



Recognized by: Higher Education Commission (HEC), Government of Pakistan

---

## Beyond Access: Socioeconomic, Academic and Disciplinary Determinants of Generative AI Use in Higher Education

### Sualeha Zafar\*

Lecturer, Department of Education, Govt. Sadiq College Women University Bahawalpur, Pakistan.

[sualeha@gscwu.edu.pk](mailto:sualeha@gscwu.edu.pk)

### Farzana Shaheen

Independent Researcher.

[fshaheen41@gmail.com](mailto:fshaheen41@gmail.com)

### Shahzad Ahmad Khan

Senior Special Education Teacher, Govt. Secondary School for Blind Bahawalpur, Department of Special Education, Pakistan.

[shahzad.dg@gmail.com](mailto:shahzad.dg@gmail.com)

### \*Corresponding Author

---

#### ABSTRACT

Although generative artificial intelligence (GenAI) is swiftly revolutionizing higher education, it prompted significant inquiries on adoption trends, equity and academic consequences. This research investigates the factors influencing the utilization of generative AI among university students, emphasizing demographic, academic, socioeconomic and technological variables. Data from a survey of 333 students were analyzed through cross-tabulations and chi-square tests to evaluate associations between the frequency of GenAI usage and variables such as gender, academic discipline, residence, parental education, household income, internet access and academic achievement. The findings demonstrate extensive adoption of GenAI, revealing notable disparities based on gender and academic specialty. Male students and individuals studying natural sciences indicated elevated levels of continuous usage. Socioeconomic characteristics, especially household income and parental education, significantly predicted both internet access and the frequency of generative AI usage, highlighting enduring digital disparities beyond mere access. GenAI usage was favorably connected with academic performance, suggesting it can boost academic success when correctly applied. Results show that discipline-

---

---

specific and equity-oriented institutional regulations are needed for effective and accountable AI implementation in higher education.

**Keywords:** Artificial intelligence, Generative AI (GenAI), Higher education, Demographic, Academic, Socioeconomic, Internet access, AI usage, Parental education.

---

## INTRODUCTION

Generative Artificial Intelligence (GenAI) has transformed higher education, changing how students study, create and complete tasks. Incorporating tools of GenAI like, Gemini, Copilot and DALL·E into educational practices supports tailored learning pathways, facilitates research and enhances cognitive productivity (Jin et al., 2025; Kasneci et al., 2023). The incorporation of these technologies signifies a transition to algorithmically mediated learning settings, where students engage with intelligent systems as co-creators of academic content.

However, the proliferation of generative AI within higher education continues to be inconsistent. Current discrepancies in access, proficiency and utilization frequently reflect overarching structural inequities influenced by academic, departmental and socioeconomic contexts (Zawacki-Richter et al., 2024). Previous studies indicate that students' adoption decisions are affected by performance anticipation, perceived effort and value-cost assessments (Aldreabi et al., 2025). Nevertheless, insufficient focus has been directed towards the influence of academic discipline, accomplishment level and socioeconomic background on the actual usage habits and levels of AI literacy in university environments.

Empirical research demonstrates that discipline affiliation substantially affects adoption patterns, with STEM and business students showing heightened engagement due to technical exposure and the direct relevance of AI to their academic tasks (Kubullek et al., 2024). Likewise, socioeconomic factors—especially family income and parental education—continue to be significant determinants of technological access and literacy (Bassignana et al., 2025). Academic achievement seems to mediate involvement, as high-performing students (assessed by CGPA) are inclined to utilize generative AI more strategically for research, writing and analytical reasoning (Marjerison et al., 2025). These findings collectively indicate that the adoption of generative AI is not solely an individual or cognitive choice, but rather one that is situated within social and institutional hierarchies.

In light of this context, the current study examines the academic, demographic and socioeconomic factors influencing the adoption of generative AI among university students in Pakistan. This study focuses on (a) variations in generative AI usage among various academic Faculties, (b) the relationship between AI usage and students' CGPA and (c) how demographic and socioeconomic factors such as gender, family income, parental education and residential status affect the frequency of generative AI usage. This study employs a descriptive approach to clarify the ways in which educational and social stratification structures influence engagement with emerging AI technologies.

This study enhances the existing literature on technology-mediated inequality in higher education by integrating these dimensions. The results are anticipated to guide institutional approaches focused on fair AI integration making certain that the educational and cognitive advantages of generative AI are available across various disciplines and socioeconomic levels, instead of perpetuating current educational disparities.

### **Statement of the Problem**

University students' use of generative AI is unequal due to academic and socioeconomic differences. In underdeveloped countries like Pakistan, income, domicile and parental education may limit access and use. This study examines how academic and social factors affect student generative AI participation.

### **Hypotheses**

Based on the theoretical framework and prior empirical evidence, the following hypotheses were formulated:

**H1:** There is a statistically significant association between students' socio-demographic characteristics (gender, residence, marital status and faculty) and their use of generative AI technologies (ChatGPT).

**H2:** Parental education (father's and mother's education) is significantly associated with students' use of generative AI technologies, such that students from higher parental education backgrounds report more frequent AI use.

**H3:** Household monthly income is significantly associated with the availability of internet resources, with higher income levels corresponding to greater and more flexible internet access.

**H4:** Household income significantly associated with generative AI usage.

**H5:** Availability of internet resources is significantly associated with students' use of generative AI technologies.

**H6:** Students' use of generative AI technologies is significantly associated with academic performance (CGPA), with higher levels of AI use corresponding to higher CGPA.

### **Significance of the Research**

This study provides important insights into the ways in which academic and socioeconomic factors influence university students' adoption of generative AI, particularly in the context of developing countries. By uncovering disparities in access and usage among various disciplines, academic performance levels and social backgrounds, it aids universities in crafting more equitable AI literacy initiatives and inclusive digital education policies. The results are intended to help educators and legislators make sure that integrating generative AI advances equity rather than widening already-existing educational disparities.

