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Impact of AI Use on Students' Learning Competencies and Mental Health at Higher Education Institutions

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Abstract

The utilization of artificial intelligence (AI) in higher education institutions is inevitably on the rise. While it offers numerous advantages, particularly in academia, it adversely affects users' mental health and learning capabilities by hindering the development of creative skills. The current study examined the relationship between AI usage and mental health as well as learning competencies through a correlational design employing a deductive approach. To provide greater demographic representation, stratified and random sampling techniques were employed to engage participants. Survey data were collected from 175 undergraduate students utilizing a five-point Likert scale instrument. The results indicate an enhancement in students' cognitive abilities and self-directed learning, with a somewhat positive and statistically significant association between AI usage and its direct impact on students' psychological well-being. To maintain academic integrity, it is essential to emphasize the requisite institutional standards about AI usage. This study, confined to the higher education sector, has implications for other settings.

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Introduction

Contemporary students increasingly utilize artificial intelligence technology to accomplish assignments, obtain writing support, make academic choices, and meet diverse educational obligations (Darling-Hammond et al., 2020). The incorporation of AI in education presents numerous significant benefits: it improves comprehension of technological capabilities, heightens awareness of algorithmic mechanisms, offers adaptable applications across various contexts, and optimizes traditionally laborious learning processes (Boahene et al., 2019). When it comes to the extensive implementation of AI in educational environments, it generates considerable apprehension. Indeed, critics highlight algorithmic biases, the possible decline of critical thinking abilities, and the lack of emotional and motivational support inherent in human connection. Similarly, excessive reliance on AI tools for efficiency may jeopardize students' capacity for critical thinking and the cultivation of fresh ideas. This excessive dependence may lead to what Dato and Siddiqui (2024) characterize as a steady deterioration in critical thinking and genuine learning processes. In the same vein, comprehending student learning necessitates acknowledging its intrinsic complexity. Moreover, learning transcends mere knowledge acquisition and encompasses complex interactions among cognitive, social, emotional, and environmental elements (López Carrillo et al., 2024; Namjoo et al., 2023). Cognitive learning involves the mechanisms by which pupils process information, cultivate thinking abilities, generate responses, and understand their environment (Adityatama & Faizah, 2024). According to Piaget's cognitive development hypothesis, students advance through specific learning stages as they mature into adulthood. In the meantime, social learning is equally significant in student growth, where they also acquire knowledge incrementally within emotional contexts, where emotions and interpersonal relationships influence their educational experiences (Hmelo, 2004; Akbar Adityatama & Faizah, 2024). Notably, various theoretical frameworks highlight the complex nature of student learning, identifying motivation and environmental context as essential elements (Duan, 2024).

In the twenty-first century, digital networks, encompassing artificial intelligence, social media, and various online resources, exhibit unparalleled influence on student learning (Shahzad et al., 2024). This technological integration transpires within the extensive framework of university life, where students encounter academic pressures, personal obstacles, and social issues that can profoundly affect their mental health and overall well-being. Similarly, mental health is a crucial determinant of student achievement due to the intrinsic pressures associated with higher education (Amjad et al., 2024). The correlation between AI utilization and mental health introduces an additional dimension of intricacy to this domain. Nonetheless, research indicates that the integration of AI may exacerbate stress, anxiety, depression, and overall dissatisfaction among university students (Boahene et al., 2019; Idresne, 2024), underscoring the necessity for meticulous deliberation regarding the implementation and support of these technologies in educational environments. To adeptly navigate diverse challenges and sustain resilience, motivation, and vitality, individuals must uphold superior mental health (Zhang et al., 2024). Poor mental health might render students more vulnerable, thus affecting their overall psychological well-being. These vulnerabilities may render individuals more prone to mental health issues (Ponsford, 2016). Students consistently utilize AI tools in higher education to enhance their fundamental understanding. In this instance, the incorporation of AI affects students' mental health as well as their learning processes.

