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Assessing the influence of generative AI tools on students' learning outcomes in institutions of higher learning

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Abstract

This study aimed to investigate the impact of generative artificial intelligence on student learning outcomes in higher education institutions. A mixed-methods approach was utilized, concentrating on a private university operating in Papua New Guinea. Data were gathered using an online questionnaire distributed to 101 intentionally selected students and 16 lecturers. Significant findings revealed enhancements in student grades, with several students utilising AI technologies for assessment completion, concept generation, and the exploration of study-related subjects. Both students and lecturers noted challenges, including limited access to computers, digital devices, and intermittent internet connectivity, along with the exorbitant cost of data. Furthermore, problems such as plagiarism arose, primarily due to the negligent utilisation of AI tools. This study sheds light on the impact of generative AI tools on student

learning outcomes, engagement, and academic performance in higher education institutions, thereby guiding evidence-based AI integration in educational settings. Higher education institutions must establish explicit policies and training initiatives to govern the ethical and successful application of generative AI tools in pedagogy. Furthermore, lecturers should be motivated to include these tools in their pedagogical approaches to augment student involvement and promote academic performance. The study concludes that generative AI technologies, when properly integrated and ethically governed, can substantially improve student learning outcomes in higher education institutions**.**

Keywords: Generative AI, academic performance, learning outcomes, pedagogical, Papua New Guinea

1. Introduction

The rapid adoption and integration of generative artificial intelligence (GAI) tools are significantly transforming the landscape of higher education worldwide. These tools have revolutionised various aspects of education, including content creation, personalised learning, assessment, and feedback, by generating outputs that mimic human-like text, graphics, and code. GAI is reshaping educational practices by creating new opportunities to enhance student learning outcomes and promote inclusive teaching methods (Kar et al., 2023; Wang et al., 2023). As students and educators increasingly incorporate AI into academic activities, there is growing interest in understanding its impact on student outcomes such as academic achievement, engagement, and critical thinking. While AI is perceived to offer the potential for personalised education and improved efficiency, it also raises concerns about academic integrity, equitable access, and responsible use.

While the potential benefits of these technologies are evident, their implications for student achievement, learning patterns, and the pedagogical approaches employed by educational institutions remain largely unexplored. The integration of AI-generated tools in education has brought about significant changes in how students learn and perform. Since their introduction in early 2023, higher education students have used generative AI to support their learning and academic development across various courses and disciplines (Chen et al., 2025). The implementation of generative AI tools in higher education has transformed traditional methods of teaching and assessment, promoting a more personalised approach that caters to individual learning needs and abilities. This shift has led to improved academic performance and increased student engagement (Aravith et al., 2022). These technologies facilitate real-time feedback, adaptive learning systems, and automated content generation, which have been shown to boost student engagement and academic performance (Chu et al., 2025; Varghese et al., 2025). Moreover, AI-powered analytics are increasingly used to process large-scale educational data, identifying patterns in student performance and informing targeted interventions for struggling learners (Chen et al., 2025; Mokmin et al., 2025). Research also suggests that such technologies can promote critical thinking and deepen conceptual understanding by encouraging students to critically evaluate AI-generated content (Naqvi et al., 2025; Pohn et al., 2025).

With the rapid advancements in AI, it has become crucial to understand how AI-generated technologies are influencing educational outcomes. This is particularly relevant within specific institutional contexts such as IBSUniversity, Papua New Guinea. By investigating their impact on academic performance, student engagement, and the overall educational experience, we can gain valuable insights into both the benefits and challenges of AI integration. These insights can inform future educational practices and policy formulation

and review, aligning with emerging trends in educational innovation (Fatahi et al., 2024; Wen et al., 2025).

The transformative impact of generative GAI on higher education is becoming increasingly evident across curricula, pedagogy, and institutional strategies. Amiri et al. (2025) emphasize that GAI, particularly tools such as ChatGPT, is reshaping teaching and learning by enabling the development of dynamic, responsive curricula that accommodate diverse student needs. Their study demonstrates that GAI functions not merely as a supplementary tool but as a catalyst for next-generation pedagogies that support personalized and flexible learning experiences. They contend that to fully harness the pedagogical potential of GAI technologies, educational institutions must undergo both structural and pedagogical adaptation and transformation.

Similarly, Liang et al. (2025) conducted a systematic review study that revealed how GAI has already begun to alter the landscape of instruction, assessment, and curriculum design in higher education institutions. Their findings suggest that the integration of AI-driven tools challenges traditional models of teaching, prompting the need for faculty training and policy innovation. The review concludes that to sustain quality and academic rigor, institutions must implement robust frameworks that incorporate AI into core educational functions, thereby ensuring its ethical and effective use in student learning and institutional advancement.