### **Theoretical Foundations**

This research synthesizes the Technology Acceptance Model, the Unified Theory of Acceptance and Use of Technology and Digital Divide Theory to clarify the adoption of generative AI as a multi-faceted phenomenon. TAM and UTAUT address individual and social acceptance mechanisms, indicating that perceived

usefulness, effort expectancy and social influence differ among demographic and disciplinary groups; thus, H1 posits that socio-demographic characteristics (gender, residence and faculty) correlate with generative AI usage. Digital Divide Theory asserts that structural inequalities, especially socioeconomic capital, influence varying access to and engagement with emerging technologies. Consequently, H2 and H4 propose that parental education and household income significantly affect the frequency of AI usage. Consistent with second-level digital divide theories, H3 and H5 assert that household wealth influences internet accessibility, which then promotes AI adoption, highlighting the mediation function of technical access. Ultimately, by integrating acceptance theory with academic capital perspectives, H6 investigates if prolonged interaction with AI results in varying academic outcomes (CGPA), framing the utilization of generative AI not solely as a behavioral entry point but as an academically advantageous practice. Collectively, these ideas frame AI adoption as cognitive (TAM), social (UTAUT) and structural (Digital Divide).

### Conceptual Framework

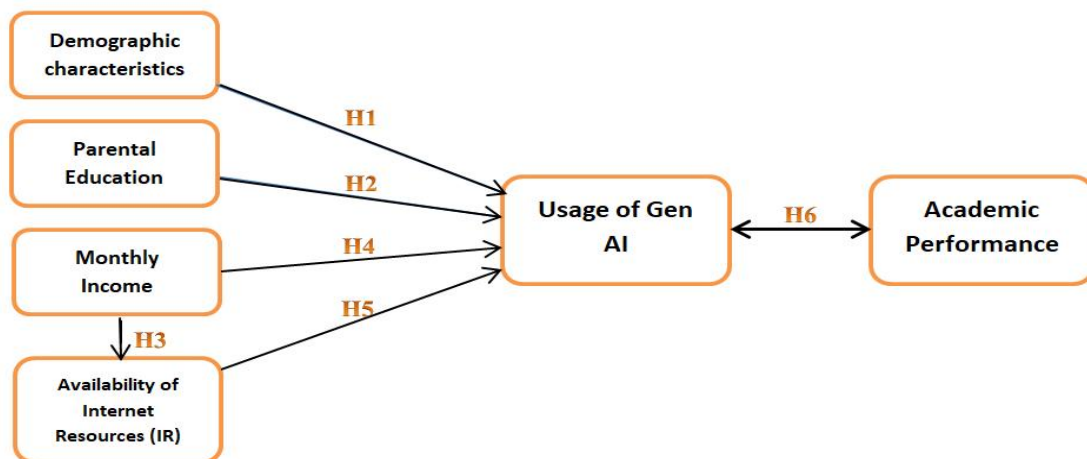


Fig. 1 conceptual framework

### LITERATURE REVIEW

Generative AI in education has arisen as a transformational and disruptive influence. More than 70% of higher education students have utilised GenAI or comparable applications for academic reasons, underscoring the prevalence of AI-assisted learning (Maxwell et al., 2025; Reyes & Contractor, 2025). Kasneci et al. (2023) highlighted that AI technologies augment students' metacognitive learning and writing support, while simultaneously presenting ethical dilemmas.

Variations among departments significantly influence the utilization of AI. Students in engineering and computer science demonstrate higher adoption rates than those in social sciences and humanities, attributable to their increased familiarity with computational tools (Contractor & Reyes, 2025). Wang et al. (2025) discovered that STEM students utilize AI more critically, employing it for data analysis and problem-solving.

Evidence indicates that high-achieving students (better CGPA) utilize AI tools as supplementary resources rather than replacements for learning. Conversely,

underperforming students may utilize AI for superficial support or content replication. (Ward et al., 2025)

Socioeconomic factors, including household income, parental education and residential origin, profoundly influence access to and knowledge with AI. Students from affluent homes with highly educated parents have greater involvement with AI, frequently attributable to superior internet access and enhanced digital literacy chances (Zhang et al., 2024)

### **Generative AI Adoption in Higher Education**

Generative Artificial Intelligence (AI) denotes sophisticated machine learning systems that can produce novel outputs—such as text, graphics and code—derived from training data and user inputs. In academia, generative AI significantly transforms conventional teaching, learning and research methodologies. It improves educational efficiency, enables individualized learning and fosters innovative problem-solving across several fields. Incorporating tools such as GenAI, DALL·E and Midjourney into academic curricula is becoming more prevalent for purposes including writing support, idea generating, programming and data analysis (Jin et al., 2024). Studies demonstrate that the integration of generative AI in higher education enhances academic engagement and originality, although it also presents ethical and pedagogical dilemmas related to plagiarism, authorship and data bias (Sergeeva et al., 2025). The worldwide proliferation of AI-driven educational tools illustrates their increasing impact on digital literacy and institutional policies (Jin et al., 2025). Generative AI in academia presents both an opportunity and a dilemma, facilitating the democratization of knowledge creation while necessitating meticulous control to uphold academic quality and equity.

University students worldwide rapidly and diversely integrate generative AI tools into academic pursuits, reflecting disparities in technical availability, digital literacy and institutional support. Studies show that students in technologically advanced regions like North America and parts of Europe use AI tools more for writing, coding and ideation, but students in developing countries face barriers like limited access and institutional guidance (Sergeeva et al., 2025). Some institutions have integrated AI through policy frameworks, training and curriculum redesigns, whereas others are wary because to worries about academic integrity, bias and data privacy (Jin et al., 2025). According to Atkinson-Toal & Guo (2024), universities that promote AI literacy and ethical use policies have higher student responsible adoption rates. AI integration in higher education is popular worldwide, but socioeconomic gaps, institutional preparation and changing policy frameworks affect adoption patterns.

