Research Article

e-ISSN: 2710-2122, p-ISSN: 2710-2114
2025: Vol 7(2), pp 1-17. https://doi.org/10.38140/ijer-2025.vol7.2.08
Interdisciplinary Journal of Education Research

GenAI in Private Higher Education: Student Insights by Gender, Study Level, and Delivery Mode

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EDITORIAL DATES
Received: 11 May 2025
Revised: 07 August 2025
Accepted: 08 August 2025
Published: 25 August 2025

DOI: 10.38140/ijer-2025.vol7.2.08

Abstract: As generative artificial intelligence (GenAI) tools gain importance in higher education, understanding how different student groups engage with these technologies is essential for equitable integration. This study investigates the perceived differences in awareness, use, and benefits of GenAI and reference management tools across gender, level of study (undergraduate vs. postgraduate), and mode of delivery (contact, part-time, distance) in five private higher education institutions (PHEIs) in South Africa. Following a quantitative research approach, a total of 1,866 students participated in a structured, Likert-scale questionnaire distributed via MS Forms. Based on Pearson's chi-square test and the chi-square goodness-of-fit test, significant differences emerged across genders, modes of delivery, and study levels. Female students were more likely to use GenAI for paraphrasing and grammar support, while male students engaged more with tools for coding, image generation, and mathematics. Postgraduate and part-time students reported higher perceived benefits, particularly in terms of efficiency and academic support, while distance students consistently reported lower perceived value and confidence in usage. The results support the need for targeted AI literacy interventions, particularly for female students and those in distance learning, as well as training that aligns with specific fields and tasks. These differences highlight the urgent need for targeted AI literacy initiatives and pedagogical interventions that address structural inequities in private higher education settings.

Keywords: Awareness, generative artificial intelligence, gender, private higher education, students.

1. Introduction

Generative artificial intelligence (GenAI) tools have rapidly evolved across various sectors, including education, due to their perceived usefulness. Tools like ChatGPT, Grammarly, Zotero, and DALL-E (to name a few) offer unique features that have the potential to transform teaching and learning in higher education (HE). The global literature reveals an increasing awareness and use of GenAI tools, particularly ChatGPT. Denecke et al. (2023) found that 80% of students were familiar with ChatGPT, Google Translate, and DeepL, but not with DALL-E or GitHub. According to Almassaad et al. (2024), Saudi students primarily utilise ChatGPT (86.2%), followed by Gemini, Socratic, and Copilot. Both Guillén-Yparrea (2024) and Denecke et al. (2023) identified ChatGPT as the most popular GenAI platform in academia. However, usage frequency remains inconsistent. Almassaad et al. (2024) report high usage rates, while Fošner (2024) indicated that only 51% of students used GenAI tools, with just 22% utilising them frequently. Additionally, the academic year and discipline influence GenAI usage: first-year students primarily use it for research and summarisation, whereas third-year and postgraduate students utilise it for data analysis and problem-solving. Fošner (2024) found that only 1% of students use GenAI solely for assessments without modification, while 31% use it extensively under supervision. Despite agreeing that chatbot outputs are unreliable, 76% still employ them (Fošner, 2024), demonstrating a mix of pragmatism and cynicism. Nam (2023) notes that 43% of students trust AI-generated content.

The perceived differences in GenAI use, awareness, and benefits among students over the last few years reveal significant trends influenced by gender, study level, and mode of delivery. Research

indicates that male students generally engage with GenAI tools, such as chatbots, more frequently and broadly, while female students prioritise text-related tasks (Møgelvang et al., 2024). Female students also express more concerns regarding critical thinking and the ethical implications of AI use (Møgelvang et al., 2024). Postgraduate students tend to demonstrate greater AI literacy and acceptance than undergraduates, likely due to their advanced academic exposure and experience, as indicated by Brown et al. (2024) and Strzelecki and ElArabawy (2024). A study by Ofem et al. (2024) involving 5,554 university students found that, in research, male and postgraduate students are more aware of and optimistic about AI tools. They further conclude that awareness and perception directly influence the use of AI tools, with perception playing a mediating role, thereby positively and significantly affecting the relationship between awareness and use of these tools (Ofem et al., 2024).

Globally, students are using GenAI in their studies (Brown et al., 2024; Guillén-Yparrea, 2024; Malik et al., 2023; Møgelvang et al., 2024; Nam, 2023; Strzelecki & ElArabawy, 2024). Most studies concentrate on students in the northern hemisphere. There is a dearth of literature globally on perceived differences in gender, level of study, and mode of delivery. This study addresses the limited understanding of how gender, study level, and delivery mode influence GenAI perceptions in South African PHEIs. The study was guided by the following research objectives:

- To examine perceived differences in awareness and usage of GenAI and reference management tools among students in South African PHEIs based on gender.
- To explore how students' level of study (undergraduate vs. postgraduate) influences their engagement with and perceived benefits of GenAI and reference management tools.
- To investigate the impact of delivery mode (contact, part-time, and distance learning) on students' confidence, frequency of use, and perceived value of GenAI and reference management tools.

For this study, GenAI refers to tools that autonomously generate new textual, visual, or code-based outputs (e.g., ChatGPT, Midjourney, DALL-E). A subset of GenAI includes large language models that focus on dialogue (e.g., ChatGPT). In terms of research, AI research tools encompass applications that primarily support referencing and language tasks, such as Grammarly for syntax corrections and paraphrasing, while Zotero is used for reference management. A critical review of the literature on students' engagement with GenAI, based on gender, mode of delivery, and level of study, will be conducted to situate the research problem more deeply.