This study aims to evaluate the impact of GAI tools on student outcomes in higher education institutions by analysing their effects on academic performance, learning engagement, creativity, and critical thinking skills, as well as the ethical and pedagogical implications of their application. To achieve this aim, the following objectives were developed:

i) evaluate the impact of Generative AI tools on the academic performance of students at IBSUniversity.
ii) discuss the potential changes in student learning patterns and strategies associated with the integration of Generative AI tools.
iii) gain insights into the perspectives of both students and faculty members regarding the perceived benefits and challenges associated with Generative AI integration in the educational setting.
iv) Considering the findings, provide recommendations to key stakeholders in higher education

Despite the growing integration of generative AI technologies such as ChatGPT, Gemini, and others in higher education institutions, empirical evidence regarding their influence on student learning outcomes remains limited (Cordero, 2024), particularly in PNG. Most of the current literature emphasises the technical functionalities of these tools. Furthermore, limited studies have examined the ethical implications and instructional challenges encountered by educators and students in utilizing these tools. This study aims to address this gap by offering context-specific, evidence-based insights on the impact of generative AI technologies on student outcomes in higher education institutions, focusing on IBSUniversity.

2. Theoretical framework: Technology Acceptance Model (TAM)

This study is underpinned by the Technology Acceptance Model (TAM), established by Fred Davis in 1989 (see Fig. 1). The model outlines two principal aspects that affect an individual's intention to utilize a technology:

- Perceived Usefulness (PU) – the extent to which an individual believes that utilizing a specific system will improve their performance.
- Perceived Ease of Use (PEOU) – the extent to which an individual believes that utilizing the system will require minimal effort.

The Technology Acceptance Model (TAM) provides a systematic framework for evaluating how students' perceptions and attitudes toward generative AI technologies influence their usage behavior, and consequently, how this behavior affects their learning outcomes. It facilitates the connection between technology adoption and educational effectiveness, providing a theoretical framework for assessing both psychological acceptance and academic influence in higher education environments.

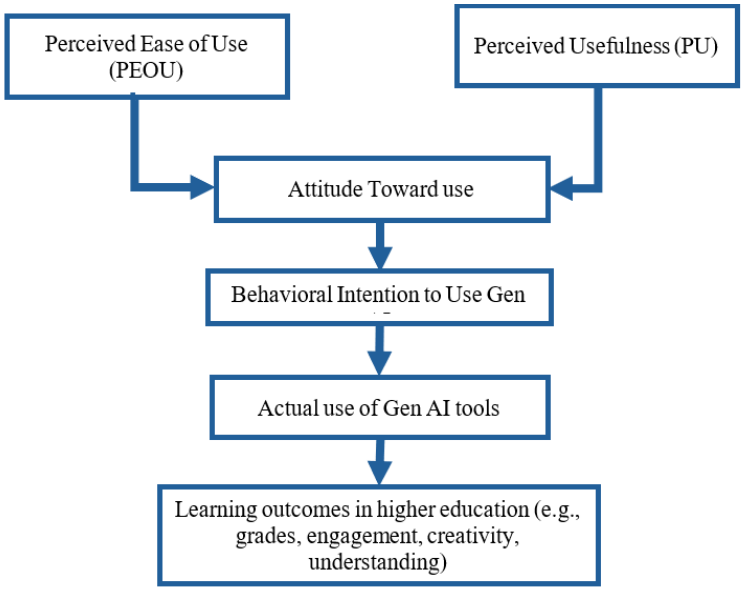

Figure 1: Technology Acceptance Model (TAM)
Source: Researchers' model

3. Review of related literature

Generative Artificial Intelligence in Education refers to the integration of AI technologies, particularly generative AI tools, within educational settings to improve learning outcomes, foster creativity, and optimise educational processes. A wide array of AI tools, including Large Language Models, for example, ChatGPT, content generation platforms, intelligent tutoring systems, and automated grading solutions, have shown the potential to enhance productivity and offer personalized educational experiences (Salih, et al., 2025).

According to Bura (2025), Nguyen and Hoang (2025), GAI is a transformative force in education, equipping the present and future generations with tools for deeper engagement and learning, and this aligns with the objective of this study. Students and educators alike have reported varied perceptions regarding GAI. This corroborates a study by Kim et al. (2025), who found divergent attitudes toward GAI's role, with students focusing more on utility and faculty stressing academic integrity. These perceptions directly inform how learning outcomes are perceived and measured. Johnston et al. (2024) reinforced this by analysing student viewpoints, emphasizing ethical dilemmas and academic conduct.

