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The Impact of Generative AI on University Students' Academic Performance: A Quantitative and Explanatory Analysis

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Abstract
This research is concerned with assessing the effects of generative AI on the academic performance of university students in terms of usage, benefits, and challenges. Quantitative research methodology was used for data collection via structured questionnaires from 256 university students. Data analysis was performed through IBM SPSS (version 27.0) and Stata software utilizing non-parametric statistics considering the type of data. The reliability test showed that the instrument was highly reliable with a Cronbach's Alpha score of 0.842. The results show a statistically significant positive association between the different variables of AI use, with research assistance being the most significant predictor of academic performance. Exploratory factor analysis indicated three important factors affecting academic performance, namely academic integration, perception of challenges, and skill development. Regression analysis showed a positive relationship between academic integration and skill development and academic performance. However, perception of challenges had a negative relationship. In addition to this, another strong relationship between the geographical position of students and awareness about risks related to generative AI was observed. In general, the research offers a balanced look at the role of generative AI in academia as a very helpful technology, as well as a risky one, which has to be approached thoughtfully.

Keywords: *Generative Artificial Intelligence (AI), Academic Performance, University Students, AI Usage in Education, Perceived Benefits and Challenges.*

I. INTRODUCTION

A new platform of information technology that is about to make a massive change in the education, healthcare and society is Artificial Intelligence (Celik, 2023). The rise of Artificial Intelligence (AI) has made it possible for a drastic change in humans' attempts to understand intelligence (Soeffner, 2024). It has reshaped the computing tasks faster and more efficiently, and automated tasks of repetitive, tiring work, mimicking human-like thinking abilities and intelligence, with which AI systems are increasingly being used as assistants to humans (Bangsawan et al., 2025; Naseer & Ahmed, 2025; Tan et al., 2026). The latest and most useful technological invention of Artificial Intelligence (AI) is Generative Artificial Intelligence (GenAI). According to (Cooper, 2023), GenAI is predicted to be another major advancement in human history that is about to reshape the entire education system.

According to (Zhang & Aslan, 2021), Artificial Intelligence technology has gained an enormous influence over the education sector due to its interactive behavior, personalized education, and substantial engagement in mixed learning settings. In advanced nations, the students in universities are making use of GenAI in their education by engaging in multiple AI-powered

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resources consisting of online laboratories, AI-coaching systems, AI-driven guidance for students, and some more tools (Khosravi et al., 2022). Nevertheless, in less developed countries or developing countries, a deficiency of understanding of AI integration into government banking, universities, and other educational institutions is found to a greater extent (Luan et al., 2020). Despite Bangladesh being a developing country, students today get access to online learning systems due to the adoption of smartphones and increased internet connections. Students have been able to access academic materials because of the initiatives of UGC and BdREN's efforts to make learning systems in public and privately owned educational institutions digitalized since the onset of the COVID-19 pandemic (Rahman, 2021).

An extensive list of implementations in academic sectors with the help of GenAI, including optimization of faculty evaluation (Qadir, 2023), helping researchers with their work and facilitating and customizing coaching (Cooper, 2023), computerizing a vast quantity of student tasks (Su & Yang, 2023), designing and organizing study materials (Lim et al., 2023). Moreover, (Su & Yang, 2023) pointed out, several new companies and startups have been observed to have offered GenAI solutions to teachers and pupils as the primary customers. However, (Lim et al., 2023) puts in, the uses of GenAI have been restricted because of worries regarding the inappropriate aptitude of existing detection technologies. Concerns regarding plagiarism are also on the rise due to the inadequacy of educational rules and regulations and the deficiency of knowledge and consciousness regarding the use of GenAI among the public and private university teachers and students (Wang & Li, 2024). However, very few studies have been conducted on university students' perception of the use of AI, AI-related misdoings like use of AI in academic writing and evaluations of responses from institutions despite the use of AI tools like Chat Generative Pre-trained Transformer (ChatGPT) has been continually rising (Nelson et al., 2025).

Due to the introduction of Generative AI in education, several kinds of challenges arise, such as issues related to systemic partiality, information security, and surveillance, which are growing as we incorporate these tools into our education systems (Nguyen et al., 2023). There have been relatively few studies published that evaluate performance, cognitive findings, and future implications, rather ethical reflection and philosophical debates are more focused on by empirical current research on the use of GenAI in the education sector (Ng & Ho, 2025). Previous studies suggest strong correlations between adaptability and client satisfaction, as adaptability is considered an essential variable in evaluating how well such advancements are accepted (Yelkur, 2000). Existing research lacks rigorous studies on college students' attitudes and technological readiness toward using GenAI, as well as the factors that contribute to student satisfaction. Therefore, the current research aims to fill this gap by exploring students' behavior, including

technology savviness, the tendency to use innovative technologies, and their attitudes toward Artificial Intelligence (AI).