Problem Statement

In contemporary discourse, it is essential to underscore the influence of artificial intelligence on the educational experiences of students (Abbas, 2023). Furthermore, AI exerts an effect on students' mental well-being (Abbas, 2023; Shahzad et al., 2024), suggesting that the ramifications of their learning are inversely related to mental health in the context of AI utilization. In higher education institutions, students utilize AI to assist them in the completion of academic assignments and various projects (Alturki et al., 2022). Concurrently, students encounter a myriad of psychological challenges, encompassing stress, anxiety, depression, and a sense of discontent, largely attributable to their pervasive engagement with AI daily. Conversely, they encounter a deficiency in comprehension and proficiency within their particular disciplines, a diminished sense of self-assurance, an absence of foundational knowledge, a shortfall in analytical reasoning, and a scarcity of innovative thought in their educational pursuits (Wang et al. 2022). Students may experience a deficiency in comprehensive development as well. Among various influences, AI stands out as a significant factor impacting the learning experiences and mental well-being of students within higher education institutions (Pardeshi & Jain, 2024). A multitude of investigations into the effects of artificial intelligence on students' educational experiences and their implications for their mental well-being have been undertaken; however, notable deficiencies exist in the research emanating from local higher education institutions where students are engaging with AI tools in a practical context. Regardless of gender, students in higher education institutions in Sindh are the focus of consideration.

Research Objectives

- To determine the key factors influencing students' use of AI in higher education
- To assess the effects of AI usage on learning and mental health at this level.

Research Questions

- What are the key factors that drive students to use AI in higher education institutions?
- What effects does AI usage have on students' learning experiences and mental well-being at the higher education level?

Research Hypothesis

Null Hypothesis: There is no connection between learning through AI and the mental health of students at the higher education level.

Alternative Hypothesis: A significant relationship exists between learning through AI and the mental health of students at a higher education level.

Conceptual Framework

The relationship between Cognitive Load Theory (CLT) and the Unified Theory of Acceptance and Use of

Technology (UTAUT) was applied in this work. The factors that influence students in higher education to use AI technology were investigated using the UTAUT framework. Xue et al. (2024) clarify how students' behaviors and intentions toward using AI for learning are influenced by the frequent use of AI tools in the educational environment. Conversely, the Cognitive Load Theory (CLT), which emphasizes the psychological effects of academic pressure and assignment responsibilities, is used to evaluate the competency and mental health of students in higher education. As students aspire to academic success, CLT explains how too much information or badly built AI might negatively impact cognitive processing and mental wellness at the higher education level (Sweller, 2011). Students' learning processes are becoming more sophisticated as a result of their growing emphasis on employing AI technologies to accomplish tasks. Learning and mental well-being may suffer as a result. This underscores the influence of AI usage in educational settings as a significant factor affecting the learning competency and mental health of higher-education students, manifesting as stress, pressure, and anxiety. As illustrated in Figure 1, key factors drive the use of AI tools, affecting learning competency and mental health among higher-education students. This study offers genuine pathways for addressing these challenges.