Bùi & Tong (2025) analyzed English-majored students' responses, revealing evolving patterns in handling academic integrity, implying strategic adaptations by students. Guillén-Yparrea (2024), on the other hand, offered perspectives from engineering students and faculty, which support observations of strategic behavioral shifts in learning. Barros et al. (2023) examined GAI's implications for research, teaching, and service, highlighting institutional and individual-level reflections. Khlaif et al. (2024) examined educators' acceptance of AI tools, adding the faculty perspective. Amani et al. (2023) and Al-Zahrani (2023) broaden this by surveying multiple academic roles.

3.1 Impact of AI technology on student learning experience

AI technology has influenced student learning and performance (Ou, 2024). Numerous studies highlight AI's role in providing personalized learning experiences (Ejjami, 2024), enhancing engagement, and improving academic outcomes through adaptive learning systems and intelligent tutoring (Slomp et al., 2024).

The impact of technology on learning is shaped by a complex interplay of pedagogical, institutional, and individual factors. Key influences include the learners' digital literacy, the alignment of technology with curricular goals, institutional support, and educators' attitudes toward technological integration. Al-Adwan and Smedley (2012) emphasized the importance of organizational readiness and teacher acceptance in their study of e-learning adoption in Jordanian higher education, highlighting that technological infrastructure alone is insufficient without a positive institutional culture and faculty engagement. Similarly, Chokri (2012) identified critical factors such as perceived usefulness, ease of use, and students' technological competency in the successful adoption of e-learning technologies. These findings suggest that for technology to effectively enhance learning outcomes, both human and systemic dimensions must be addressed concurrently.

Integrating technology into educational environments offers a range of benefits that enhance both teaching and learning experiences. One significant advantage is the ability to create engaging, interactive, and personalized learning experiences that cater to diverse learning styles and needs. Ranasinghe and Leisher (2009) emphasized that technology integration empowers students by developing critical thinking and problem-solving skills, ultimately fostering deeper engagement with learning content. Furthermore, Riasati et al. (2012) found that educational technologies, particularly in language learning, facilitate increased motivation, learner autonomy, and access to authentic learning materials. These studies affirm that when thoughtfully implemented, technology catalyzes pedagogical innovation, improving not just content delivery but also learners' cognitive and metacognitive development.

Despite the transformative potential of educational technologies, their integration presents several notable challenges and limitations. Key barriers include digital inequality, resistance to change among educators, technical issues, and a lack of pedagogically sound implementation strategies. Häfner (2020) categorizes these challenges by highlighting how immersive technologies, while promising, often encounter limitations such as liability concerns, user discomfort, and steep learning curves, which hinder widespread adoption in formal education settings. Similarly, Leer and Ivanov (2013) discuss the financial constraints and institutional inertia that obstruct the effective use of technology, arguing that without supportive policy, training, and infrastructure, digital tools may exacerbate existing educational disparities rather than bridge them. These insights underscore the need for a balanced approach to technology integration, one that not only leverages its strengths but also addresses systemic and contextual limitations.

4. Methodology

The study used a mixed-methods approach to investigate the impact of AI-generated tools on student learning outcomes at IBSUniversity in Papua New Guinea. This approach allowed for a comprehensive understanding of the phenomenon, consistent with best practices in research design (Creswell & Plano Clark, 2018). IBSUniversity was selected as a case study because it offers an ideal setting to gain a deep and comprehensive understanding of this intricate phenomenon within its natural context. This method is particularly advantageous for exploratory studies where the distinction between the phenomenon and its context is unclear (Yin, 2018). By concentrating on IBSUniversity, our research could intensely investigate the

impacts of AI tools on educational outcomes, facilitating the generation of detailed qualitative data and the identification of subtle aspects that might be overlooked in a more generalized study.

An online questionnaire was distributed to 150 respondents, including the 16 lecturers. One hundred and one (101) responses were received, representing a 78% response rate. The students were drawn from four schools, namely: the School of Economics and Development Studies, the School of Accounting and Finance, the School of Information Technology, and the School of Business and Management. Qualitative responses were obtained through face-to-face interviews with twenty students and five senior managers.

Documentary evidence was used to gather data on students' performance over three years, 2022-2024. This involved a comparative analysis of grades before the introduction of GAI tools, just after their introduction, and after they had been fully adopted. The analysis was aimed at identifying any statistically significant differences in student performance.