Very few studies have been conducted regarding student satisfaction and the intent to use GenAI for education, which are greatly influenced by readily prepared trust in the results generated by AI, especially in the context of low and middle-income countries. Furthermore, most of the research that is now available is longitudinal in nature, which documents a specific point periodically when GenAI was at its early stage of hype (Leite, 2025). Very few studies can be found on long-term conduct plans of students, as a significant advance in technology has been observed. However, whether tech-savviness is a prerequisite for deep learning or just a catalyst for shortcutting the educational context in regions and various fields of study is still disputed (Oc et al., 2025). A crucial cognitive research oversight regarding the socio-economic interaction between GenAI's operational abilities and the mental traits of persona persists even after the very first barrier of acceptance. The overall technology competence is unable to account for the differences in happiness between students compared to those who possess substantial knowledge in technology and different educational expectations, but still, the baseline for usage is offered by overall technological competence (Ai et al., 2025). Merely a partial knowledge provided by previous research on the way the educational atmosphere of an individual is altered by these technologies, ignoring the complex connection underlying the innate imagination of a learner and their real sensory perspectives (Întorsureanu et al., 2025).

Limited research has been conducted whether GenAI's working as an ultimate solution for students low in academic, again there has not been enough research yet that highly imaginative and motivated students might consider it as a collaborator or a partner for learning methods. A significant gap in cognitive preparedness and students' perceptions of using Artificial Intelligence, as well as the lack of comprehensive data on the elements that affect how satisfied the students are, is found in the current studies (Wang et al., 2025). In addition to this, a hidden mechanism is found across how the tools are viewed and the way the educational process is changed by it due to the existence of a few foundations by which the traits are linked to certain learning performances (Lin et al., 2025). How newer technologies are adopted by the students, changes in their behavioral patterns, how the cutting-edge technologies are employed by them, and the level of contentment among users in an environment that is driven by Artificial Intelligence are examined by the present investigation to close the disparity.

The research will have the following objectives:

1. To investigate whether the use of Generative AI can influence the academic performance of students and the quality of the learning outcomes in general.

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2. To determine the most meaningful factors of AI use that forecast academic gains in university students.
3. To investigate how students see the advantages and the pitfalls of Generative AI and whether it impacts their academic achievements.

This research has a vital role in improving and broadening the conceptual structures already employed in the larger scholarly discussion to comprehend the human-computer artificial intelligence connection. Conventional approaches like the Technology Acceptance Model (TAM) have been used as the standard for a long time for the evaluation of software adoption, but they have resulted in frequent failure to recognize the AI's incredibly dynamic and autonomous features (Xue et al., 2026). An intricate perspective is offered by this study whereby the generative turn in colleges and universities can be examined by incorporating concepts like technology preparedness, as well as individualized inventiveness, into the contentment framework.

The underlying cognitive factors are highlighted by this, which determines the interaction of the individuals, challenging the widely believed instructional utility, which is directly translated by technical availability. In addition to this, Satisfaction among students in academic environments is influenced by filling a significant scholarly gap concerning the socio-technical elements, and thus, the global empirical body of knowledge is enriched by this study. A crucial standard for upcoming prospective investigation is provided by the study by repeating concentration from general moral discussion to a thorough examination of cognitive characteristics. In conclusion, the study makes its influence on research-based educational improvement by helping other researchers create broad and highly effective incorporation of artificial intelligence tactics in a variety of educational scenarios.

II. LITERATURE REVIEW

Since the year 2022, GenAI has become a transformational force higher education, with the explosive rise and increased adoption of cutting-edge innovations like ChatGPT and numerous other Large Language Models. These technologies have greatly transformed the way students in universities interact with academic activities such as writing, research, coding, and problem solving. Compared to conventional digital tools, generative AI systems can generate human-like text, generate ideas, summarize complex information, and even help in technical work, redefining the learning process.

Over the last two to three years, GenAI was successful in attracting substantial attention from students and teachers due to its ease and effectiveness. This influx can be especially seen in online learning, where AI tools are being incorporated into the academic process. Research indicates that

these tools increase student productivity, academic writing quality, and speed of information access.