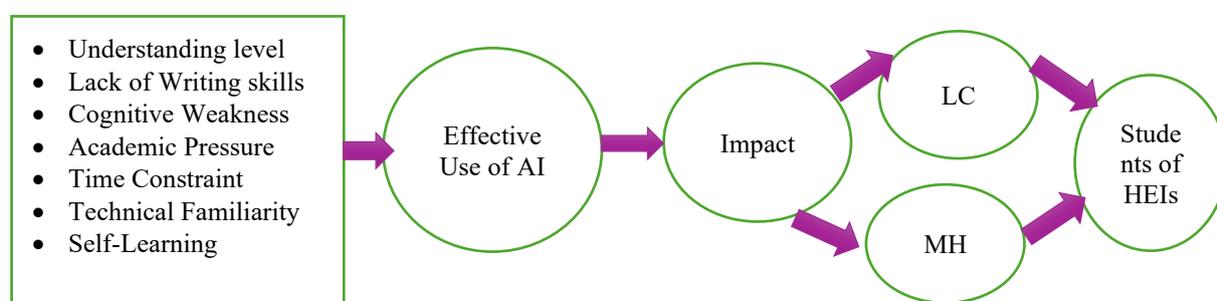


Figure 1. Conceptual Framework

Literature Review

Integration of AI in Higher Education Institutions

Artificial intelligence (AI) involves the deployment of machines and computer programs to execute tasks that typically require human cognition, such as problem-solving, data-driven learning, language comprehension, and decision-making. Within the realm of higher education (HE), AI encompasses tools such as ChatGPT, DeepSeek, and Gemini, a sophisticated learning system, alongside data analysis to facilitate teaching, management, and planning (Gadmi et al., 2024). The integration of AI in education can be traced back to the 1960s with rudimentary programs, such as ELIZA, which could engage in basic conversational exchanges (Young, 2024). By the 1980s, institutions such as Stanford had developed early intelligent tutoring systems that provided individualized assistance to students using foundational AI. At that juncture, AI was still constrained and predominantly utilized in research settings because of the prohibitive cost of technology. In the 2000s, AI became more accessible with advancements in computing and internet tools. It was incorporated into learning management systems (LMS) and online courses, such as Coursera and edX. These platforms employ AI to manage large student cohorts and customize lessons based on individual student performance. AI has also begun assisting students through virtual assistants and chatbots, offering guidance, answering inquiries, and connecting them to campus services. University leaders have recently leveraged AI to make informed decisions. It aids in analyzing student data to

identify trends, predict future needs, and optimize resource management (Abulibdeh et al., 2024). This enhances planning and budgeting effectiveness and increases accountability by highlighting results and areas requiring improvement (Shwedeh, 2024). In classrooms, AI enables educators to provide personalized support to students (Kehlenbach, 2024). Tools such as MATHia monitor how students solve problems and offer feedback tailored to their learning needs (Young 2024). This is particularly advantageous in subjects such as mathematics and science, in which each topic builds on the previous topic. Additionally, AI supports research by sorting large datasets, writing summaries, and even suggesting research ideas (Galdames, 2024). This conserves time and allows researchers to focus on creative endeavours. However, possessing technology is insufficient; educators and students must understand how to effectively utilize it to enhance teaching and learning (Almusawy, 2025). The integration of AI at the HEI level presents both a challenge and an emerging issue. Students increasingly rely on AI for minor tasks, potentially leading to significant future problems. Although AI can enhance education by making it more personalized and efficient, it must be employed cautiously. Without fairness, clear guidelines, and proper training, AI may exacerbate disparities instead of bridging them (Katsamakos et al. 2024).

The Influence of Artificial Intelligence on Students' Learning Competency

Artificial Intelligence (AI) revolutionizes the way education is delivered by giving students the cognitive, social, and technological abilities they need to succeed in the twenty-first century. Since students need to be ready for future employment prospects, the integration of AI into educational settings—especially at the K–12 level—is becoming more and more important (Chiu et al., 2024). AI has an impact on students' learning competencies in this setting. First, cognitive competence, which is the capacity to solve problems, think critically, and understand complicated concepts, is essential to AI education. Sanusi et al. (2022) state that strong cognitive abilities are required for pupils to understand AI concepts, which promotes interest in difficult subjects. Other learning skills, like independent learning and cooperation, are also improved by these cognitive capacities. Asio (2020) states that cognitive abilities are crucial for pupils to comprehend AI-related material. However, each learner experiences these skills differently. Gender and school type have different effects on cognitive ability in AI learning; students in public schools and male students have a higher correlation than students in private schools and female students (Sanusi et al., 2022). The development of these skills may have been limited by the 45-minute class sessions, indicating that more time and practice are needed to strengthen cognitive competency. Strong cognitive learners also do well in group environments, where cooperation fosters drive, creativity, and problem-solving skills (Ahn and Oh, 2024). Second, self-learning competency, or the capacity to learn on one's own, entails practice, analysis, and investigation without outside assistance. Because AI education uses cutting-edge tools and materials, it encourages self-learning. According to Chee et al. (2024), self-learning is supported by cognitive and tool-use skills. Third, it's critical to use AI technologies to enhance learning efficiently. The ability that has the biggest impact on AI material comprehension is when students use AI-powered platforms to solve problems or finish assignments. Students who successfully worked using AI tools showed a higher level of comprehension of the course material, according to Nguyen et al. (2024). Competencies like autonomous learning, teamwork, cognitive thinking, and tool collaboration are all made easier by AI, but not every student benefits equally. Due to their poor comprehension, poor writing, and poor cognitive capacities, some students turn to artificial intelligence (AI) technologies to finish their assignments. Academic dependence on AI is caused by a number of circumstances,