Quantitative data from surveys and grade analysis were analysed to identify patterns. Qualitative data from interviews were transcribed and subjected to thematic analysis to identify common themes and insights. The integration of the two methods occurred through a concurrent triangulation strategy, where both sets of data were collected simultaneously and then merged to interpret the overall findings.

Ethical issues in the study were addressed by obtaining informed consent, ensuring participant anonymity and data confidentiality, avoiding academic harm or coercion, securing institutional ethical approval from the ethics committee, and promoting responsible and transparent use of generative AI tools in line with academic integrity policies. To preserve anonymity, pseudonyms M1-M5 were employed to denote management, whereas pseudonyms S1-S20 were utilized to represent the students during face-to-face interviews.

5. Findings and discussion

5.1 Demographic information

The study participants included students and lecturers from IBSUniversity. The response distribution by school is as follows: 49% from the School of IT, 20.6% from the School of Business and Management, 18.6% from the School of Accounting and Finance, and 11.89% from the School of Economics and Development Studies. Among the lecturers, 40% were from the School of IT, 26.67% from the School of Business and Management, 20% from the School of Accounting and Finance, and 13.33% from the School of Economics and Development Studies. Other demographic information about the respondents is shown in Table 1.

Table 1: Demographic information about the respondents

Characteristics	Frequency	Percentage
• Age Group (Students) - (n=101)		
o Under 20 years old	11	11%
o 21 to 30 age group	89	88%
o 30 and Above age group	1	1%
• Age Group (Lecturers) – (n = 16)		
o 24 years old and below	0	0%
o 25 to 34 age group	4	25%
o 35 to 44 age group	5	31%
o 45 to 54 age group	5	31%
o 55+ age group	2	13%

• Year Level (Students) (n=101)				
○ 4th Year	15		14.9%	
○ 3rd Year	30		29.70%	
○ 2nd Year	40		39.60%	
○ 1st year	16		15.80%	
• Gender	Students		Lecturers	
○ Female	55	54%	5	31%
○ Male	45	45%	11	69%
○ Prefer not to answer	1	1%	0	0%

Source: Filed data

Objective 1: Impact of generative AI tools on student academic performance

The data presented in Table 2 compares average student performance metrics, such as GPA and grade distributions, across three distinct periods: Pre-Generative AI Usage, Partial Adoption, and Full Adoption. This segmentation enables a direct comparison of academic outcomes before and after the integration of Generative AI, offering insights into how these tools may be reshaping student achievement trends.

Table 2 below shows the analysis of student academic performance data across three school years: Pre-Generative AI (2022), Partial Adoption (2023), and Full Adoption (2024). The data demonstrate a clear upward trend in GPA averages (from 1.97 to 2.455) and a concurrent decline in failure rates (from 27% to 16%).

Interviews with Manager 1 (M1) revealed that the quality of students' assessments had improved, thus influencing the final grade. Thirteen of the interviewed students reported that AI was assisting them, although they encountered integrity issues, including plagiarism, which constitutes a serious academic violation. A solitary student remarked, *"Our lecturers prohibit the use of AI, yet the majority of their assessments are produced by AI. I feel it is unfair."*

These improvements are matched by a notable increase in the percentage of students attaining credit and distinction grades, particularly during full Generative AI integration. These findings suggest that the use of GenAI tools has enhanced learning effectiveness, possibly by supporting students with drafting, summarising, and problem-solving tasks. This is consistent with findings from Bura (2025), who notes that GenAI significantly contributes to personalized learning and academic support systems, especially for students who might struggle with traditional instruction modalities. These findings align with the Technology Acceptance Model, since students and instructors recognize its utility.

Table 2: Average Grades of Students from Pre-Generative, partial, and full adoption of Generative AI (2022-2024)

Description	**Pre-Generative AI Usage (2022)**	**Partial Generative AI Adoption (2023)**	**Full Generative AI usage (2024)**
GPA Average	1.97	2.17	2.46
High Distinction Percentage	3%	3%	3%
Distinction Percentage	11%	16%	19%
Credit Percentage	23%	29%	34%
Pass Percentage	32%	28%	26%
Failure Percentage	27%	25%	17%
Pass Percentage	72%	75%	83%

Source: Examinations Controller

However, despite overall gains, the percentage of students attaining high distinction remained static at around 3%, suggesting that GenAI may have a ceiling effect, improving performance mainly among low - to mid-achieving students without substantially influencing top-tier academic performance. This aligns with observations from Nguyen & Hoang (2025), who argue that while GenAI tools can foster engagement and help overcome language and structural barriers in learning, they are less likely to advance cognitive complexity or deep critical thinking in already high-performing students. Furthermore, the narrowing performance gap and increased pass rates raise important questions about the integrity and rigour of assessments in the AI-assisted era—an issue flagged by Bùi & Tong (2025) in the context of academic honesty and AI writing tools. Overall, the passage underscores the dual impact of AI in education: enhancing learning opportunities and knowledge exploration while also posing challenges related to academic integrity and policy coherence.