### **Academic Department as a Factor Influencing AI Adoption**

AI adoption studies across academic disciplines show that university students' usage, perceived utility and engagement with generative AI technologies vary. Generative AI applications are used more by STEM and business students for programming, data analysis and professional communication, while humanities students use them for writing support, idea generation and language refinement

(Kubullek et al., 2024). STEM and business students have higher technological self-efficacy and see AI as improving efficiency and productivity, while humanities students are cautious due to ethical and creative concerns. Further research from Spanish universities shows that engineering and computer science students adopt AI faster due to curriculum design and institutional encouragement, while social sciences and humanities students lag behind despite seeing AI's potential (Llorens-Largo et al., 2024). These data show that disciplinary culture, curricular integration and digital preparation influence higher education departmental AI adoption.

### **AI Usage and Academic Achievement**

Motivation and self-efficacy mediate the relationship between students' academic achievement and generative AI tool usage, according to recent studies. Daha and Altelwany (2025) discovered that students with higher academic self-efficacy and mastery goal orientation use GenAI less for academic activities, suggesting that self-confidence may limit AI-generated aid. Avoidance-oriented students utilized GenAI more, which increased procrastination and lowered CGPA. Simultaneously, empirical evidence underscores the prospective educational advantages of generative AI when utilized effectively. Zafar et al. (2024) discovered that students' utilization of ChatGPT correlated with enhancements in intellectual ability, critical thinking, vocabulary, grammar and language competency, content generation, suggesting that generative AI can augment academic talents rather than solely supplant student labor. Amorin and Gallaron (2025) found that learning motivation strongly influences the association between GenAI attitudes and academic performance, suggesting that positive AI attitudes only improve performance when accompanied with intrinsic motivation. General studies like Balaskas et al. (2025) and Kim et al. (2025) emphasize the importance of trust, enjoyment and responsiveness in AI adoption among students of different academic backgrounds. Ibrahim and Wah (2020) found that students with better CGPAs express more self-efficacy, confirming the idea that personal competence moderates academic success and technology adoption. These findings suggest a complex relationship between CGPA, self-efficacy and motivational orientation, with personality and affective factors like conscientiousness and academic anxiety moderating higher education generative AI usage.

### **Socioeconomic Determinants Affecting AI Engagement and Utilization**

University students' access to and involvement with generative AI technology depends on socioeconomic and family background. Research shows that income, home type and parental education affect pupils' access to digital infrastructure, affecting AI literacy and adoption. Students from rural and low-income backgrounds encounter challenges such as restricted device availability and intermittent internet connectivity, while those from higher-income households and urban settings report better exposure to AI technologies and improved digital competencies (Vesna, 2025). Students with more educated parents are more confident and trusting in using AI systems for academic purposes, possibly due to more supportive home learning environments and digital culture (Limna &

Kraiwanit, 2024). Socio-cultural gaps in AI usage frequency persist even inside academic institutions, as family money and technological views moderate students' adoption behaviors and ethical judgments of AI. These studies show how socioeconomic capital and familial environment affect university students' material access, psychological preparation, literacy and faith in generative AI technology.

### **Implications for Education Policy and Practice**

Higher education equity AI literacy efforts emphasize institutional responsibility, inclusive pedagogy and curricular reform. Research shows that fair AI literacy programs should teach technical skills and AI ethics, bias and social impacts. Universities should develop multi-level AI literacy programs to ensure all students, regardless of background, can use AI technologies (Tadimalla & Maher, 2025). Through AI ethical rules, faculty training and student mentorship programs that demonstrate responsible AI use, institutional support structures are crucial (Jin et al., 2025). Universities should integrate AI literacy results into interdisciplinary curricula that promote critical digital citizenship and creativity, not just technical courses. This method contextualizes AI applications in STEM, business and humanities while addressing ethical and societal issues. These initiatives make AI education egalitarian, responsible and future-oriented, preparing students for academic and professional roles in an AI-driven world.

### **Research Gap**

Students' attitudes, beliefs and behavioral intentions towards AI tools have been studied, but demographic and socioeconomic drivers of generative AI uptake in higher education have not. Most studies have focused on psychological or technological aspects including perceived usefulness, ease of use and performance anticipation, without addressing how students' academic fields, CGPA levels, or socioeconomic backgrounds affect their generative AI use. Current information is mostly from industrialized countries, leaving a contextual gap in understanding adoption dynamics in developing nations like Pakistan, where technological access and educational fairness differ greatly. This study fills that gap by describing how academic and socioeconomic aspects affect university students' generative AI knowledge and use, making AI adoption in higher education more inclusive and context-sensitive.

## **METHODOLOGY**

The research was quantitative in nature and employed a descriptive survey research design. This design provided a true picture of AI usage across demographic and academic dimensions without manipulating variables.

Students at public universities of Punjab were part of the whole population. The target population consisted of undergraduate and post graduate students enrolled in four major faculties: Management Sciences, Natural Sciences, Arts and Humanities and Social Sciences. These faculties were purposefully selected to ensure coverage of a diverse range of academic disciplines, each characterized by

different levels of exposure to technology and AI integration. A convenience sampling technique was employed. A total of 333 students, consisting of 111 males (33.3%) and 222 (66.7%) females from 6 universities spread across Punjab, participated in the study.

Data were collected using a structured questionnaire developed specifically for the study and distributed online through the media WhatsApp groups of university students assisted by lecturers.

The instrument was designed to capture key information related to demographics, AI usage and access to digital resources.

- **Demographic Information:** Included items on faculty, cumulative grade point average (CGPA), residence (urban or rural), parental education levels and monthly household income.
- **Access to Internet and Digital Resources:** Assessed availability of AI-supportive technologies and digital platforms.
- **AI Usage Patterns:** Focused on responses, rated using a four-point Likert scale ranging from 1 (Never) to 4 (Always).

The questionnaire was reviewed by three experts in educational technology and research methodology to ensure content validity and then tested on students to assess the clarity of language and question structure. Their feedback was incorporated to improve the clarity and relevance of items.

Participants were informed about the purpose of the study, assured of confidentiality and notified that participation was voluntary. Data were collected through both online (Google Forms) and printed copies of the questionnaire to accommodate students with different levels of internet access. Data collection took place over a six-week period, ensuring a sufficient response rate and allowing for comprehensive coverage across all faculties.