with regular use of AI impacting learning proficiency. Due to time restrictions or assignments, students frequently go to AI for help.

The Influence of Artificial Intelligence on Students' Mental Health

University students increasingly rely on artificial intelligence applications like DeepSeek and ChatGPT for essay writing, problem-solving, literature reviews, and summarization. While these tools provide immediate relief from academic pressures, their long-term implications for learning quality and mental health require careful examination. AI tools attract students through instant responses and clear explanations, helping alleviate academic stress (Tlili et al., 2023). However, excessive dependence on AI-generated solutions may undermine genuine learning processes. When students consistently bypass cognitive struggle, they risk entering examinations feeling unprepared and anxious, creating a disconnect between AI-assisted completion and actual understanding that can severely impact self-confidence (Kooli, 2023). Likewise, critical thinking and problem-solving skills require deliberate practice with challenging material. Students who consistently rely on AI may find themselves ill-equipped for future academic and professional challenges. While ChatGPT provides customized responses, it doesn't necessarily foster deep comprehension (Farrokhnia et al., 2023). This creates a troubling paradox where students appear successful on surface assessments while struggling with genuine understanding, leading to increased anxiety when facing real-world applications. Moving on to integrity challenges, widespread AI use complicates traditional academic honesty standards. Students increasingly substitute AI-generated content for original work, raising plagiarism concerns (Crompton & Burke, 2023). Modern AI's sophistication makes detection challenging, creating uneven playing fields where success depends more on technological savvy than genuine learning (Geerling et al., 2023). When honest students observe peers achieving higher grades through AI assistance, feelings of discouragement and unfairness emerge, leading to decreased motivation and mental stress. Similarly, AI reliance may diminish meaningful human connections in educational settings (Samadi et al. 2024). Students who consistently turn to chatbots rather than seeking help from professors or peers may experience increased isolation and miss valuable social learning opportunities (Lim et al., 2023). The irreplaceable value of human interaction—with its nuanced feedback, emotional support, and collaborative problem-solving—cannot be replicated by AI systems. Despite concerns, AI tools offer genuine benefits for students with disabilities or language barriers, providing translation and accessibility support that boosts confidence and reduces academic stress (Dwivedi et al., 2023; Lim et al., 2023). However, even positive applications require balance, as over-reliance may limit opportunities for developing independence and essential skills. An engagement paradox has emerged where students achieve improved grades through AI assistance without developing subject mastery. While initially beneficial, this often leads to academic disengagement and burnout when students lose connection to authentic learning processes (Chatterjee & Bhattacharjee, 2020). Notably, many institutions lack comprehensive AI policies, leaving students and educators without clear guidelines (Michle-Villarreal et al., 2023). While AI can enhance teacher-student engagement and provide timely feedback, it should complement rather than replace genuine learning initiatives (Kuhail et al., 2022). Indeed, the challenge lies not in rejecting AI technologies but in developing frameworks that harness their benefits while preserving essential human elements of learning. Academic communities must collaborate to establish guidelines promoting both technological literacy and authentic educational engagement, ensuring AI serves as an enhancement rather than a replacement of genuine

learning experiences.