Figure 2 visually reinforces the positive academic trends associated with Generative AI integration. A clear upward progression in GPA average is seen across the three phases, rising from 1.97 (pre-GenAI) to 2.165 (partial adoption) and finally reaching 2.455 during full adoption.

Objective 2: Learning patterns associated with the integration of Generative AI tools

Table 3 presents the duration of generative AI tool usage by the students. 36.3% of students had been using AI-generated tools for less than six months, while another 36.3% had used them for more than six months but less than a year. Only 19.6% had been using generative AI tools for over a year, and 8.90% had never used them. *M4 stated: "Students utilizing AI are encountering difficulties with their assessments."* This was corroborated by all interviewees.

Table 3. Generative AI tools period of utilization by students (August 2024)

Characteristics	N	%
• Duration of Gen AI Utilization by Students		
○ Less than 6 Months	37	36.30%
○ 6 Months to one year	37	36.30%
○ More than one year	20	19.60%
○ Never used Gen AI	8	8.90%

Source: Field data

This distribution suggests that some students are still in the process of adapting Gen AI tools, while others have recently started using them. The data reflects a growing adoption trend, with most students in the early to mid-stages of incorporating Gen AI tools into their activities. This may suggest an ongoing learning curve and the need for further orientation or training to maximize effective use. It also points to potential opportunities for institutions to support students in becoming more proficient with these tools.

5.2 Utilisation of Gen AI tools in students' studies

Figure 2 presents insightful data on why students integrate GAI into their academic practices. A striking 70.3% of the respondents reported using AI tools primarily for explanations and clarification on concepts, highlighting the growing dependence on AI for personalized and accessible academic support. This was followed by writing assistance (55.4%), including tasks like drafting, editing, and paraphrasing, reflecting the AI tools' significant role in enhancing written communication and productivity. In addition, 41.6% of students employed generative AI for analysis and research, such as literature reviews and data interpretation, demonstrating how AI is increasingly involved in deeper cognitive tasks. 27.7% used it for coding and

programming, indicating a strong interest among technical learners, while 16.8% leveraged AI for creative projects like image or music generation. Notably, only 8.9% of students stated they did not utilize AI tools at all, suggesting widespread adoption across disciplines.