2. Literature Review

Emerging research highlights substantial disparities in how students engage with GenAI, with variations across gender, level of study, and mode of delivery. These factors influence student awareness, adoption behaviour, perceived benefits, and the ethical implications of GenAI integration in higher education.

2.1 Gender-based differences

Gender remains a critical variable in understanding engagement with GenAI, yet findings are increasingly nuanced. Large-scale studies indicate that male students utilise GenAI tools, such as ChatGPT, more frequently and across a wider array of tasks compared to female students, who primarily employ these tools for writing-related activities and express greater concerns regarding trust, dependency, and academic integrity (Sundet et al., 2023; Vogels, 2023). For instance, Elshami et al. (2024) found that male students in clinical medical programmes exhibited significantly higher knowledge of AI, while Ghanem et al. (2025) reported that 50% of male students were aware of GenAI tools, compared to 37% of their female counterparts.

However, recent studies challenge the notion of a persistent gender gap. Iddrisu et al. (2025) found no significant differences in the perceived effectiveness of AI writing tools among undergraduates, suggesting that the supportive designs of these tools may equalise output quality across genders.

Similarly, Yadav et al. (2024) reported minimal gender differences in attitudes toward AI, although postgraduate students demonstrated greater knowledge of AI applications. Gasaymeh et al. (2024) further indicated that gender and educational level had little impact on familiarity, concerns, and perceived benefits regarding GenAI writing tools.

These mixed findings imply that contextual factors, including academic level, discipline, and AI training, may mediate gender effects. For instance, Draxler et al. (2023) found that gender gaps in the adoption of large language models diminish when students are trained in technology-related subjects. Furthermore, qualitative insights reveal distinct interaction styles: women tend to engage in collaborative prompting and critically evaluate AI outputs, while men exhibit more direct and deferential approaches (Mashburn et al., 2025). Bouzar et al. (2024) noted that while males engaged with ChatGPT for longer periods, both genders valued its educational utility.

In a broader educational context, Gesser-Edelsburg et al. (2024) found that while males reported greater familiarity with GenAI, actual usage rates were similar across genders, emphasising that knowledge and perception, rather than access, are the primary differentiators. Dzhanegizova et al. (2024) reinforced this notion, indicating that gender disparities in AI knowledge can influence educational participation; however, postgraduate students generally exhibit higher AI literacy regardless of gender.

2.2 Level of study and mode of delivery

The level of study and mode of delivery significantly influence students' engagement with GenAI. Evidence suggests that postgraduate students display more positive attitudes and a greater integration of GenAI into academic tasks than undergraduates (HEPI, 2024). This trend can be attributed to increased academic experience, confidence, and discipline-specific application needs. Chan and Hu (2023) found that both undergraduates and postgraduates acknowledged GenAI's learning benefits, with postgraduates reporting higher levels of critical and analytical engagement.

Disciplinary context further intersects with academic level. Elshaer et al. (2024) found that students in applied fields, such as engineering and medicine, exhibit higher awareness and intent to use GenAI tools compared to those in theoretical disciplines. In Ghana, Nyaaba et al. (2024) noted that usage increases with academic year and age, indicating a growing confidence and strategic engagement with GenAI tools over time.

2.3 Perceived benefits and ethical concerns

Researchers have well-documented the perceived benefits of GenAI in learning. Students utilise GenAI tools for various purposes, including translation, grammar checking, summarisation, idea generation, and writing assistance (Chan & Hu, 2023; Khalifa & Albadawym, 2024; Denecke et al., 2023). Malik et al. (2023) found that these tools enhance students' writing skills, self-efficacy, and understanding of academic integrity. Almassaad et al. (2024) reported that students primarily use GenAI for conceptual clarification, summarising literature, and obtaining instant feedback, highlighting its efficiency. Noroozi et al. (2024) also echo the time-saving aspect and further add that GenAI tools can aid in providing personalised learning pathways, personalised feedback, assistance in learning different languages, and research, but one should be mindful of the ethical and quality concerns (such as plagiarism, hallucinated content, and data misuse). However, the integration of these tools raises ethical dilemmas that higher education institutions (HEIs) must carefully consider before adoption.

Concerns about academic misconduct are growing as GenAI techniques become more prevalent in higher education. The International Centre for Academic Integrity (2018) emphasises that academic integrity requires honesty, fairness, trust, respect, accountability, and courage—principles that can be compromised when students use GenAI without proper attribution (Pramjeeth & Ramgovind,

2024a). While tools like Grammarly are widely accepted, ChatGPT remains controversial (Currie, 2023). Unreliable AI detection methods (Chaka, 2024) and the increasing use of AI-generated content in university evaluations (Davis, 2025) exacerbate these issues. Fošner (2024) noted that only 1% of students relied solely on AI for assessments, while 31% used GenAI tools for most tasks, revealing a troubling ethical literacy gap among students.

Overreliance on GenAI systems may diminish students' critical thinking, writing autonomy, and engagement with content. Al-Zahrani (2024) and Günay (2025) argue that excessive use can stifle creativity and originality. Some researchers advocate for banning GenAI in assessments, while others recommend promoting ethical AI use through reflective assessments, critical interaction with AI outputs, transparency statements, and AI literacy training (Pramjeeth & Ramgovind, 2024b).