#### **Data Analysis and Interpretation**

SPSS 20 was used to screen, code and analyze data. This study used descriptive and inferential statistics to meet its goals. First, descriptive statistics including frequencies, percentages and cross-tabulations were used to summarize respondents' demographics and show internet access and ChatGPT usage patterns. These descriptive methods helped comprehend variable distribution among groups. The Chi-square test of independence was used to see if categorical variables like gender, parental education, household income, internet access, generative AI use and academic performance were associated. This test is ideal for categorical data and determines whether group differences are statistically significant. To meet statistical assumptions and stabilize results, categories were logically compressed. Using descriptive and inferential statistics together ensured rigor in methodology and strengthened data results.

**Table 4.1** *Descriptive statistics of the study variables*

<b>Demographic Data</b>	<b>Categories</b>	<b>Frequency</b>	<b>Percentage %</b>
Gender	Male	111	33.3
	Female	222	66.7

	Total	333	100.0
Class level	Undergraduate	291	87.4
	Post Graduate	42	12.6
	Total	333	100
Faculty	Management Sciences	81	24.3
	Social Sciences	63	18.9
	Natural Sciences	118	35.4
	Arts and Humanities	71	21.3
	Total	333	100.0
Marital Status	Married	69	20.7
	Unmarried	264	79.3
	Total	333	100.0
Residence	Urban	195	58.6
	Rural	138	41.4
	Total	333	100.0
CGPA	1.5to2.5	111	33.3
	2.6to3.5	151	45.3
	3.6to4.0	71	21.3
	Total	333	100.0
Availability of Internet resources	Nowhere	16	4.8
	At Home	101	30.3
	At University	46	13.8
	Everywhere	170	51.1
	Total	333	100.0
AI Usage pattern	Never	39	11.7
	Sometimes	135	40.5
	Often	86	25.8
	Always	73	21.9
	Total	333	100.0
Economic Status	Lower Economic	83	24.9
	Lower Middle Economic	127	38.1
	Upper Middle Economic	58	17.4
	Higher Economic	65	19.5
	Total	333	100.0
father's education	Low education (Illiterate–Primary)	54	16.2
	Medium education (Elementary–Matric)	116	34.8
	Higher education (FA/FSc and above)	163	48.9
	Total	333	100.0
Mother's education	Low education (Illiterate–	109	32.7%

	Primary)		
	Medium education (Elementary–Matric)	112	33.6%
	Higher education (FA/FSc and above)	112	33.6%
	Total	333	100%

Table 1 presents the rate and percentage of the participants' demographic characteristics. In the sample of 333 students, 66.7% were female and 33.3% were male, indicating a higher likelihood of participation among female respondents. 12.6% of individuals were engaged in postgraduate studies, but the majority (87.4%) was enrolled in undergraduate programs.

A diverse array of academic specialties was represented among the participants. The sample exhibited adequate disciplinary diversity, with Natural Sciences comprising the largest number (35.4%), succeeded by Management Sciences (24.3%), Arts and Humanities (21.3%) and Social Sciences (18.9%). A plurality of respondents (79.3%) were single, whilst 20.7% were married, aligning with the population's predominance of undergraduates.

A very equitable geographic distribution was shown by the fact that 41.4% of the students originated from rural areas, while 58.6% resided in urban locales. According to the academic performance indicator, 45.3% of respondents possessed a CGPA ranging from 2.6 to 3.5, 33.3% had a CGPA between 1.5 and 2.5 and 21.3% achieved a CGPA between 3.6 and 4.0.

The accessibility to internet resources for respondents was inconsistent. 30.3 percent of pupils have internet connectivity at home, while over half (51.1%) reported access to it universally. Conversely, 4.8% reported infrequent access to the internet, while 13.8% predominantly depended on university resources. Despite existing inequities, these data indicate a generally favorable access to digital resources.

A significant proportion of students (88.3%) reported used AI technologies, while 11.7% indicated they had never employed such tools. 25.8% reported frequent usage, 40.5% indicated occasional usage and 21.9% stated they utilized them consistently. The respondents' economic origins indicated that 38.1% were from the lower-middle class, 24.9% from the lower class, 19.5% from the higher class and 17.4% from the upper-middle class, reflecting socioeconomic diversity within the sample.

Parental education levels revealed that 48.9% of dads achieved higher education (FA/FSc and above), 34.8% attained medium-level education and 16.2% possessed poor educational attainment. In contrast, the educational attainment of mothers was more uniformly spread, with 33.6% possessing higher education, 33.6% holding medium education and 32.7% having low education.

### Cross-tabulation

A cross-tabulation analysis was performed to examine the relationship between various variables and the frequency of generative AI tool utilization.

#### Effect of Demographic Characteristics on Generative AI Usage

Table 4.2(a). Gender and Use of Generative AI

Gender	Use of Gen-AI				Total
	Never	Sometimes	Often	Always	
Male	14 (12.6%)	39 (35.1%)	22 (19.8%)	36 (32.4%)	111 (100%)
Female	25 (11.3%)	96 (43.2%)	64 (28.8%)	37 (16.7%)	222 (100%)
<b>Total</b>	39 (11.7%)	135 (40.5%)	86 (25.8%)	73 (21.9%)	333 (100%)

Table 4.2(a) presents Female students represent a greater percentage of the sample and are more prevalent across all usage categories; nevertheless, males exhibit a significantly higher number of "Always" users (32.4%) compared to females (16.7%). Females exhibit a higher concentration in the "Sometimes" and "Often" usage groups.

**Table 4.2(b). Use of Generative AI (GenAI) by Residence**

Use of Gen-AI	Residence		Total
	Urban	Rural	
Never	23	16	39
Sometimes	82	53	135
Often	50	36	86
Always	40	33	73
<b>Total</b>	195	138	333

In all residential categories, the majority of respondents are categorized under "sometimes" and "often" usage, signifying a moderate to high level of involvement with generative AI technologies irrespective of residential background. The percentage of respondents indicating they have never utilized GenAI is comparatively low in both urban and rural demographics, implying extensive awareness and acceptance.

