focus should be on using AI to supplement educational experiences, not replace them. Hence, the result of the analysis caused the null hypothesis to be rejected while the alternative one was retained.

7 Conclusions

In summary, the research conducted on the ethical concerns surrounding the integration of AI in academic settings, with a particular emphasis on the delicate balance between fostering innovation and safeguarding student privacy in the context of Jordan, provides valuable insights into the crucial junction of technology and education. The results of this study emphasise the imperative need for a deliberate and all-encompassing strategy toward integrating AI in educational establishments while considering the ethical aspects that emerge.

7.1 Recommendations

Drawing from an extensive examination of the ethical implications associated with incorporating AI in academic settings within Jordan, this report presents a set of crucial suggestions to guide educational institutions, policymakers, and relevant parties. These recommendations are intended to facilitate a responsible and efficient integration of AI technology, emphasising fostering innovation and safeguarding student privacy. The objective is to formulate and execute a complete set of ethical principles that align with Jordan's cultural, socioeconomic, and legal frameworks. These frameworks must include data privacy, algorithmic transparency, bias reduction, and accountability systems. Frequent updates and conversations with relevant stakeholders are needed to maintain the endeavour's relevance and efficacy.

Promote and facilitate open, clear communication channels about integrating AI into academic institutions. This entails disseminating information on the AI user's purpose, extent, and ramifications to students, educators, parents, and the broader society. Open

discussions can foster trust and alleviate apprehensions about data privacy and ethical ramifications. Including rigorous data security protocols, such as encryption, anonymisation techniques, and safe data storage practices, is essential. It is essential to ensure that explicit, informed permission is obtained from students and their guardians regarding using their data inside AI systems. It is important to conduct routine audits and evaluations of AI systems to identify and address any biases that can perpetuate prejudice or injustice. Developing and implementing effective techniques for identifying and remedying biased results is essential to guarantee the equitable distribution of benefits arising from AI systems.

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