Data privacy and equity concerns also arise with GenAI adoption. Yilmaz and Yilmaz (2022) found that students desire transparency regarding data usage, yet many lack the awareness to voice concerns. The POPI Act mandates South African HEIs to secure data and employ AI responsibly (POPIA, 2021). Chanda et al. (2024) reported that 27% of respondents identified privacy and data security as their top ethical concerns. Students express worries about misinformation, reduced critical thinking, and the potential erosion of academic integrity (Fošner, 2024). Despite GenAI's shortcomings, many students continue to use it because of its perceived efficiency (Fošner, 2024).

Student engagement with GenAI is multifaceted and shaped by gender, academic level, and mode of delivery, alongside awareness and perceived functionality. While male, postgraduate, and contact-based students often report greater use of and confidence in GenAI tools, these gaps can be narrowed through education, training, and access. Importantly, the widespread use of tools like ChatGPT for writing, summarisation, and translation highlights GenAI's educational value. However, concerns around reliability, academic dishonesty, and learning quality demand institutional policies and pedagogical frameworks that promote ethical, informed, and inclusive AI use. Without such measures, the adoption of GenAI risks reinforcing existing inequalities rather than fostering equitable and effective learning environments.

3. Conceptual Framework

This study draws on the Technology Acceptance Model (TAM) by Davis (1989) to explore how perceived usefulness influences students' adoption of GenAI tools. The framework supports an investigation into student behaviours and attitudes towards emerging educational technologies, specifically GenAI and reference management tools. This study builds on the TAM by integrating variables such as perceived risk and ethical concerns, digital literacy, and trust in AI outputs, which recent studies (e.g., Gesser-Edelsburg et al., 2024) highlight as critical to equitable AI adoption. Figure 1 illustrates how contextual factors, including gender, level of study, and mode of delivery, influence students' engagement with GenAI tools, mediated by perceptions such as trust, ethical concerns, and digital literacy. This framework extends the Technology Acceptance Model (TAM) by incorporating context-specific variables relevant to the South African PHEI sector. Trust and ethical concerns were assessed based on students' level of agreement regarding whether the GenAI tool hallucinates, the accuracy of the GenAI outputs, and the variability of the outputs across different GenAI tools. Contextual variables (gender, level of study, mode of delivery) serve as the independent variables, while the perceptual mediators (trust, ethical concerns, and digital/AI literacy) affect how students process these contextual factors. Together, they influence the engagement outcomes—namely, awareness, use, and perceived benefits. Based on this, below is the self-constructed conceptual Framework showing contextual factors influencing GenAI engagement.

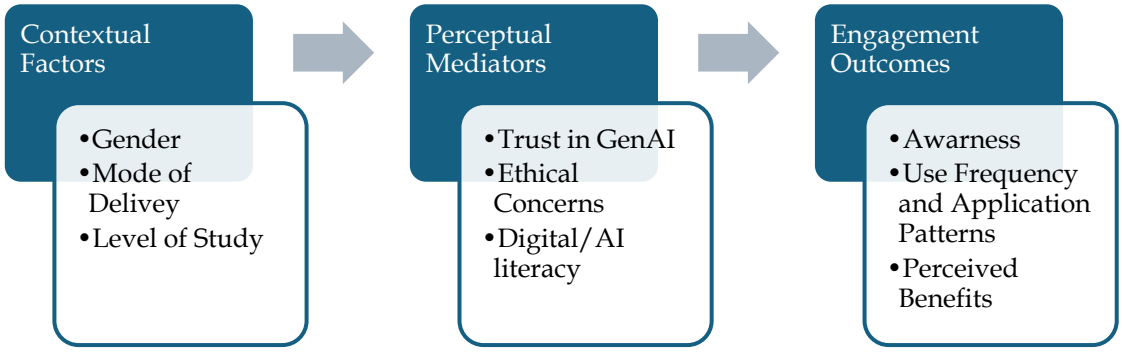

Figure 1: *Conceptual Framework showing contextual factors influencing GenAI engagement*

4. Methodology and Methods

This quantitative study followed a positivist paradigm. There is limited research available on perceived student awareness and use of GenAI tools, reference management tools, and LLMs (such as ChatGPT) in higher education in the southern hemisphere, particularly regarding gender, level of study, and mode of delivery. An online questionnaire employing a closed-ended ratings scale, informed by available literature on GenAI, was used to collect the data. Awareness in this study is self-reported and operationalised as respondents' familiarity with specific GenAI and reference management tools, measured on a three-point scale (not aware, somewhat aware, fully aware). Awareness is treated as a measurable, observable construct, not a subjective narrative. Self-reporting is valid for measuring awareness, as noted by similar studies by Fošner (2024), who assessed university students' attitudes and perceptions towards AI tools. It is important to acknowledge that self-report data can differ from actual proficiency in use.

The instrument questions sought to determine the GenAI and reference management tools commonly used, awareness of these tools, and how frequently they are used. Furthermore, the perceived benefits of using these tools in respondents' qualifications and respective modules, as well as the purposes for which they are used, were also examined.The instrument was structured using various scale-based questions to assess awareness, usage, and benefits. The ethics committee at the researcher's institution vetted the instrument, and two academics at the researcher's PHEI reviewed it for clarity. Internal consistency was measured using Cronbach's Alpha testing, resulting in a score of 0.75. Data were collected through the online survey platform Microsoft Forms from 3 October 2024 to 15 October 2024. The targeted population comprised students across five PHEIs in South Africa. The survey link was emailed to this population using a centralised student database. The instrument was anonymous, and participation in the study was voluntary. The study included students in five PHEIs across postgraduate and undergraduate degrees, disciplines, and modes of delivery. A screening question was included in the survey to ensure participants met the participation requirements. The survey was closed after 1,866 responses were received.