The Utilization of Artificial Intelligence in Higher Education: Challenges and Coping Strategies

Higher education's (HE) use of artificial intelligence (AI) has greatly improved learning by tailoring course materials and offering quick feedback similar to that of advanced instructors. Through the automation of the grading process and the tracking of student progress, AI supports educators (Amin et al., 2025; Chiu et al., 2023). Even with these benefits, students still face several difficulties while utilizing AI. According to VargasMurillo et al. (2023) and Murtaza et al. (2022), students' privacy and data security are a major concern. Artificial intelligence (AI) systems' intrinsic bias, which might produce unfair results since they were trained on data from a small demography, is another important problem. As a result, students from different backgrounds might not get the help or feedback they need, which could result in less-than-ideal learning opportunities and unfair treatment (Nah et al., 2022). Additionally, many students are not familiar with the correct use and functionality of AI technologies, which presents a challenge (Lauchler et al., 2022). Furthermore, some teachers lack the necessary training to assist pupils in using AI effectively (Xu & Babaian, 2021). It's also critical to remember that teachers still need to provide emotional support and encouragement to their students, something that AI chatbots are unable to provide (Klasnja-Milicevic and Ivanovic 2021). Finally, the digital gap is made worse by differences in access to dependable Internet and digital devices, which disproportionately impact pupils in underserved or rural locations (Machado et al., 2025). AI can improve learning, but there are drawbacks as well that need to be considered. Concerns have been voiced about the psychological effects of AI's quick integration into daily life, including stress, worry, and feelings of inadequacy. To deal with these difficulties, a number of coping mechanisms have been found. Through upskilling programs, it is imperative to actively engage students in addressing stressors connected to AI, such as skill shortages or concerns about job displacement. AI-induced anxiety can be reduced by using problem-focused techniques like cooperative problem solving, but an over-reliance on AI may stifle innovation (Nasaj et al., 2025). ChatGPT users expressed relief after turning to AI for consolation and validation. Distress can be reduced by having candid conversations about worries regarding AI and remaining hopeful. By fostering interpersonal relationships, people can work together to minimize stress brought on by AI. While they shouldn't take the place of human connection, AI chatbots like ChatGPT and DeepSeek can be useful as a stopgap for people who don't have access to human support (Giray, 2025). By demythologizing technology, improving AI literacy can lower anxiety levels. Students' cognitive and emotional adjustments are facilitated by educational institutions that include AI in their curricula (Kim et al., 2023). Cognitive behavioral therapy can assist in reframing these difficulties, while mindfulness exercises can help reduce the stress brought on by the quick changes in technology. It is crucial to use a well-rounded approach that blends artificial intelligence (AI) capabilities with human-centric tactics.

Research Design

The impact of artificial intelligence (AI) on mental health (MH) and learning competency (LC) at Sindh, Pakistan's higher education institutions (HEIs), is examined based on positivist philosophy, which holds that social situations can be governed by the same rules that govern natural occurrences (Qadir, 2020). In order to prevent researchers

from influencing conclusions, this emphasizes the importance of objectivity in research (Rehman & Alharti, 2016). The relationship between AI use and learning competency, and mental health among Pakistani university students was investigated using a correlational research design (Bryman, 2016). For gender representation to be balanced, stratified random sampling is employed (Haer & Becher, 2012). Based on their active involvement with AI, 175 participants were chosen using Morgan's table (Krejcie & Morgan, 1970), and rigorous procedures were followed to acquire informed consent. Efficient large-scale data collection was made possible using a five-point Likert scale instrument that was modified and tailored based on a literature review (Creswell, 2008; Pentang, 2023). 17 items were utilized, with five items addressing the first research question through descriptive statistics and 12 items addressing the second research question using inferential statistics. In SPSS (version 27.0), descriptive and inferential statistics were applied to analyze the data. An adequate level of internal consistency was suggested by a Cronbach's alpha score of 0.733 (Coşkuner et al., 2021).