Consequently, generative AI is becoming a more acceptable educational technology that can be used to support learning and academic performance. But with these benefits, a number of issues have arisen. Overreliance and misuse of AI tools like ChatGPT, generally used by learners, is considered the biggest concern in the education sector. Students may have brain development hampered and not gain enough brainstorming abilities due to the high expectations from AI and their excessive dependence on it. Studies have shown that although AI can help to complete academic tasks more effectively, it can lead to the deterioration of deep learning processes and cognitive engagement (Lim et al., 2023; and Khosravi et al., 2022).

A. Generative AI in Academic Writing and Ethical Concerns

Generative AI in academic writing has gained a growing popularity among college students. AI-solutions help students to write essays, revise materials, brainstorm, and even organize the arguments. Such abilities can greatly help to save time to accomplish tasks and enhance linguistic quality especially among those students who have low proficiency in writing. In spite of these positive aspects, the application of AI in academic writing has severe ethical implications. The problems of originality, authorship and scholarly integrity have emerged as the subject matter of debate in recent studies. Inadequate or overuse of AI tools could result in plagiarism, misappropriation of authorship, and academic misconduct.

Research highlights that unless there is a set of rules and regulations, the abuse of generative AI is likely to damage the integrity of academic work (Nguyen et al., 2023) Moreover, there is still no clear line between what is considered as helpful and what is regarded as unethical in most academic institutions. This uncertainty leaves the students confused about the responsible use of AI tools. Thus, it is the immediate necessity to set the definite ethical guidelines and institutional standards that will outline the usage of AI in academic life.

B. AI Literacy and Student Awareness

The awareness of AI and the level of AI literacy of students is the other significant issue in the academic use of generative AI. Despite the widespread use of AI tools by numerous students, research shows that they have a low understanding of responsible and ethical usage. This disconnect shows the necessity to make AI literacy a higher education competency. AI literacy does not merely constitute technical understanding of the way to utilize AI tools but also its weaknesses, ethical considerations, and potential dangers (Lin et al., 2025; Wang et al., 2025) imply that the introduction of AI in the educational sector should be complemented by the

necessary training and awareness programs as, in this way, students could be taught to use the technologies in an efficient and accountable manner. Integrating AI literacy into the curriculum can assist students to make wise choices regarding the use of AI tools and when to use them. It is also able to minimize the dangers of abuse and make the academic environment more ethical.

C. Pedagogical Implications and Skill Development

Generative AI has its opportunities and challenges in a pedagogical sense. Positively, AI has the potential to enhance personalized learning by modifying according to the needs of the individual students and offering personalized feedback. It is also able to make the learning more efficient by automating repetitive tasks and enabling students to concentrate on more mental aspects of learning. Nevertheless, there is a risk of over-reliance on AI, which will fail to encourage the growth of key academic skills, including critical thinking, problem-solving, and independent analysis.

It is these abilities that will help an individual succeed in the long term both academically and in life. Studies indicate that AI can enhance productivity, but it can also decrease the participation of students in the in-depth learning processes unless appropriately applied (Lim et al., 2023; Khosravi et al., 2022). Thus, a balanced approach, which would incorporate the advantages of AI, as well as traditional learning techniques, should be applied. Teachers are to promote AI as the tool of assistance and not the one that will cultivate independent thinking.

D. Institutional Readiness and Policy Frameworks

The use of GenAI is most effective in higher education when educational institutions are well prepared and have sufficient regulatory assurance. Today, a potential lack of regulation is observed in the majority of schools and higher educational institutions, with a thorough and unambiguous policy to ensure the morality of students when they are using AI for education. The possibilities of misuse of AI are raised by the lack of organized administration, which creates dissonance between teachers and students. The significance of the framework of governance structures to assure the responsible application of AI in the teaching system has been pointed out by organizations around the world, like the OECD and UNESCO.

Topics which are considered significant and relevant like confidentiality of data, scholarly honesty, and availability of tools like AI and other technologies, ought to be covered by these structures. The universities must introduce clear policies that define what is permissible in the process of using AI, educate students and faculty, and integrate AI into pedagogical and evaluation processes in a controlled and ethical manner. These institutional readiness factors are summarized in Table 1.