The data were analysed using SPSS, and descriptive and inferential statistical tests were performed. Pearson's chi-square cross-tabulation was used to examine the association between categorical variables such as gender, level of study, and mode of delivery in relation to GenAI and reference management tool awareness, usage frequency, and perceived benefits. This non-parametric test is appropriate for identifying statistically significant relationships between two or more categorical variables in a large sample. Binomial testing was conducted to assess whether the proportion of students selecting specific binary responses (e.g., aware vs. not aware of GenAI tools) differed significantly from expected proportions. This test is suitable for analysing dichotomous outcomes and determining whether observed frequencies deviate meaningfully from chance or assumed distribution patterns.

Ethical clearance for the study was obtained from the PHEI's Ethics Committee in accordance with its ethics review and approval procedures (R.00084). The ethical considerations extended to participant confidentiality, anonymity, privacy, and informed consent.

5. Results and Discussion

5.1 Demographics

Females make up 70.3% of the respondents, followed by males (28.0%) and others (0.9%). Most students (89.2%) are enrolled in full contact mode, and 89.7% are undergraduates. The highest percentage of responses (31.3%) came from the Faculty of Commerce, followed by the Faculty of Information and Communication Technology (23.1%). The Faculty of Engineering, Science, and Public Health, as well as the Hotel School, contributed the fewest responses (0.7% and 0.9%, respectively). The lower response rates from the engineering and hotel schools reflect their smaller enrolment bases in the sampled PHEIs.

5.2 Awareness of GenAI tools

As per Table 1, ChatGPT has the highest awareness rate (86.4%) among the students, followed by Grammarly (70.5%), QuillBot (58.4%), Microsoft Bing (50.5%), and Microsoft Copilot (34.5%). Specialised AI tools, such as GitHub Copilot (16.9%), Midjourney (8.2%), Zotero/Mendeley (10.9%), and DALL-E (10.2%), show significantly lower awareness rates. A chi-square goodness-of-fit test was conducted to determine if a significant proportion of the sample selected the same response option. It was found that a significant proportion of the sample is aware of Grammarly, Microsoft Bing, QuillBot, and ChatGPT, while a significant proportion is unaware of the other GenAI tools. A Pearson chi-square cross-tabulation was conducted to assess whether there is a relationship between gender, level of study (undergraduate vs. postgraduate), mode of delivery (contact vs. part-time vs. distance), and GenAI use frequency and awareness. This paper reports only significant relationships.

Based on the various GenAI tools respondents are aware of, there is a significant relationship between gender and awareness of QuillBot ($\chi2(4) = 21.437$, $p < .000$). The majority of females (61.0%) are aware of it, while 29.3% of males are not. In terms of Microsoft Bing ($\chi2(4) = 19.601$, $p < .000$), an inverse relationship was noted, with 56.8% of males being aware of it, while 37.4% of females are not aware of it. Similar findings were noted for Gemini, Microsoft Bing, Midjourney, GitHub Copilot, DALL-E, and Perplexity AIs. Study habits, field of study, or exposure to tech-related content could potentially influence these gender preferences.

There is a significant relationship between the level of study (undergraduate and postgraduate) and awareness of QuillBot ($\chi2(2) = 14.732a$, $p < .001$). A significant proportion of postgraduate students (36.3%) are not aware of it, while no significant differences were noted for undergraduates. Similar findings were noted for Zotero/Mendeley/Cite This for Me, with a significant proportion of postgraduate students ($\chi2(2) = 34.803a$, $p < .000$) being somewhat aware (17.1%) and aware (17.6%) of the tool.

Table 1: *Student awareness level of the various GenAI and reference management tools*

Item	Responses as Frequency (%)			X^2	df	p-value
	Not aware	Somewhat aware	Aware			
Gemini	1070 (57.3)	361 (19.3)	435 (23.3)	488.415	2	<.001
Grammarly	219 (11.7)	332 (17.8)	1315 (70.5)	1168.421	2	<.001

Microsoft Bing	551 (29.5)	372 (19.9)	943 (50.5)	274.248	2	<.001
Quilbot	470 (25.2)	307 (16.5)	1089 (58.4)	547.296	2	<.001
Midjourney	1544 (82.7)	169 (9.1)	153 (8.2)	2050.248	2	<.001
ChatGPT	45 (2.4)	209 (11.2)	1612 (86.4)	2385.206	2	<.001
GitHub Copilot	1309 (70.2)	242 (13.0)	315 (16.9)	1142.473	2	<.001
Youchat	1540 (82.5)	186 (10.0)	140 (7.5)	2033.994	2	<.001
Microsoft Copilot	917 (49.1)	305 (16.3)	644 (34.5)	302.248	2	<.001
DALL-E	1539 (82.5)	136 (7.3)	191 (10.2)	2030.299	2	<.001
Zotero/Mendeley/Cite this for me	1506 (80.7)	156 (8.4)	204 (10.9)	1886.392	2	<.001
AI Writer/CoWriter	1315 (70.5)	258 (13.8)	293 (15.7)	1159.141	2	<.001
Perplexity AI	1526 (81.8)	169 (9.1)	171 (9.2)	1970.781	2	<.001

5.3 Frequency of use

According to the chi-square goodness-of-fit test (Table 2), a significant portion of the sample sometimes uses ChatGPT (58.1%), QuillBot (37.7%) and Grammarly (37.4%). A significant portion of the respondents have also, however, not used QuillBot (46.9%) and Grammarly (43.2%), while the other AI tools are not in use by a significant proportion of the sample. Only 21.9% of the students always use ChatGPT. The Pearson chi-square cross-tabulation found a significant relationship between gender, year of study and mode of delivery, and GenAI use frequency. Only significant relationships are reported on.