**Table 4.2(c) Faculty Affiliation and Generative AI Usage**

Faculty Affiliation	Use of Gen-AI				Total
	Never	Sometimes	Often	Always	
Management Sciences	8 (9.9%)	40 (49.4%)	15 (18.5%)	18 (22.2%)	81
Social Sciences	10 (15.9%)	26 (41.3%)	17 (27.0%)	10 (15.9%)	63
Natural Sciences	7 (5.9%)	38 (32.2%)	41 (34.7%)	32 (27.1%)	118
Arts and Humanities	14 (19.7%)	31 (43.7%)	13 (18.3%)	13 (18.3%)	71
<b>Total</b>	39 (11.7%)	135 (40.5%)	86 (25.8%)	73 (21.9%)	333

According to Table 4.2(c), 11.7% of faculty indicated they never utilize GenAI technologies, whereas 47.7% claimed regular usage (combined categories of Often and Always). The Natural Sciences faculty exhibited the highest adoption rate, with 61.9% frequently or consistently utilizing GenAI technologies and the lowest non-usage rate at 5.9%. Conversely, Arts and Humanities had the highest percentage of non-users (19.7%), while Management Sciences recorded the greatest proportion of individuals indicating occasional use ("Sometimes") at 49.4%.

### Effect of Parental Education on Generative AI Usage

**Table- 4.3(a) Father's Education and Use of Generative AI**

Father's Education	Use of Gen-AI				Total
	Never	Sometimes	Often	Always	
Low Education (Illiterate–Primary)	9	19	5	2	35
Medium Education (Elementary–Matric)	14	62	33	7	116
Higher Education (FA/FSc & Above)	16	54	48	64	182
<b>Total</b>	<b>39</b>	<b>135</b>	<b>86</b>	<b>73</b>	<b>333</b>

The education level of fathers is markedly correlated with students' utilization of generative AI technology. Individuals whose fathers had greater education are significantly more inclined to utilize GenAI regularly, indicating "often" or "always" usage. Individuals from low-education backgrounds are prone to "Never" utilize GenAI or to employ it just sporadically. The medium-education cohort signifies a transitional phase, exhibiting moderate yet increasing involvement with AI products.

**Table 4.3(b) Mother's Education and Use of Generative AI**

Mother's Education	Use of Gen-AI				Total
	Never	Sometimes	Often	Always	
Low Education	18	37	22	32	109
Medium Education	10	55	29	18	112
Higher Education	11	43	35	23	112
<b>Total</b>	<b>39</b>	<b>135</b>	<b>86</b>	<b>73</b>	<b>333</b>

Students with mothers who possess higher education are the predominant users of AI (51.8%). Students with moms who have low educational attainment demonstrate significant utilization, indicating a compensatory dependence on AI. Families with moderate educational attainment have the least frequent utilization of AI.

**Table 4.4 Monthly Income and Generative AI Use**

Monthly Income	Use of Gen-AI				Total
	Never	Sometimes	Often	Always	
lowest income group 15,000 to 30,000	17	38	19	9	83
lower-middle income group 31,000 to 45,000 + 46,000 to 60,000	7	48	37	35	127
upper-middle income group 61,000 to 75,000 +76,000 to 90,000	6	25	11	16	58
Highest income group Above than 91,000	9	24	19	13	65
<b>Total</b>	<b>39</b>	<b>135</b>	<b>86</b>	<b>73</b>	<b>333</b>

The distribution of respondents by economic groups indicates that in the lowest income bracket (15,000–30,000), a comparatively greater percentage of participants reported never or occasionally utilizing GenAI, while less indicated

frequent or constant usage of the technology. In the lower-middle economic bracket (31,000–60,000), the utilization of generative AI becomes increasingly prevalent, with a significant rise in respondents indicating occasional and regular use of such tools.

Individuals in the upper-middle income bracket (61,000–90,000) exhibit an equitable distribution among usage categories, with heightened prevalence in the 'often' and 'always' categories relative to the lowest income group.

A significant proportion of respondents in the highest income bracket (exceeding 91,000) indicate frequent and regular utilization of generative AI, reflecting enhanced engagement with these technologies. The descriptive data indicate that as household income rises, the frequency of GenAI usage generally increases. However this trend is not uniformly linear across all income brackets.

#### Internet Resource Availability and Generative AI Usage

Availability of Internet Resources	Use of Gen-AI				Total
	Never	Sometimes	Often	Always	
At home	11 (10.9%)	41 (40.6%)	27 (26.7%)	22 (21.8%)	101
At university	5 (10.9%)	16 (34.8%)	15 (32.6%)	10 (21.7%)	46
Everywhere	16 (9.4%)	72 (42.4%)	41 (24.1%)	41 (24.1%)	170
Nowhere	7 (43.8%)	6 (37.5%)	3 (18.8%)	0 (0.0%)	16
Total	39 (11.7%)	135 (40.5%)	86 (25.8%)	73 (21.9%)	333

The distribution exhibits a distinct pattern: participants indicating Universal access (n=170, 51.1% of the sample) demonstrated the highest overall engagement, with almost half (48.2%) utilizing generative AI tools frequently or consistently. Conversely, individuals with 'Nowhere' access had significantly lower adoption rates, with 43.8% never utilizing such products and no respondents indicating Always use. The At home and At university groups exhibited intermediate patterns, with Sometimes as the modal category in both instances.

**Table 4.6 Academic Achievement and Use of Generative AI**

Use of Gen-AI	Academic Success (CGPA)			Total
	1.5 to 2.5	2.6 to 3.5	3.6 to 4.0	
Never	15	19	5	39
Sometimes	56	62	17	135
Often	30	36	20	86
Always	10	34	29	73
Total	111	151	71	333

High performers (CGPA 3.6–4.0) are predominantly found in the "Often" and "Always" AI usage categories, including 49 out of 71 individuals. Only 5 high-CGPA students do not utilize GenAI, whereas 29 consistently employ it. Students with

lower CGPA (1.5–2.5) predominantly belong to the Sometimes/Often categories, with a minimal number of constant users. This demonstrates a distinct positive correlation; as the utilization of Generative AI rises so, too does academic achievement. Students that utilize GenAI more frequently generally attain significantly higher CGPAs, underscoring AI's role as a functional academic enhancer rather than simply a technological resource.