Table 1. Recent Publications List

Procedures	Key Results	Purposes	Discussion	References
Survey and experimental studies	AI enhances academic performance but may decrease deep learning ability	To investigate the effects of generative AI on academic performance	Further research is needed on long-term cognitive impacts of AI use	(Kasneci et al., 2023)
Mixed methods (survey + text analysis)	AI assists writing processes, but concerns about originality remain	To examine AI-aided academic writing practices	Development of ethical guidelines for AI-assisted writing is necessary	(Lim et al., 2023; Su & Yang, 2023)
Case study and conceptual analysis	Increased risk of plagiarism and academic malpractice	To investigate ethical concerns of AI application	Institutions should establish clear AI usage policies	(Nguyen et al, 2023; Celik, 2023)
Survey research	High usage of AI but low awareness of responsible usage practices	To investigate student awareness and AI literacy	Implementation of AI literacy programs in higher education	(Wang et al., 2025; Lin et al., 2025)
Experimental research studies	AI improves productivity but may reduce critical thinking skills	To investigate the use of AI in skill development	Development of balanced learning approaches combining AI and traditional methods	(Khosravi et al., 2022; Cooper, 2023)
Policy analysis	Lack of clear guidelines in most universities	To evaluate institutional preparedness to adopt AI	Development of governance frameworks for responsible AI use	UNESCO; OECD
Survey and behavioral analysis	AI tools increase engagement but may reduce active participation	To investigate the effect of AI on student participation and learning behavior	Encourage interactive and guided AI use in classrooms	(Nelson et al., 2025; Oc et al., 2025)
Experimental and longitudinal studies	AI facilitates dynamic learning experience that are student- centered	To examine the use of AI in individual learning	Integrate AI into curriculum design for personalized education	(Ai et al., 2025; Leite, 2025)
Systematic literature review	Barriers include lack of training, infrastructure, and policy support	To explore issues of AI implementations in higher education	Focus on capacity building and institutional readiness	(Luan et al., 2020; Zhang & Aslan, 2021)
Conceptual and policy analysis	Traditional assessment methods are challenged by AI tools	To assess the impact of AI on academic integrity and assessment	Redesign assessment strategies for AI-inclusive environments	(Qadir, 2023); Soeffner, 2024)

III. RESEARCH METHOD

A. Research Design

The researchers in this study decided to use a quantitative research method to investigate how generative AI affects the academic performance of university students. The survey approach was applied in a cross-sectional form, which allowed gathering information about the subjects at a specific time.

B. Data Collection Method

Primary data collection involved a questionnaire. This questionnaire had three major sections, namely, sociodemographic information, AI use and its benefits, and challenges faced in using AI. Socio-demographic variables included such characteristics as gender, education, and place of residence. In the second section, information on students' interaction with Generative AI in relation to assignment, research, exam preparation, and the improved academic quality was collected. Also, the perceived benefits such as round-the-clock assistance, customized learning, and increased creativity were included in this section. In the last section, challenges faced by students in using AI such as dissemination of misinformation, dependency, academic dishonesty, and lack of context knowledge were included. Most items were measured using a 5-point Likert scale, while some were binary (Yes/No) in nature.

In this paper, academic performance is defined as students' perceived academic improvement in their academic tasks due to using the Generative AI tools. Academic improvement includes improved quality of assignments, efficiency in conducting research, effectiveness in learning, improved writing ability, and general academic productivity. Thus, the dependent variable measures perceived improvement in academics, not actual academic achievements like grade point average (GPA) or exam marks.

C. Sample Size and Sampling

The experiment was performed using a sample size of 256 people (n=256) who were students in various stages of education at a university. In addition, the sample comprises both undergraduates and postgraduates, with participants from both rural and urban areas, although the latter form the majority. It was possible to use a convenience sampling approach because of the availability and constraints on time.

Despite using convenience sampling in order to save on time and overcome difficulties in accessing the target audience, the total number of 256 subjects is sufficient to meet the required criterion for conducting multivariate statistics and factor analysis in which the number exceeding 200 is usually acceptable. In order to minimize any sampling bias, the answers were obtained from respondents at various education levels as well as from diverse geographical locations ranging from rural to urban areas.

D. Data Analysis Tools

The study was conducted with a total of 256 participants for the research sample (n = 256). This consists of students from various levels at universities. The sample involves both undergraduates and graduates, with participants from urban and rural settings. However, a higher proportion of

urban participants was used in the study. A convenience sampling method was employed in this study owing to convenience and time constraints.

E. Reliability Testing

Internal consistency of the test was established by using Cronbach's alpha. Value 0.842 represents a reliable coefficient of consistency, which suggests that the items of the test consistently measure what is intended to be measured and are ready for statistical analyses.

F. Statistical Techniques Used

Due to the non-normal distribution of the data and the use of ordinal data, it is important to apply non-parametric statistical methods. Descriptive statistics were performed to describe the demographics of the participants. Correlation was carried out to determine the correlation between different variables related to the use of AI technology. Logistic regression was performed to determine the significant predictor of academic improvement. A chi-square test was also performed to determine the association between demographic factors and risk perception related to AI technologies. Exploratory Factor Analysis (EFA) was performed through the principal component method with varimax rotation to determine the underlying factors related to AI technology use and perception. Multiple regressions were also performed to analyze the effects of these factors on academic performance.