***Table 2**: Student GenAI and reference management tool usage frequency*

Item	Responses as Frequency (%)			X^2	df	p-value
	Never	Sometimes	Always			
Gemini	1524 (81.7)	280 (15.0)	62 (3.3)	2000.270	2	<.001
Grammarly	806 (43.2)	698 (37.4)	362 (19.4)	172.399	2	<.001
Microsoft Bing	1186 (63.6)	491 (26.3)	189 (10.1)	840.428	2	<.001
Quilbot	875 (46.9)	704 (37.7)	287 (15.4)	294.145	2	<.001
Midjourney	1752 (93.9)	102 (5.5)	12 (0.6)	3085.852	2	<.001
ChatGPT	372 (19.9)	1085 (58.1)	409 (21.9)	518.068	2	<.001
GitHub	1656 (88.7)	161 (8.6)	49 (2.6)	2588.434	2	<.001
Youchat	1766 (94.6)	89 (4.8)	11 (0.6)	3161.006	2	<.001
Microsoft Copilot	1362 (73.0)	387 (20.7)	117 (6.3)	1379.180	2	<.001
DALL-E	1751 (93.8)	100 (5.4)	15 (0.8)	3079.701	2	<.001
Zotero/Mendeley/C	1679 (90.0)	143 (7.7)	44 (2.4)	2702.209	2	<.001
AI Writer/CoWriter	1643 (88.0)	186 (10.0)	37 (2.0)	2531.772	2	<.001
Perplexity AI	1723 (92.3)	109 (5.8)	34 (1.9)	2927.836	2	<.001

According to the Pearson chi-square cross-tabulation, there is a significant relationship between gender and QuillBot frequency of use ($\chi 2$ (4) = 24.085, $p < .000$). In total, 71.70% of females always use the tool, while 51.8% of males never use it. The inverse was noted for the other tools. Of males, 21.3% sometimes use Gemini ($\chi 2$ (4) = 31.516, $p < .000$), while 84.8% of females never use it. When it comes to Midjourney ($\chi 2$ (4) = 55.642, $p < .000$), 11.1% of males sometimes use it, with no significant female use. A significant proportion of males (4.8%) always use GitHub Copilot ($\chi 2$ (4) = 68.683, $p < .000$), with 15.4% sometimes using it, and 92.6% of females never using it. A similar finding was noted for Microsoft Copilot. In total, 1.3% of males always use DALL-E ($\chi 2$ (4) = 49.831, $p < .000$), with

10.9% sometimes using it, and no significant use by females. A similar finding was made for Perplexity AI.

In terms of a significant difference between postgraduate and undergraduate students' use of these tools, a significant proportion of postgraduates (10.4%, $\chi 2$ (2) = 12.192a, p<.002) sometimes use DALL-E. On the other hand, a significant proportion of postgraduates always use Zotero/Mendeley/Cite This for Me (6.7%, $\chi 2$ (2) = 19.146a, p<.000).

Based on the GenAI tools used most often, students were asked the extent to which they agree with the statements depicted in Figure 1. The Pearson chi-square cross-tabulation established that there is a significant relationship between gender, year of study, and mode of delivery, as well as the statements in Figure 3. Only significant relationships are reported.