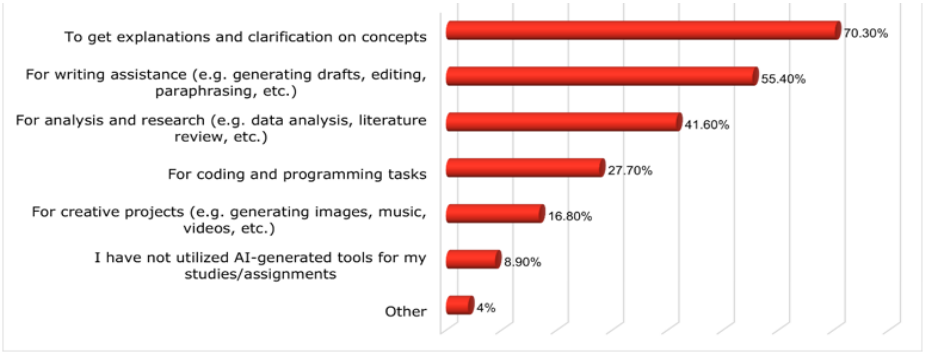

Figure 2: Students' Reasons for Using Generative AI
Source: Field data

The data illustrate a significant shift in how students are integrating AI into their academic and creative work, particularly in tasks requiring deeper cognitive engagement. A notable portion of students are using AI for advanced academic activities such as literature reviews and data interpretation, reflecting a growing reliance on AI for analytical and research-focused tasks. This trend underscores AI's expanding role beyond simple automation into areas that demand critical thinking and complex problem-solving. Additionally, 27.7% of students reported using AI for coding and programming, highlighting strong adoption among learners in technical fields. This suggests that AI is becoming a valuable tool not only for improving coding efficiency but also for learning new programming concepts and debugging. Meanwhile, 16.8% utilized AI for creative pursuits such as generating images or music, pointing to its versatility across disciplines. This cross-functional use shows that AI is not limited to analytical domains but is also empowering innovation in the arts and creative industries. Significantly, only 8.9% of students indicated they do not use AI tools at all. This low percentage demonstrates widespread adoption and integration of AI technologies among students, suggesting that AI is rapidly becoming a standard component of the educational experience across diverse fields of study. These findings align with Johnston et al. (2024), who emphasize that students view generative AI as a versatile academic aid, especially when financial accessibility enables broader use. All the participants indeed agreed that AI improves the students' learning outcomes. This finding aligns with the Technology Acceptance Model (Davis, 1989), indicating that students recognize its use and appreciate its ease of use.

Figure 3 shows that the integration of generative AI (Gen AI) tools has had a

predominantly positive influence on student engagement in academic settings.

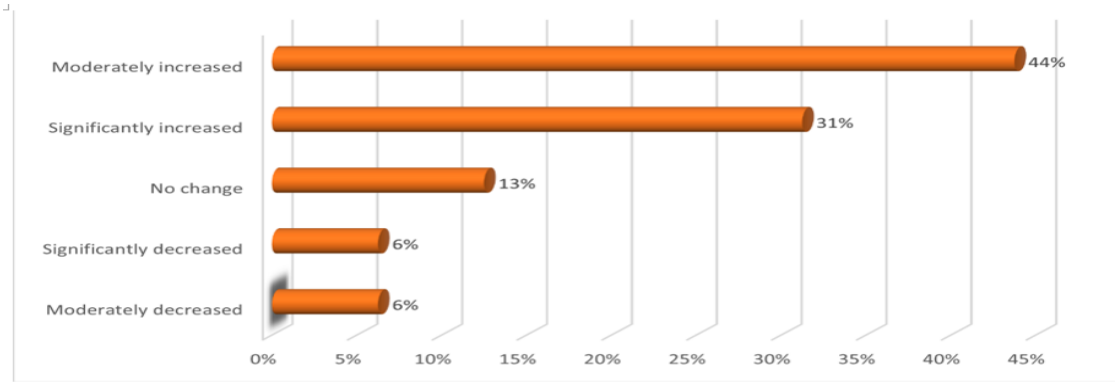

Figure 3: Impact of Gen AI on students' engagement
Source: Field data

Specifically, 44% of students reported a moderate increase, and 31% experienced a significant increase in class engagement, totalling a substantial 75% perceiving enhanced involvement. All those interviewed concurred that AI was playing a significant role in students' learning outcomes

This surge is likely attributed to Gen AI's capacity to offer real-time, personalized support, adaptive learning assistance, and improved access to academic content. These findings echo those of Johnston et al. (2024), who emphasized that Gen AI tools such as ChatGPT significantly enhance student motivation and conceptual understanding by facilitating personalized and flexible learning environments.

Objective 3: Benefits and concerns associated with Generative AI integration

5.3 Challenges of students using Generative AI

Figure 4 shows the challenges faced by students in using Gen-AI tools in academic work. The primary issue regarding AI-generated content is the danger of plagiarism, acknowledged by 77.5% of respondents. The second most often mentioned issue was a decline in creativity and critical thinking, reported by 57.8% of respondents, while 50% indicated that overreliance on AI impedes learning. Misunderstandings and factual inaccuracies in AI output were reported by 37.3%. Concerns regarding the authenticity of AI-generated work affected 26.5% of respondents. Time management challenges associated with AI were noted by 17.6%. Technical difficulties and usability issues with AI were identified by 11.8%. The digital divide, characterized by unequal access to AI, was recognized by 10.8%, while other concerns were minimal, with only 3% of respondents mentioning additional unspecified issues.

Interviews with senior management and the twenty students revealed the same. Management one (M1) stated:

> *"Many of our students struggle academically, which often results in a high similarity index in their assessments. We must educate them on the responsible and ethical use of AI tools.*

The data suggests that while AI tools offer potential educational benefits, serious concerns exist regarding academic integrity, overdependence, and the impact on student learning and thinking skills. Ethical use, accessibility, and accuracy remain key issues that institutions must address when integrating AI into education. This corroborates findings by Arowosegbe et al. (2024), where plagiarism was the top concern among UK university students using Gen-AI tools

(Arowosegbe et al., 2024). Equally pressing are cognitive concerns; over half of students report that Gen-AI use diminishes their critical thinking and creativity, a view echoed by Zhang (2025), who found that AI reliance can hinder autonomous and affective learning (Zhang, 2025).