**Table 4.7 Effect of Household Monthly Income on Internet Availability and Generative AI Use**

Household Monthly Income	Internet Availability	GenAI Use
15,000–30,000	Limited / Institutional Access	Low–Moderate Use
31,000–45,000	Transitional Access	Moderate Use
46,000–60,000	Broad Access	Moderate–High Use
61,000–90,000	High Mobility Access	High Use
Above 91,000	Universal / Everywhere Access	Very High Use

The table above illustrates that household income serves as a significant socio-economic determinant of both electronic media access and generative AI utilization.

Income not only affects respondents' access to the internet but also their proficiency in utilizing modern digital learning tools like GenAI.

**Table 4.8 Pearson Chi-Square test results**

Hypothesis	Associations Between variables	$\chi^2$	P-value	Status
H1a	Gender Usage of GenAI	12.031	.007	Significant
H1b	Residence Usage of GenAI	0.700	0.873	
H1c	Faculty Usage of GenAI	22.007	.009	Significant
H2a	Father's Education Usage of GenAI	95.807	.000	Significant
H2b	Mother's Education Usage of GenAI	69.514	.000	Significant
H3	Monthly Income Internet Availability	32.781	.000	Significant
H4	Monthly Income Usage of GenAI	20.677	.014	Significant
H5	Internet Availability Usage of GenAI	17.319	.044	Significant
H6	Usage of GenAI Academic Success	29.759	.000	Significant

A chi-square test demonstrated a strong correlation between gender and the utilization of generative AI technologies,  $\chi^2 = 12.03$ ,  $p = .007$ , suggesting that patterns of generative AI usage considerably differ between male and female students. No statistically significant correlation exists between respondents' domicile and their use of generative AI technologies, such as GenAI ( $\chi^2 = 0.700$ ,  $p = 0.873$ ),

suggesting that usage trends are comparable among urban and rural respondents. A statistically significant correlation between academic affiliation and the frequency of GenAI usage was observed,  $\chi^2 = 22.007$ ,  $p = .009$ .

The Chi-square test indicates a statistically significant correlation between paternal education and the utilization of generative AI technologies, such as GenAI ( $\chi^2 = 95.81$ ,  $p < .001$ ) which indicates that adolescents with fathers who have advanced educational qualifications display markedly more involvement with generative AI technologies, whereas pupils from less educated fathers exhibit restricted utilization. The correlation between maternal education and GenAI utilization is statistically significant ( $\chi^2 = 69.514$ ,  $p < .001$ ). Students from both high and low maternal education backgrounds utilize AI more frequently, whereas those from medium-education backgrounds depend on it to a lesser extent.

Analysis indicates that household monthly income is a significant predictor of both internet resource availability ( $\chi^2 = 32.78$ ,  $p < .001$ ) and the utilization of generative AI technologies like GenAI ( $\chi^2 = 20.68$ ,  $p = .014$ ), suggesting that increased income levels are associated with enhanced electronic access and more frequent AI engagement.

Income  $\times$  GenAI Utilization:  $\chi^2 = 20.677$ ,  $p = .014$  (Significant) and Income  $\times$  Internet Accessibility:  $\chi^2 = 32.781$ ,  $p < .001$  (Highly Significant). This indicates that variations in Generative AI utilization among income levels are improbable to have arisen by coincidence.

The availability of internet resources was significantly correlated with the frequency of generative AI usage ( $\chi^2 = 17.319$ ,  $p = .044$ ). This indicates that internet availability considerably affects the regularity of students' AI usage, underscoring enduring inequities despite largely positive overall access.

A significant correlation exists between CGPA and the utilization of Generative AI. The connection is very statistically significant, as  $\chi^2 = 29.759$ ,  $p < .001$ . Academic achievement exhibits considerable variation depending on the levels of AI utilization.

## Findings

The descriptive study revealed extensive use of generative AI technologies, with the majority of students indicating moderate to high usage levels. Inferential testing corroborated multiple submitted hypotheses and elucidated the structural aspects influencing AI adoption patterns.

A chi-square test indicated a statistically significant correlation between gender and generative AI usage,  $\chi^2 = 12.03$ ,  $p = .007$ . In accordance with descriptive trends, male students indicated greater levels of constant (“always”) usage, while female students were predominantly found in the occasional and frequent usage categories. These findings substantiate that patterns of AI interaction differ significantly by gender. No statistically significant correlation was seen between domicile (urban vs. rural) and AI usage,  $\chi^2 = 0.700$ ,  $p = .873$ , suggesting similar adoption tendencies across geographic origins.

Academic discipline was identified as a significant predictor of AI usage frequency,  $\chi^2 = 22.007$ ,  $p = .009$ . Students in Natural Sciences exhibited the greatest frequency and consistency of usage, whilst those in Arts and Humanities indicated the highest percentage of non-users. Students of Management Sciences primarily participated on an intermittent basis. The findings indicate variations within disciplines regarding the perceived relevance and usefulness of generative AI techniques.

Variables related to socioeconomic status and familial history were significantly correlated with the adoption of AI. Paternal education had a significant correlation with generative AI usage ( $p < .001$ ), as children from more educated paternal backgrounds reported increased frequency of use. Mother education shown a statistically significant correlation ( $p < .001$ ); notably, students from both high and low mother education backgrounds reported greater AI usage than those from medium-education families. Monthly household income had a substantial correlation with generative AI utilization,  $\chi^2 = 20.677$ ,  $p = .014$  and an even more pronounced association with the availability of internet access,  $\chi^2 = 32.781$ ,  $p < .001$ . These data suggest that income affects both digital access and the degree of AI involvement.

Access to internet resources was substantially correlated with the frequency of generative AI usage,  $\chi^2 = 17.319$ ,  $p = .044$ . Students with universal access exhibited the highest frequency and consistency of AI usage, while those with restricted access displayed negligible engagement.

Ultimately, academic performance (CGPA) showed a significant correlation with the utilization of generative AI ( $p < .001$ ). High-achieving students were over-represented among frequent and consistent users, suggesting that academic performance considerably differs across degrees of AI usage.