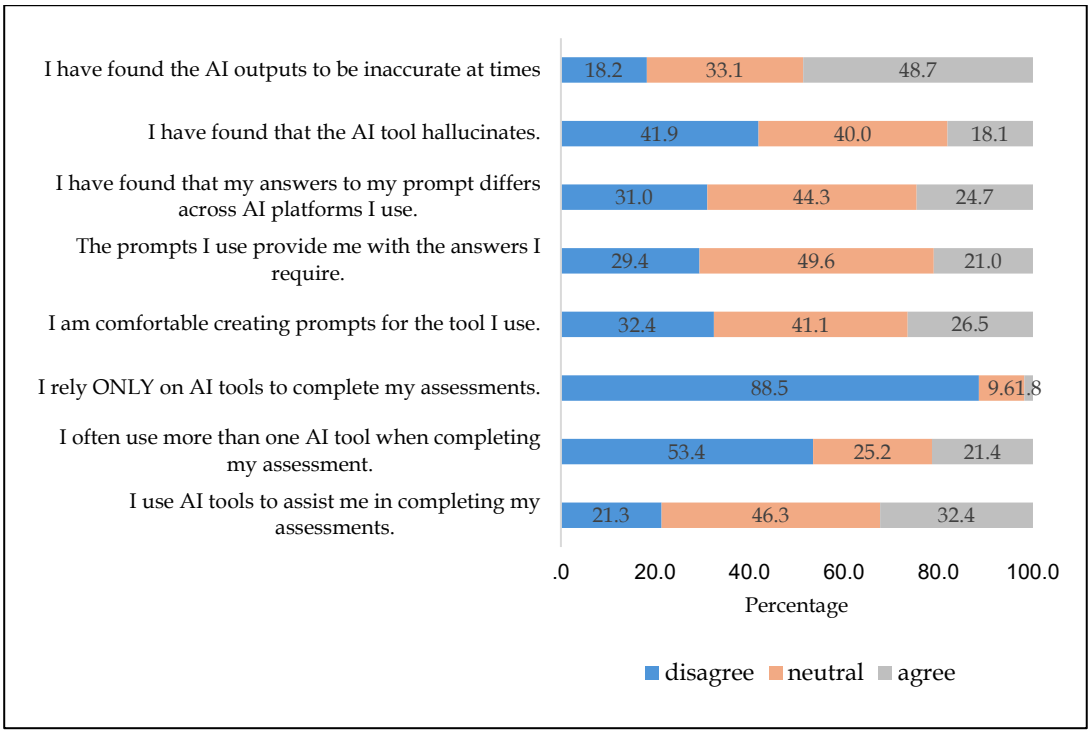

***Figure 2**: Student levels of agreement*

5.3.1 Perceived accuracy and reliability of AI outputs

The Pearson chi-square cross-tabulation indicates that there is a significant relationship between gender and AI hallucinations ($\chi 2$ (4) = 15.286, p < .004). Of males, 21.7% agree that AI hallucinates, while 44.0% of females disagree. A significant proportion of postgraduate students disagree that their AI output responses were inaccurate (2.38%, $\chi 2$ (2) = 8.409a, p < .015). No significant differences were noted among undergraduates. It was further established that a significant proportion of distant students disagree that their prompts differ across platforms (49.5%, χ (4) = 10.127a, p<.038). No significant differences were noted among contact and part-time students.

5.3.2 Variability in AI responses

There is a significant relationship between gender and AI answers across different AI platforms ($\chi 2$ (4) = 14.593, p < .006). In total, 28.8% of males agree that responses across AI platforms differ, while 33.1% of females disagree. A significant difference was noted between undergraduate and postgraduate students, with 38.9% of postgraduate students disagreeing that their AI output

responses differ across platforms ($\chi2(2) = 7.018a$, $p<.030$). There are no significant differences among undergraduates. It was further established that a significant proportion of distance students disagree that their prompts differ across platforms (46.7%, $\chi2\ (4) = 23.924a$, $p<.000$). No significant differences are noted among contact and part-time students.

5.3.3 Confidence in prompt engineering

The study found that there is a significant relationship between gender and confidence in creating prompts ($\chi2\ (4) = 28.315$, $p < .000$). Of males, 33.2% agree, while 35.2% of females disagree and find it difficult to formulate appropriate prompts.

In terms of responses to the accuracy of prompt outputs, there is a significant relationship between gender and accuracy of prompt responses ($\chi^2\ (4) = 19.388$, $p < .001$). A significant proportion of males (27.3%) agree with the answers provided by the prompts they use, while a significant proportion of females (31.3%) disagree.

A significant relationship is noted for the mode of delivery (contact, part-time, distance) and prompts used to provide the required answers. A significant proportion of distance students disagree that they use AI tools to assist them in completing assessments (39.6%, $\chi\ (4) = 13.001a$, $p<.011$).

5.3.4 AI Tools in completing assessments

In terms of students relying solely on AI tools to complete their assessments, 14.1% of males were neutral about using AI solely to complete their assessments ($\chi2\ (4) = 17.918a$, $p<.001$). No significant differences were noted among females.

A significant relationship was noted for the mode of delivery (contact, part-time, distance) and students using the tool to assist them in completing their assessments. A significant proportion of distance students disagree that they use AI to assist them in completing their assessments (36.3%, $\chi2\ (4) = 28.777a$, $p<.000$). No significant differences were noted among contact and part-time students.

5.4 Benefits of using GenAI and reference management tools

The results of a chi-square goodness-of-fit test show that a significant proportion (79.2%) of the respondents perceive the benefits of using these AI tools in their qualification as low or medium ($\chi2(3) = 793.957$, $p<.001$). They thus acknowledge the value some of these tools provide but do not consider them a game-changer in their studies. This view may change as students' AI literacy levels improve.

The Pearson chi-square cross-tabulation found that there is a significant relationship between gender and overall perceived benefits of GenAI tools ($\chi2\ (6) = 16.855a$, $p < .010$). A significant proportion of males (15.2%) consider AI use in their qualification beneficial, while there were no significant findings for females.

The test further established that there is a significant relationship between level of study and perceived overall benefits ($\chi^2\ (3) = 21.718$, $p < .000$), with 21.8% of postgraduate students considering GenAI use in their qualification beneficial.

There is a significant relationship between the mode of study and perceived overall benefits ($\chi^2\ (6) = 18.275a$, $p < .006$). A significant proportion of part-time students (21.1%) consider the use of GenAI tools in their qualification beneficial, while 14.8% of distance students perceive no benefits.