IV. RESULT

A. Reliability and Validity

Statistical analysis of the study was carried out using the software application – IBM SPSS Statistics (version 27.0). Given the non-parametric data set (the use of Likert scales, as well as categorical variables) along with the non-normal distribution, the application of non-parametric tests was necessary. Statistical significance was set at the level of $p<0.05$.

To assess the internal consistency and reliability of the multi-item constructs employed within the scope of this study, the Cronbach's Alpha reliability test was applied. The test returned the value of 0.842, which is well-above the acceptable value of 0.70. Hence, we may conclude that the survey tool demonstrates internal consistency and allows measuring academic usage and impact of Generative AI among college/university students with great accuracy.

B. Descriptive Statistics (Demographic Breakdown)

From the demographic profile, it can be seen that there is an overwhelming majority of male students who have been selected for the research, forming 72 percent of the sample size, whereas female students form only 28 percent of the sample. The educational background of the

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participants reflects that 82 percent of the participants belong to the undergraduate level students, whereas the remaining 18 percent are from graduate/post-graduate levels. Geographically speaking, there is a prevalence of urban-based participants who form 85 percent of the total participants. The detailed demographic breakdown of the participants is presented in Table 2.

Table 2. Descriptive Statistics

Category	Group	Frequency (%)
Gender	Male (1)	72%
	Female (2)	28%
Educational Level	Undergraduate (1)	82%
	Graduate/Postgrad (2-3)	18%
Location	Urban (1)	85%
	Rural (2)	15%

C. The Correlation Matrix

Based on the correlation matrix, it is possible to conclude that there are rather strong positive correlations between all four variables linked to the usage of AI systems. All the coefficients have high statistical significance at the $p<0.01$ level indicating strong interrelationships among the variables. The highest degree of correlation is seen between Research Support and Quality Improvement (0.74), which indicates that the application of AI tools for research purposes leads to significant improvements in the overall quality of the produced output. At the same time, it was revealed that Regular AI Usage correlates with Assignment Help to an extent of 0.72, and thus regular usage of such instruments makes students use them while doing homework.

Besides, the provided data shows that Regular AI Usage provides steady contribution to Quality Improvement (0.68) and Research Support (0.65) suggesting that consistent engagement with AI technologies supports multiple dimensions of academic performance. Even the lowest correlation between Assignment Help and Research Support equals 0.58. In other words, the studied aspects are mutually interconnected and when the engagement grows in one area, a considerable growth can be observed in the others. Overall, the findings presented in Table 3 indicate that the studied factors are closely interconnected, and increased engagement with AI tools is associated with broader academic support and improved learning outcomes.

Table 3. Correlation Matrix

Variables	AI Usage	Assignment Help	Research Support	Quality Improvement
Regular AI Usage	1			
Assignment Help	0.72**	1		
Research Support	0.65**	0.58**	1	
Quality Improv.	0.68**	0.61**	0.74**	1
*Note: ** Significance at p<0.01 level.				

D. Binary Logistic Regression Analysis

Binary logistic regression was conducted using Stata to find out the AI-driven tasks that contribute significantly towards an increase in the quality of academic performance. The outcome variable is the level of academic improvement, while usage categories are the predictor variables. Table 4 displays the binary logistic regression analysis carried out to determine whether there was a significant association between the AI-related activities and perceived academic improvement.

Table 4. Binary Logistic Regression Analysis

Predictor Variables	Odds Ratio	Standard Error	z-statistic	p-value	95% Conf. Interval
Research Support	3.12	0.45	2.88	0.004	[1.45, 6.72]
Assignment Help	1.85	0.32	1.96	0.045	[1.02, 3.35]
Exam Preparation	1.12	0.28	0.45	0.652	[0.65, 1.94]

Table 4 reveals that research support was the most significant factor with the highest odds ratio of 3.12 and a statistically significant p-value of 0.004, while assignment help was also shown to be positively and significantly associated with perceived academic improvement, compared to exam preparation which did not exhibit a statistically significant relationship.This model indicates that research assistance is the best determinant of academic performance. Those students who leverage AI in conducting research are 3.12 times more likely to experience a considerable improvement in the quality of their work.