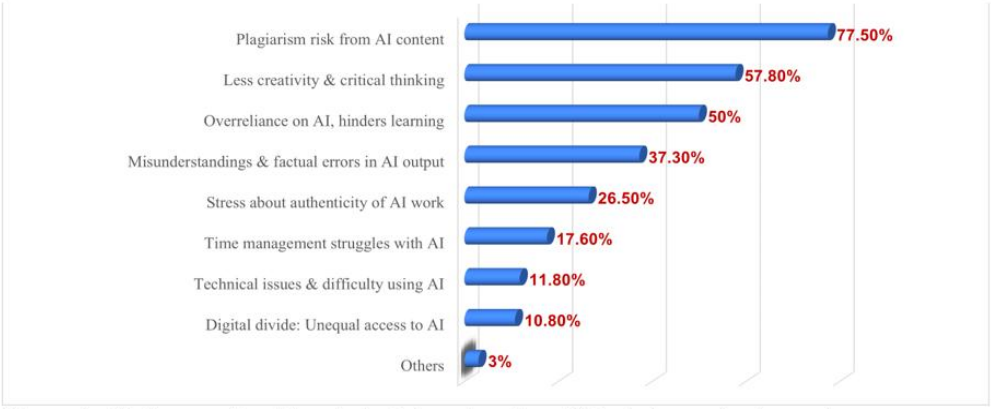

Figure 4: Challenges faced by students in using Gen-AI tools in academic work
Source: Field data

Adding to the problem, students also worry about incorrect information, relying too much on AI, and whether the AI-generated work is truly original. Miranda et al. (2024) found that less than half of students fully trust AI outputs, and many expressed difficulty interpreting or validating results, especially in low-support environments (Miranda et al., 2024). The digital divide also persists, with limited access to AI tools due to economic constraints, particularly in lower-income regions. Collectively, these findings underscore the need for ethical guidelines, institutional clarity, and digital literacy programs to ensure that AI serves as an aid to learning, not a replacement for it.

5.4 Benefits of students using Generative AI tools

The predominant advantage identified was research and idea production (73%), followed by individualized learning (60%), which occupied the second position. Accelerated feedback was recognized as a notable benefit by 56% of participants. Furthermore, learning support (46%) and writing assistance (45%) garnered comparable recognition. Forty-two percent of subjects moderately reported an enhancement in critical thinking. Simultaneously, an increased duration for learning (34%) and participatory, interactive experiences (31%) were perceived as supplementary advantages. A mere 2% referenced alternative benefits, indicating that the primary advantages were effectively encompassed within the specified categories. Responses from face-to-face interviews with the students and university management concurred that AI was indeed improving students' learning outcomes.

The data shows that students and educators largely see AI as a supportive tool for research, personalized learning, and feedback. There is a growing recognition of AI's ability to enhance various aspects of the educational process, from content creation to critical thinking. However, while the top benefits are clearly defined, lower percentages for engagement and automation indicate areas where AI's potential may still be underutilized or underexplored.

These findings are supported by Gasaymeh et al. (2024), who found that students valued generative AI tools for fostering creativity, simulating innovation, and enhancing engagement in academic writing tasks. Similarly, Holechek and Sreenivas (2024) observed that undergraduates frequently used AI tools for writing assistance and research ideation, underscoring AI's role in expanding students' cognitive reach and productivity.