The data indicate that engagement with generative AI is influenced by interrelated demographic, disciplinary, socioeconomic and technological aspects. Income, parental education, technological access and academic accomplishment variables exhibited notably robust correlations with usage intensity, however residency did not significantly affect AI adoption trends.

## DISCUSSION

This study presents timely empirical evidence regarding the patterns and determinants of generative AI (GenAI) utilization among university students, yielding significant insights into the intersection of technological adoption with academic, socioeconomic and institutional issues. The data indicate that GenAI tools are not ancillary technology but are increasingly integrated into students' academic practices, especially among those with enhanced access to resources and superior academic performance.

This study reveals a notable gender-based disparity in the patterns of GenAI usage. Although female students were more prevalent in all usage categories owing to their greater representation in the sample, male students indicated significantly

elevated levels of consistent “always” consumption. This corresponds with previous studies on technology adoption indicating that males typically exhibit higher levels of use for emerging digital tools, while females tend to adopt these technologies more slowly or selectively. The elevated frequency of occasional and regular use among female students suggests that the disparity is not related to access or competence, but rather to the intensity of usage and its incorporation into daily academic practices. This differentiation is essential for comprehending the varied normalization of GenAI among student subgroups.

Contrary to the digital divide, GenAI usage was not strongly connected with urban or rural domicile. Institutional infrastructure and peer exposure may reduce geographic technology use gaps in higher education. In environments where mobile connection and campus-based internet access are spreading, colleges are becoming equalizing platforms for digital engagement.

One of the strongest GenAI adoption predictions was discipline. The most frequent users were Natural Sciences students, while Arts and Humanities students were less likely to utilize. These trends match recent literature that links GenAI tools to STEM areas' computational, analytical and research-oriented duties. Due to originality, interpretive depth and academic integrity issues, humanities fields may interact more cautiously. These findings emphasize the necessity for discipline-sensitive frameworks rather than universal institutional approaches to integrate GenAI into courses.

Socioeconomic background was crucial. Household income substantially influenced GenAI use and internet access, demonstrating that economic capital continues to impact digital access and advanced learning technology engagement. Higher-income students were more likely to use GenAI frequently and consistently, suggesting that financial resources enable connectivity, digital confidence, experimentation and persistent use. This supports digital inequality ideas that the split has migrated from access to technology quality, intensity and effectiveness.

Parental education nuanced GenAI engagement. Educational capital shapes students' technology attitudes, as higher paternal education was substantially connected with frequent use. Interestingly, students from high and low maternal education used AI more than those from medium-level homes. This pattern may indicate compensatory use of AI tools by students without academic direction at home and strategic enhancement by those from highly educated households. These data show that GenAI may multiply resources and equalize students based on their families.

Interestingly, GenAI usage was strongly correlated with academic performance. GenAI was mostly used by high-achieving pupils, whereas lower-achieving kids used it sometimes. This contradicts the idea that GenAI is a shortcut or academic danger and instead frames it as a strategic academic booster. The positive gradient between AI usage and CGPA shows that GenAI-integrated pupils may benefit academically, especially in research, synthesis and problem-solving.

These findings add to the expanding body of data that social, economic and

academic factors determine GenAI uptake in higher education, not access alone. Policy and practice should focus on targeted digital literacy programs, discipline-specific AI integration solutions and equity-focused interventions to guarantee GenAI improves learning without reinforcing inequities. Responsible and inclusive educational innovation requires analyzing who utilizes GenAI technologies, how they are used and with what academic outcomes.

## CONCLUSION AND IMPLICATIONS

This study provides empirical insights into the patterns and drivers of generative artificial intelligence (GenAI) utilization among university students, illustrating that AI engagement is influenced by academic, economical and technological factors rather than accessibility alone. The results demonstrate that GenAI has become a fundamental element of students' academic activities, with usage intensity differing systematically based on gender, discipline, parental education, home income and internet access. Frequent usage of Generative AI was significantly correlated with improved academic performance, suggesting that AI may serve as a potential academic enhancer when employed strategically.

There are the following policy recommendations based on the findings;

- The Higher Education Commission (HEC) ought to promulgate discipline-specific national rules for the use of generative AI, enabling universities to customize AI integration in accordance with disciplinary conventions while upholding uniform ethical and academic standards.
- Universities ought to institutionalize compulsory AI literacy and ethics courses, providing tailored assistance for students from lower-income and first-generation backgrounds to mitigate rising digital and academic disparities.
- Nationwide expansion of faculty capacity-building programs is essential to teach instructors in the curriculum-embedded and assessment-aligned utilization of AI, hence ensuring pedagogical consistency instead of ad hoc or banned methods.
- Assessment and academic integrity standards must be amended to allow for guided and transparent AI-assisted instruction, transitioning from punitive enforcement to responsible and supervised usage models.
- Federal and provincial authorities must prioritize investment in digital infrastructure at the campus level, especially in public sector universities, to provide dependable internet access and equal utilization of modern AI tools.

## REFERENCES

- Aldreabi, H., Dahdoul, N. K. S., Alhur, M., Alzboun, N., & Alsahhi, N. R. (2025). *Determinants of Student Adoption of Generative AI in Higher Education*. 23(1), 15–33.
- Amorin, R. B., & Gallaron, G. M. (2025). The Mediating Effect Of Learning Motivation On Attitudes Towards Using ChatGPT (ATUC) As Educational Resource And Academic Performance: Evidence From A State University In Iloilo, Philippines. *MIER Journal of Educational Studies Trends and Practices*,