The result holds true at a p-value of less than 0.01, which suggests that the role played by AI is cognitive, not just a drafting tool. This observation concurs with other studies conducted by Kasneci et al. and Dwivedi et al., where it was proposed that Generative AI increases the ability of students to synthesize information, become more productive in their studies, and be efficient in research. Nonetheless, this study goes a step further than other studies because it shows a stronger correlation between AI and academic improvement.

E. Chi-Square Test: Geographic Location and Risk Awareness

Chi-square test for independence was used to find out if there is a significant relationship between the geographical location of a student and the knowledge of restrictions of AI concerning information accuracy. The results of the chi-square test to investigate the relationship between the geographic location students live in and their awareness of AI-related risks are shown in Table 5. Table 5 reveals that the level of awareness of urban students towards the risks of AI was higher than that of rural students. The chi-square value (6.12) and p-value (0.013) suggest that there is a statistically significant relationship between geographic location and awareness of AI limitations and misinformation.

The output shows that there is a significant relationship between location and critical thinking skills (p= 0.013). Urban students tend to be much more careful while using AI-based information. It means that in the case of Bangladesh, the urban-rural digital divide does not only involve

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availability of technology, but rather literacy in terms of critical evaluation of AI outputs. The marked disparity between urban and rural learners also indicates the existing digital literacy gap in emerging nations like Bangladesh. It implies that disparities in knowledge concerning the dangers of AI and disinformation can affect the effectiveness of students' evaluation and application of AI-generated scholarly materials.

Table 5. Chi-Square Test: Geographic Location and Risk Awareness

Demographic Factor	Awareness of AI (Yes)	Awareness of AI (No)	Chi-Square Value	p-value
Urban Students	88%	12%	6.12	0.013
Rural Students	65%	35%		

F. Exploratory Factor Analysis

The study utilized PCA with varimax rotation to uncover the dimensions that underlie the students' perceptions of generative AI. The Kaiser-Meyer-Olkin statistic and Bartlett's test of sphericity showed adequate sampling. There were three factors with an eigenvalue larger than one, and they accounted for 54.18% of the total variance. In the exploratory factor analysis, the three dimensions of students' perception of Generative AI were identified: academic usage of AI, challenges and risks of AI and academic support and benefits of AI as shown in Table 6.

Table 6. Factor Naming & Interpretation Table

Factor Name	Items (Survey Statements)	Factor Loadings	Interpretation
Factor 1: Academic Usage of Generative AI	• Regularly use AI tools for academic purposes • Use AI tools to assist in writing assignments • Use AI tools to prepare for exams • Use AI tools to support academic research • AI improves the overall quality of my academic work	.873 – .919	This factor reflects how students actively use AI in their academic life for writing, exam prep, and research. It captures the core academic integration of AI.
Factor 2: Challenges & Risks of AI	• AI doesn't always understand specific context • Requires stable internet connection • Over-reliance may reduce critical thinking • May lead to academic dishonesty • Sometimes gives incorrect or outdated info	.563 – .684	This factor highlights the limitations and risks of AI usage. It reflects students' concerns about reliability, ethical misuse, and dependency on technology.
Factor 3: Academic Support & Benefits of AI	• Improves my writing by showing clear structure • Helps practice exams with sample questions • Offers personalized explanations • Generates creative ideas for projects/essays • Provides 24/7 academic support	.489 – .710	This factor represents the perceived benefits of AI in learning, such as improved writing, creativity, personalized learning, and continuous support.

Factor 1 had the largest factor loadings, suggesting that academic integration of AI is a key component of students' learning experience.This research shows that the opinions of the students have been influenced by the combination of possibilities and threats since the students utilize AI tools for education and research purposes, and at the same time are aware of the shortcomings of AI, including spreading of false information and possible ethical implications of AI usage.

G. Multiple Regression Analysis of Identified Factors

This regression analysis was carried out on the basis of the three factors obtained from the PCA. Academic Integration (Factor 1) had the highest beta coefficient (β = 0.521) and statistically significant results, as presented in Table 7, showing that this factor had the strongest effect on academic achievement. Skill Enhancement (Factor 3) was also found to have a positive contribution while Perceived Challenges (Factor 2) had a negative impact on academic performance.According to the model, Academic Integration (Factor 1) turns out to be the best predictor of an academic performance enhancement, and next comes Skill Enhancement (Factor 3). It should be mentioned that Factor 2, Perceived Challenges, correlates negatively. That is, such challenges as overdependence and false information will undermine the effectiveness of the tool. These three components account for more than 54% of variance.