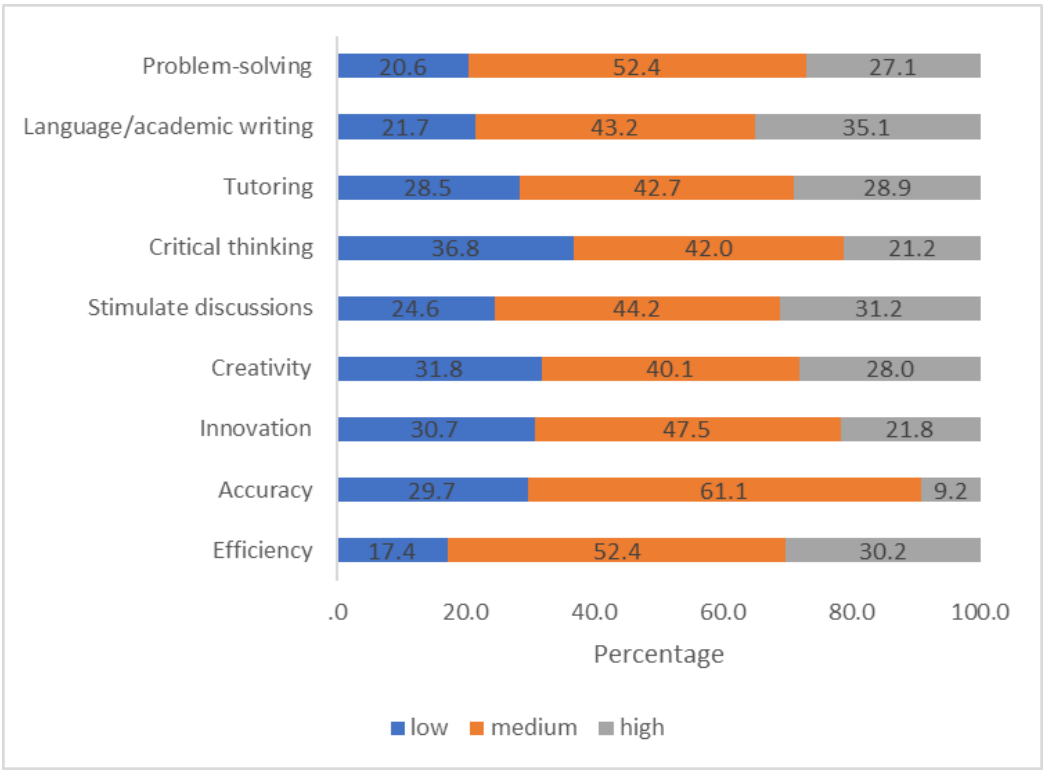

Figure 3: *Perceived benefits of using GenAI and reference management tools in qualifications*

In terms of specific key benefits as per Figure 3, the Pearson chi-square cross-tabulation indicates that there is a significant relationship between gender and perceived efficiency benefits of GenAI tools ($\chi 2$ (4) = 36.547a, p<.000), with 40.1% of males perceiving the benefits as high and 56.0% of females perceiving medium benefits in terms of efficiency. In terms of accuracy ($\chi 2$ (4) = 13.069a, p < p<.011), 11.1% of males consider the benefits high, while 32.0% of females consider them low. Similar findings were made for tutoring ($\chi 2$ (4) = 13.988a, p<.007), with 33.2% of males perceiving the benefits as high, while 30.7% of females considered it low. Similar findings were made for problem-solving, with males perceiving a high benefit in terms of problem-solving (32.1%, $\chi 2$ (4) = 11.435a, p<.022). In terms of level of study (undergraduate and postgraduate) and a relationship with critical thinking, a significant difference was noted ($\chi 2$ (1) = 7.704a, p < .021), with 36.8% of postgraduate students perceiving a high critical thinking benefit. No significant relationships were noted for undergraduates.

In terms of mode of delivery and a relationship with efficiency, accuracy, innovation, tutoring, and problem solving, a significant relationship was noted. A significant relationship with efficiency was noted ($\chi 2$ (4) = 29.156a, p < .000), with 31.6% of distance students considering the benefit low. Similar findings were noted for accuracy, with 40.7% of distance students perceiving low benefits ($\chi 2$ (4) = 12.423a, p<.014). In terms of innovation, the results among distance students were split: 40.1% perceived significant low benefits, while 25.8% perceived high benefits if GenAI tools were used in their qualifications ($\chi 2$ (4) = 15.470a, p<.004). No significant differences were found between contact and part-time students.

In terms of tutoring, a significant relationship was noted for part-time and distance students ($\chi 2$ (4) = 13.022a, p < .011). The part-time students perceived a high benefit (42.1%) in terms of tutoring, while the distance students perceived a low benefit (51.8%). The distance students also perceived low benefits for problem-solving (35.7%, $\chi 2$ (4) = 30.201a, p<.000).

5.5 How GenAI and reference management tools are being used

Respondents were asked, "In what ways do you use the various generative AI and reference management tools in your coursework?" (as per Figure 4). The Pearson chi-square cross-tabulation shows a significant relationship for gender, mode of delivery, and the various ways GenAI tools are being used. A significant proportion of males were found to only use the tools for the following, with no significant difference noted for females (only significant responses are reported on): GenAI for text generation (26.5%, $\chi 2$ (4) = 36.547a, p<.001), mathematics (10.4%, $\chi 2$ (2) = 22.723a, p<.000), and image generation (17.3%, $\chi 2$ (2) = 12.712a, p<.002).

The inverse was noted for paraphrasing, with a significant proportion of females (48.4%, $\chi 2$ (2) = 24.284a, p<.000) using it for paraphrasing, while a significant proportion of males (62.9%) did not use it for paraphrasing. Similar findings were also made for grammar checking; a significant proportion of females (53.9%, $\chi 2$ (2) = 9.790a, p<.007) used the tool. Both males and females show a significant relationship for information search (χ^2 (2) = 39.061, p < .000). Males (42.5%) use the tools for information searches, while females (72.4%) opt not to use them. Similar findings were noted for coding (χ^2 (2) = 108.637a, p < p<.000), with a significant proportion of males using the tool for coding (24.9%). A significant relationship was noted for distance students and using the tools for summarisation and paraphrasing. Distance students (75.1%) do not use the tools for summarising ($\chi 2$ (2) = 8.454a, p<.015) and paraphrasing (100.3%, $\chi 2$ (2) = 16.304a, p<.000).