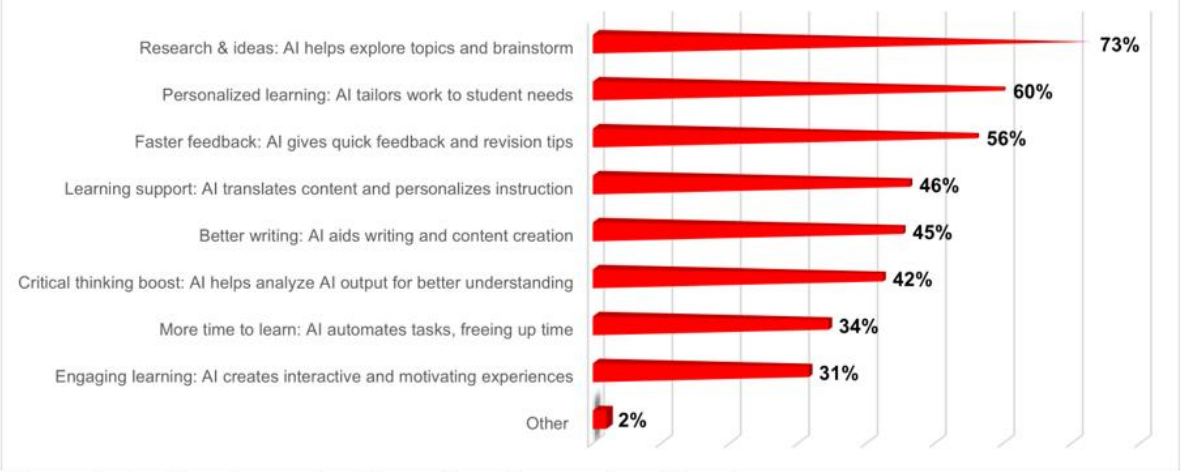

Figure 5: Students' perceived benefits of generative AI tools
Source: Field data

It also shows that students benefit from AI's ability to enhance their critical thinking and automate mundane tasks. As noted in the figure, 42% of students highlighted AI's ability to support analytical reasoning, while 34% appreciated the extra time it provides by handling repetitive academic tasks. These insights align with Gasaymeh et al. (2024), who recommend leveraging generative AI to deliver adaptive learning experiences and foster deeper engagement. Despite these benefits, the educational value depends heavily on how the tools are used. Ethical integration, teacher support, and AI literacy are crucial to ensuring that these technologies complement, rather than compromise, academic development.

6. Recommendations

To maximize the academic benefits of Generative AI while mitigating its risks, educational institutions should establish clear policies and ethical guidelines for AI usage in coursework. This includes training students how to responsibly engage with AI tools through AI literacy programs embedded in curricula. Additionally, there is a need to redesign assessments to focus more on open-ended, process-oriented, and oral evaluations that are less susceptible to automation. Ensuring equitable access to AI technologies across all student demographics is critical to prevent widening the digital divide. Institutions should promote a balanced, human-AI collaborative learning model that emphasizes critical thinking, creativity, and originality, positioning AI as a support tool rather than a substitute for student effort and intellectual development

7. Policy contribution

This study offers evidence-based insights to guide the formulation of higher education policies concerning the incorporation of generative AI tools inside academic settings. By emphasizing the beneficial effects of these technologies on students' learning outcomes, alongside the related problems, the findings can assist policymakers in developing strategic frameworks that promote responsible AI utilization. These may encompass policies about digital literacy, academic integrity, equal access to AI technologies, and ethical norms that guarantee the tools facilitate learning without compromising fundamental educational principles. The research emphasizes the necessity for national and institutional policies that reconcile innovation with accountability and inclusivity.

8. Contribution to practice

The study provides essential information for educators, academic institutions, and technology developers on the optimal integration of generative AI into teaching and learning processes. It discusses the tangible benefits students gain, such as improved learning experience, improved learning outcomes, deeper understanding, and tailored assistance, while also recognizing challenges like insufficient training or excessive reliance on AI tools. These findings can assist educators in reviewing pedagogical approaches, guiding curriculum reformation, and promoting the creation of AI-enhanced learning platforms customized for varied student requirements. The study enables practitioners to utilize AI technologies not as substitutes for instruction but as potent supplements that boost student engagement and academic performance.

9. Conclusions

The findings demonstrate that the adoption of GAI technologies has contributed to notable improvements in student academic performance and engagement. Quantitatively, average GPA scores increased from 1.97 to 2.455 across three academic periods—Pre-AI, Partial AI Adoption, and Full AI Usage, accompanied by a marked rise in the proportion of students attaining Distinction and Credit grades and a reduction in failure rates from 27% to 17%. Qualitatively, students reported using GenAI primarily for concept clarification and academic writing assistance, with 87% acknowledging a positive impact on their academic performance. Furthermore, 75% of students indicated heightened classroom engagement, suggesting that GenAI fosters not only academic achievement but also active participation in the learning process.

The most prominent concerns raised by students include academic integrity (77%), diminished critical thinking and creativity, and overreliance on AI outputs. Additionally, accessibility issues persist, with over 72% of students and 75% of lecturers citing limited access to GenAI tools due to infrastructural constraints or restrictive institutional policies. Lecturer responses further underscore a cautious stance, with only 19% expressing strong interest in GenAI integration, while a majority support its use with reservations. These disparities reflect a broader institutional uncertainty regarding the pedagogical and ethical implications of AI in higher education, reinforcing the need for clear guidelines, educator training, and inclusive technology strategies.

The results of this study support Davis's (1989) claim that individuals adopt technology primarily based on its perceived usefulness and ease of use. However, applying this model effectively requires careful consideration of contextual factors such as the affordances and accessibility of the technology for students from varied backgrounds.

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