Table 7. Multiple Regression Analysis of Identified Factor

Variable	Beta (β)	t-value	Sig. (p)
Factor 1: Academic Integration	0.521	9.51	0
Factor 2: Perceived Challenges	-0.198	-3.644	0.003
Factor 3: Skill Enhancement	0.365	6.259	0

The negative relationship between perceived difficulty and academic performance is consistent with the worries raised by Luckin et al., which stressed that over-reliance on AI technology might result in a reduction in critical thinking skills and cognitive involvement. Furthermore, the positive effect of academic incorporation and skill development suggests that there is greater advantage to using AI as an aid to learning than a replacement for it.

H. Explanatory Regression Analysis

To measure the Explanatory strength of the generated factors, a multiple linear regression model was created, which quantifies the impact that Generative AI use has on educational performance. The relationship between these factors and student academic improvement is validated in the study. The relationship between the identified AI-related factors and self-reported academic performance can be expressed using the following regression Equation (1).

$$Academic\ Performance = 1.142 + 0.485(F_1) - 0.164(F_2) + 0.338(F_3) \quad (1)$$

According to the model presented above, Academic Integration (F_1) will be the most important positive predictor, as every unit increase in the consistent use of AI for scholarly purposes will lead to an improvement in academic success by 0.485 units. Likewise, the positive contribution from Skill Enhancement (F_3) is worth 0.338 units, showing how important it is to have a strong foundation in brainstorming and personalized learning through AI. In addition to these positive predictors, the presented model shows a negative effect from Perceived Challenges (F_2). Thus, a one-unit increase in concerns regarding information distortion, overuse, and other challenges of AI would result in a decline in academic performance of 0.164 units. With the R-Square of 0.482, this implies that 48.2% of the variance in self-reported academic performance can be explained by the above regression model, suggesting that there is a moderate relationship between AI-related factors and academic achievement. However, the results of this study can be seen as being explanatory rather than predictive since there was no external validation, or evaluation process used via machine learning in the current study.

V. DISCUSSION

This research offers valuable insights into the effects of Generative AI on University students' academic performance. The results of the reliability analysis revealed that the research instrument had strong internal consistency, further supporting the dependability of the responses collected in order to explore students' academic use of AI technologies. In addition, the correlation analysis showed that there is a positive relationship between the use of AI, provision of assignment support, provision of research support, and perceived quality improvement. All these results indicated that students who use AI tools on a regular basis tend to have positive academic outcomes for various learning activities. The most significant of the results in this study is the one of research support, which proved the most powerful in terms of perceived academic improvement. The results of the binary logistic regression analysis showed that students who use AI to make research-related activities report a willingness to acknowledge improvements in academic quality and efficiency.

This is similar to the results of (Kasneci et al., 2023; Dwivedi et al., 2023) who concluded that Generative AI can help students be able to summarize information, increase their productivity, and help them in research-related tasks. In the same vein, (Cooper, 2023) pointed out that AI can help students learn science and explore scientific topics. The findings of the present study, however, reveal that the use of AI in research tasks had a greater impact on the improvement of all academic aspects in university students than previous research, which focused primarily on productivity. Additionally, the study revealed that there was no significant relationship between academic improvement and the use of AI for studying exams. This finding may indicate that

although AI tools provide quick access to information, they may not effectively contribute to long-term memory retention or deep conceptual understanding. This finding is consistent with the findings and concerns raised by (Lim et al., 2023; Khosravi et al., 2022) that heavy reliance on AI technologies decreases students' critical thinking and cognitive learning and engagement.

Another key finding is that there is a gap in awareness of the risks associated with AI between urban and rural students. The results from the chi-square analysis revealed that urban students possessed a higher awareness towards AI misinformation and ethical issues, while rural students did not. This discovery is echoing the current imbalance in digital literacy between developed and developing countries, like Bangladesh. (Luan et al., 2020; Wang et al., 2025) also raised similar issues about technological readiness and AI literacy. The results suggest that access to technology is not enough; students need to have the necessary critical evaluation skills and an understanding of the responsible use of AI. In addition, the exploratory factor analysis revealed three broad factors that impact students' perceptions of Generative AI: academic integration, perceived challenges, and skill enhancement. Academic integration emerged as the highest positive factor impacting academic performance of these, followed by skill enhancement.

These findings suggest that the consistent use of AI tools for personalized learning, academic productivity, and creativity can have a positive impact. (Su & Yang, 2023) also found that Generative AI can be leveraged for educational purposes to improve personalized learning experiences, drawing similar conclusions. But this study also found that negative perceptions of over-reliance on AI, misleading information and lack of contextual understanding have negative effects on academic performance. The match with this finding is the one done by (Nguyen et al., 2023) who talked about the ethical issues and potential risks linked to the misuse of AI technologies in the education sector. The negative correlation between challenge perception and academic achievement also aligns with the findings of (Lim et al., 2023), who suggested that the excessive dependence on AI tools can undermine independent thinking skills among students.