Results

As indicated in Table 1, the study sample consisted of 175 university students, of whom 88 were male (50.3%) and 87 were female (49.7%), with academic years ranging from one to four. Table 2 illustrates the interpretation of the student responses.

Table 1. Demographic Information

Characteristic	N	%
Gender		
Male	88	50.3
Female	87	49.7
Academic Year		
1-4	175	100

Source: Authors' work

In the context of artificial intelligence (AI) utilization in higher education, the highest mean score ($M=3.89$, $SD=0.958$) was observed among students who were recognized as employing AI applications in their academic pursuits. This was followed by students who frequently utilized AI tools to accomplish academic tasks ($M=3.54$, $SD=1.027$). Students in higher education benefit from AI assistance in completing assignments because of time constraints ($M=3.54$, $SD=1.087$), and the prompt feedback provided by AI tools enhances student confidence ($M=3.43$, $SD=1.080$). Additionally, AI contributed to an overall improvement in the quality of academic work ($M=3.37$, $SD=1.090$). According to the mean range outlined in Hassam's table, all responses fall within the moderate to high range (Hassam et al., 2015), indicating that familiarity with AI, completion of academic tasks, and academic pressure significantly motivate students to utilize artificial intelligence. Furthermore, as the data distribution did not meet normality assumptions, a nonparametric test, specifically Spearman's rho correlation test, was employed to examine the relationships between variables. Table 3 presents the results of Spearman's rho analysis. A moderate positive and statistically significant correlation was found between AI usage and learning competency (LC) ($r=0.351$, $p < 0.01$), suggesting that increased AI usage is associated with enhanced learning

competency. Conversely, no significant correlation was identified between AI usage and mental health (MH) ($r = -0.013$, $p = 0.863$), indicating that AI usage did not have a statistically significant relationship with mental health. Additionally, LC and MH demonstrated a moderately positive and statistically significant correlation ($r=0.259$, $p < 0.01$), implying that higher learning competency was linked to improved mental health. These findings suggest that while AI usage is positively correlated with LC, it does not have a similar effect on MH among higher-education students. Consequently, the null hypothesis was rejected, and the alternative hypothesis was accepted.

Table 2. Descriptive Analysis

Items	N	Mean	Std. Deviation
Students are familiar with AI applications used in education.	175	3.89	.958
Students frequently use AI tools to complete academic tasks.	175	3.54	1.027
AI tools help to complete assignments before the due date.	175	3.54	1.087
Feedback from AI tools improves the confidence level of students.	175	3.43	1.080
AI assistance improves the overall quality of the assignment.	175	3.37	1.090
Valid N (listwise)	175		

Source: Authors' work

Table 3. Correlation Analysis

Construct	Artificial Intelligence	Learning Competency	Mental Health
Artificial Intelligence			
Correlation Coefficient	1.000	.351**	-.013
Sig. (2-tailed)		.000	.863
N	175	175	175
Learning Competency			
Correlation Coefficient	.351**	1.000	.259**
Sig. (2-tailed)	.000	.	.001
N	175	175	175
Mental Health			
Correlation Coefficient	-.013	.259**	1.000
Sig. (2-tailed)	.863	.001	.
N	175	175	175

Source: Authors' work

Discussion

This study's findings provide significant insights into the correlation between artificial intelligence (AI) utilization, learning proficiency, and mental health among university students in higher education institutions in Sindh, Pakistan. The results indicated a moderately favorable and statistically significant link between AI tools and the enhancement of students' cognitive and self-learning capacities. Nevertheless, no substantial association was seen between AI utilization and mental health, indicating that AI usage does not directly influence students'