- Atkinson-Toal, A., & Guo, C. (2024). Generative Artificial Intelligence (AI) Education Policies of UK Universities. *Enhancing Teaching and Learning in Higher Education*, 2, 70–94. <https://doi.org/10.62512/etlhe.20>
- Balaskas, S., Tsiantos, V., Chatzifotiou, S., & Rigou, M. (2025). Determinants of ChatGPT Adoption Intention in Higher Education: Expanding on TAM with the Mediating Roles of Trust and Risk. *Information*, 16(2). <https://doi.org/10.3390/info16020082>
- Bassignana, E., Curry, A. C., & Hovy, D. (2025). The AI Gap: How Socioeconomic Status Affects Language Technology Interactions. In W. Che, J. Nabende, E. Shutova, & M. T. Pilehvar (Eds.), *Proceedings of the 63rd Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers)* (pp. 18647–18664). Association for Computational Linguistics. <https://doi.org/10.18653/v1/2025.acl-long.914>
- Contractor, Z., & Reyes, G. (2025). *Generative AI in Higher Education: Evidence from an Elite College* (arXiv:2508.00717). arXiv. <https://doi.org/10.48550/arXiv.2508.00717>
- Daha, E. S., & Altelwany, A. A. (2025). Exploring the impact of using-ChatGPT in light of goal orientations and academic self-efficacy. *International Journal of Instruction*, 18(2), 167–184.
- Ibrahim, I. A., & Wah, T. K. (2020). The Academic Self-Efficacy Among Undergraduates: The Role of Gender, CGPA and Trait Emotional Intelligence. *Trends in Undergraduate Research*, 3(1), e7-12.
- Jin, Y., Yan, L., Echeverria, V., Gašević, D., & Martinez-Maldonado, R. (2025). Generative AI in higher education: A global perspective of institutional adoption policies and guidelines. *Computers and Education: Artificial Intelligence*, 8, 100348. <https://doi.org/10.1016/j.caeai.2024.100348>
- Kasneci, E., Seßler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., Gasser, U., Groh, G., Günemann, S., & Hüllermeier, E. (2023). *ChatGPT for good? On opportunities and challenges of large language models for education*. <https://www.sciencedirect.com/science/article/pii/S1041608023000195>
- Kim, M., Kim, J., Knotts, T. L., & Albers, N. D. (2025). AI for academic success: Investigating the role of usability, enjoyment, and responsiveness in ChatGPT adoption. *Education and Information Technologies*, 30(10), 14393–14414. <https://doi.org/10.1007/s10639-025-13398-8>
- Kubullek, A.-K., Kumaç, N., & Dogangün, A. (2024). Understanding the Adoption of ChatGPT in Higher Education: A Comparative Study with Insights from STEM and Business Students. *Proceedings of Mensch Und Computer 2024*, 684–689. <https://doi.org/10.1145/3670653.3677507>
- Limna, P., & Kraiwant, T. (2024). *Assessing the determinants of generative AI integration: A study on Google's Gemini adoption among Thai University students*. 21(10), 1–20.

- Llorens-Largo, F., Molina-Carmona, R., Real-Fernández, A., & Arjona-Giner, S. (2024). Evolution of the Adoption of Generative AI Among Spanish Engineering Students. In P. Zaphiris & A. Ioannou (Eds.), *Learning and Collaboration Technologies* (pp. 305–320). Springer Nature Switzerland. [https://doi.org/10.1007/978-3-031-61691-4\\_20](https://doi.org/10.1007/978-3-031-61691-4_20)
- Marjerison, R. K., Jun, J. Y., & Kim, J. M. (2025). Moderators of academic performance on the use of generative artificial intelligence. *Education and Information Technologies*, *30*(17), 24085–24107. <https://doi.org/10.1007/s10639-025-13711-5>
- Maxwell, D., Oyarzun, B., Kim, S., & Bong, J. Y. (2025). Generative AI in Higher Education: Demographic Differences in Student Perceived Readiness, Benefits, and Challenges. *TechTrends*, *69*(6), 1248–1259. <https://doi.org/10.1007/s11528-025-01109-6>
- Reyes, G., & Contractor, Z. (2025). *Generative AI in Higher Education: Evidence from an Elite College* (SSRN Scholarly Paper No. 5375804). Social Science Research Network. <https://doi.org/10.2139/ssrn.5375804>
- Sergeeva, O. V., Zheltukhina, M. R., Shoustikova, T., Tukhvatullina, L. R., Dobrokhotov, D. A., & Kondrashev, S. V. (2025). Understanding higher education students' adoption of generative AI technologies: An empirical investigation using UTAUT2. *Contemporary Educational Technology*, *17*(2), ep571. <https://doi.org/10.30935/cedtech/16039>
- Tadimalla, Y., & Maher, M. (2025). AI literacy as a core component of AI education. *AI Magazine*, *46*. <https://doi.org/10.1002/aaai.70007>
- Vesna, L. (2025). Digital Divide in AI-Powered Education: Challenges and Solutions for Equitable Learning. *Journal of Information Systems Engineering and Management*, *10*(21s), 300–308. <https://doi.org/10.52783/jisem.v10i21s.3327>
- Wang, K. D., Wu, Z., Tufts, L., Wieman, C., Salehi, S., & Haber, N. (2025). Scaffold or Crutch? Examining College Students' Use and Views of Generative AI Tools for STEM Education. *2025 IEEE Global Engineering Education Conference (EDUCON)*, 1–10. <https://doi.org/10.1109/EDUCON62633.2025.11016406>
- Ward, B., Bhati, D., Neha, F., & Guercio, A. (2025). Analyzing the Impact of AI Tools on Student Study Habits and Academic Performance. *2025 IEEE 15th Annual Computing and Communication Workshop and Conference (CCWC)*, 00434–00440. <https://doi.org/10.1109/CCWC62904.2025.10903692>
- Zafar, S., Shaheen, F., & Rehan, J. (2024). Use of ChatGPT and generative AI in higher education: Opportunities, obstacles and impact on student performance. *iRASD Journal of Educational Research*, *5*(1), 1–12.
- Zawacki-Richter, O., Bai, J. Y. H., Lee, K., Slagter Van Tryon, P. J., & Prinsloo, P. (2024). New advances in artificial intelligence applications in higher education? *International Journal of Educational Technology in Higher Education*, *21*(1), 32, s41239-024-00464-3. <https://doi.org/10.1186/s41239-024-00464-3>

Zhang, C. (Xinyi), Rice, R. E., & Wang, L. H. (2024). College students' literacy, ChatGPT activities, educational outcomes, and trust from a digital divide perspective. *New Media & Society*, 14614448241301741. <https://doi.org/10.1177/14614448241301741>