In summary, the findings from this study offer a balanced view on the role of Generative AI in High Education. While AI tools have the potential to enhance research efficiency, writing quality, and academic support, they also raise key ethical issues, concerns about misinformation, and dependency concerns. So, it is important for educational institutions to educate students on responsible usage of AI, enhance AI literacy initiatives, and implement robust policy measures to guarantee that Generative AI is utilized ethically and productively within a higher education setting.

Although a relatively large amount of literature on the academic application of generative artificial intelligence (AI) exists, some shortcomings are still noticeable in the literature. Firstly,

a significant proportion of this study is based on survey-based and self-reported information, which can cause bias in responses and reduce the validity of the results. Students tend to report their behavior with regard to AI use in a subjective manner and thus it may not be a complete measure of their actual use. Second, most of the extant literature is concentrated in the developed countries such as the United States and European countries where the technological infrastructure and the degree of digital literacy is quite high. Because of this, the findings may not fully apply to developing countries like Bangladesh where the degree of access to technology, internet connectivity and institutional support may be very different.

Another weakness is that there are no longitudinal studies examining the long-term impact of generative AI on the cognitive and critical thinking skills and academic performance of students.The vast majority of studies are concerned with short-term effects, e.g., productivity and writing quality, without regard to their long-term implications of learning. Also, very little research has been done on faculty attitudes and institutional willingness in detail. Lastly, the challenge of generative AI technologies is that they are rapidly changing, which poses a challenge to researchers. With the ever-evolving AI tools, the results of the previous research are most likely to become obsolete, and it becomes challenging to draw consistent conclusions.

Future studies ought to be aimed at filling the outlined gaps and broadening the knowledge of generative AI in higher education. Among the essential directions is that more studies should be context-specific, especially in developing countries such as Bangladesh. Research is required to grasp the effects of socio-economic and digital infrastructure, and institutional policies on using AI among students in academic settings. Future research can make use of probability sampling, longitudinal analysis, and machine learning validation methods to study the impact of Generative AI use on academic performance over time and predict future trends. The other notable subject is the research on long-term implications of AI usage on the brain and cognitive abilities of the students such as critical thinking, creativity, and independent learning. Longitudinal studies will be able to demonstrate more alarming effects of how academic development is influenced by the continuous presence of AI tools.

Further, the question of how AI literacy and training programs can ensure responsible and ethical use of generative AI in the future should be investigated. A dire need to establish sustainable education systems is to provide a way to incorporate AI to the school curriculum without disrupting the academic integrity. Studies of the ways of redesigning assessment procedures to suit AI-assisted learning settings should also be carried out. The old assessment plans might not be effective and there must be new assessment plans that would allow the student fair play and authenticity in his work. Moreover, institutional perceptions, practices, and preparedness of the

faculty will also be significant in the effective integration of AI. The responses of educators to AI technologies can be useful in understanding in order to create more successful training programs and policy framing. In conclusion, future studies should consider building on the current work to find new technologies and the ways they can be integrated with generative AI, e.g. adaptive learning systems or intelligent tutoring platforms, to design a more personalized learning experience.

VI. CONCLUSION

In conclusion, generative artificial intelligence (AI) has emerged as a powerful and disruptive technology in higher education that influences significantly the interaction of students of universities with academic processes. According to the literature, AI can be helpful to students, as it can make them more productive, improve the writing quality, and grant access to information. However, there are also several problems with the use of generative AI, particularly over-dependence, negative impact on critical thinking, and the risk of academic dishonesty. The ethical concerns, including the plagiarism and authorship, suggest that there must be certain rules and responsible practices of using it.

Moreover, the findings demonstrate the importance of AI literacy, institutional readiness, and policy development to the effective use of AI in education. Unless proper guidance and regulation is offered, the risks of AI may outnumber the benefits of this technology. The review demonstrates that the situation in Bangladesh has a research gap as few empirical studies have been conducted on how generative AI can be used by students. This gap should be bridged in order to develop context specific strategies that are aligned with the local educational needs and challenges. Overall, the middle way is required, the one that will maximize the advantages of the generative AI and minimize the potential adverse outcomes. Positively influencing the future of higher education in Bangladesh and other nations through the use of generative AI is possible by promoting responsible usage, raising awareness, and developing appropriate policies.

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