psychological well-being. These findings corroborate prior studies emphasizing feedback, promoting problem-solving, and augmenting self-directed learning (Young, 2024; Chiu et al., 2024). AI solutions such as ChatGPT and DeepSeek can enhance student engagement and inspiration. It facilitates the development of vital 21st-century competencies, including critical thinking and teamwork (Ahn & Oh, 2024; Nguyen et al., 2024). A moderate positive correlation has been identified between learning competency and mental health, emphasizing the significance of cognitive and academic achievement in enhancing students' psychological well-being, comparable with the findings of Sanusi et al. (2022). In contrast, the correlation between AI utilization and mental health is not statistically significant, differing from research that highlights the possible risks of excessive dependence on AI technologies, including diminished critical thinking, academic dishonesty, and heightened anxiety (Kooli, 2023; Crompton & Burke, 2023). This inconsistency may be attributed to the students' mild amount of AI involvement reported in this study, which likely did not escalate to a point that would negatively impact mental health. Moreover, assistance from peers, institutional regulations, and individual variances can mitigate the mental health impacts of AI utilization, as indicated by studies conducted by Lim et al. (2023) and Dwivedi et al. (2023). This study identified problems associated with AI adoption, such as deficiencies in digital literacy, disparities in technology access, and concerns over data privacy and bias in AI systems (Murtaza et al., 2022; Fui-Hoon Nah et al., 2022). These obstacles may impede the timely implementation of fair learning initiatives and infrastructure development. Moreover, the findings underscore the necessity for clear institutional regulations on the utilization of AI to prevent academic dishonesty and maintain academic integrity (Geerling et al., 2023). These findings align with the paradigm of cognitive competency and self-directed learning theories, which assert that technologically enhanced environments can foster independent learning and higher-order thinking (Asio, 2020; Chee et al., 2024). To ascertain the temporal alterations, the intricate relationship between AI utilization, learning competency, and mental wellness requires additional examination.

Limitations and Future Directions

Although the study offers significant insights, it possesses major limitations. The sample size was obtained from a limited number of higher education institutions in Sindh, which may affect the generalizability of the findings to other regions with distinct sociocultural contexts. The excessive dependence on self-reported data may reveal social biases. Furthermore, the study did not investigate perceptual or emotional responses, which could elucidate the psychological implications of AI applications. This study demonstrates that the utilization of AI is significantly and favorably correlated with university students' ability to improve their academic performance without adversely affecting their mental health. Additionally, reliance on self-reported data introduces potential social desirability bias, and the study's cross-sectional design prevents understanding of how these relationships evolve. Future research should explore the temporal dynamics of AI-learning-mental health interactions while incorporating objective measures and qualitative insights into students' subjective experiences.

Implications for Practice

These findings suggest that AI tools can enhance academic outcomes without compromising psychological well-being, provided they are implemented thoughtfully within supportive institutional frameworks. The key lies in

fostering moderate, purposeful AI engagement that supplements rather than supplants critical thinking and human connection. Educational institutions must develop nuanced policies that harness AI's educational benefits while addressing equity concerns and maintaining academic integrity standards that preserve the authentic learning experience students need for long-term success.

Conclusion

AI tools can significantly improve learning competencies while maintaining psychological well-being, addressing existing concerns regarding the adverse effects of technology on student mental health. The observed moderate positive correlation between AI usage and learning competency indicates that students effectively utilize these tools to enhance their cognitive and self-directed learning skills. The lack of adverse effects on mental health is noteworthy, suggesting that careful integration of AI can function as a beneficial educational tool rather than a psychological strain. Addressing significant barriers to equitable AI adoption is essential for progress, including gaps in digital literacy, unequal access to technology, and issues related to algorithmic bias and data privacy. These challenges pose a risk of establishing new forms of educational inequality, wherein access to technological resources influences academic success. The findings highlight the necessity of formulating comprehensive institutional policies that reconcile the educational advantages of AI with the demands of academic integrity. Future research should investigate temporal dynamics, analyze various types of AI engagement, and assess long-term implications across diverse cultural contexts to guide responsible AI integration in higher education.

Statements and Declarations

Conflict of Interest Statement: The authors declare no competing interests exist.

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