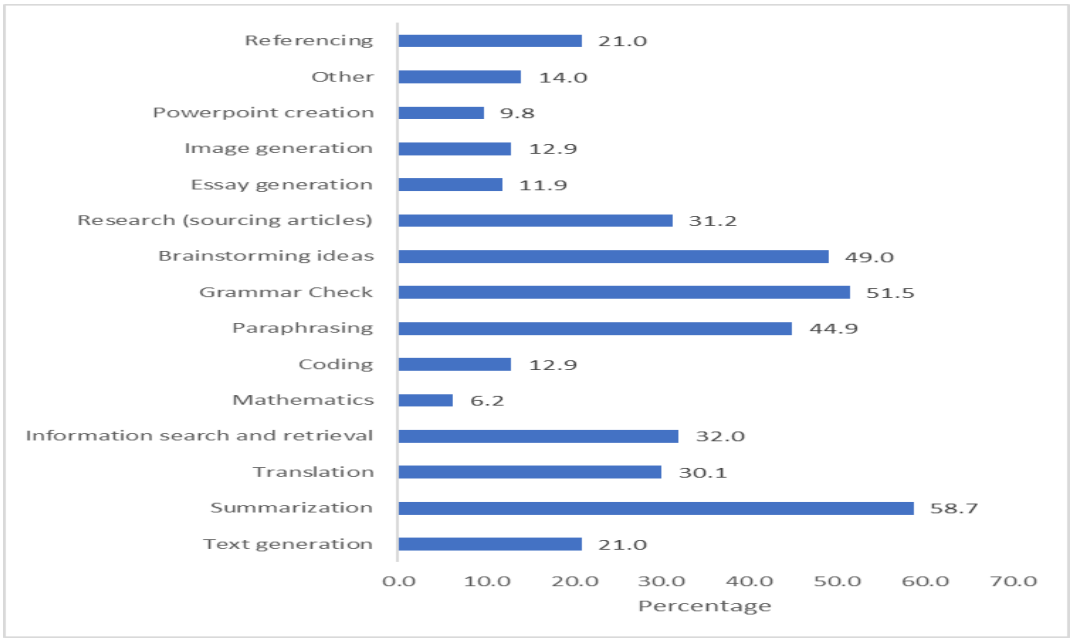

Figure 4: *Various ways GenAI tools are being used*

This study's findings strongly align with a growing body of literature that highlights how gender, level of study, and mode of delivery shape student engagement with GenAI tools. The research confirms the widespread use of writing-related applications of GenAI (Ofem et al., 2024; Chan & Hu, 2023), with female students in this study reporting higher use of tools like Grammarly and QuillBot for academic writing tasks, which supports findings by Mashburn et al. (2025). Conversely, male students demonstrate higher use of advanced and technical tools such as Midjourney, GitHub Copilot, and DALL-E, a pattern reflected in studies by Bouzar et al. (2024). While Iddrisu et al. (2025) and Yadav et al. (2024) report minimal gender differences in perceived effectiveness, this study nuances these findings by revealing gendered differences in confidence with prompt engineering and perceptions of hallucinations. Males tend to trust outputs more and perceive fewer hallucinations,

while females are more likely to disagree with AI's accuracy, which is consistent with global findings (Møgelvang et al., 2024). This study confirms existing literature indicating that gender differences persist in awareness and exposure to specific tools (Armutat et al., 2024; Draxler et al., 2023; Minh et al., 2023), with students' actual knowledge of the various tools being the main variable, rather than gender, privacy, or trust (Iñaki et al., 2024). This conclusion is supported by Ghanem et al. (2025), who found that gender, university, and study phase affect knowledge and use of GenAI tools. The difference may be attributed to lower digital confidence, which has been previously reported among female students in various technology adoption studies (Almassaad et al., 2024; Bouzar et al., 2024). These gendered findings align with the extensions of the Technology Acceptance Model (TAM), where trust and digital literacy mediate technology use. This reinforces the importance of designing inclusive AI literacy interventions that actively close the gender gap.

This study confirms that awareness does not necessarily equate to high usage (Gesser-Edelsburg et al., 2024), aligning with the literature on selective adoption of various GenAI tools. Postgraduate students in the current study exhibited higher awareness and utilisation of tools like Zotero and Mendeley, consistent with their perceived higher overall benefits, particularly in critical thinking. This observation mirrors findings from Dzhanegizova et al. (2024) and Yadav et al. (2024), who noted that postgraduate cohorts often exhibit greater AI literacy, understanding, and academic motivation. Additionally, this study found that distance education students perceive significantly lower benefits and usage of GenAI tools, particularly in areas such as efficiency, accuracy, and tutoring—a gap not widely explored in existing literature. This contrasts with the findings of Dzhanegizova et al. (2024) but aligns with broader access and engagement concerns outlined by Ofem et al. (2024) and Nyaaba et al. (2024), suggesting that academic year and age significantly influence the adoption and perceived value of digital tools.

The moderate perceived benefits identified in this study echo the work of Chan and Hu (2023), Arowosegbe et al. (2024), and Guillén-Yparrea (2024), who argue that while students appreciate the convenience of GenAI, they remain cautious about its academic reliability and impact. Confidence in prompt engineering, more commonly expressed by male and postgraduate students in the present study, is similarly supported by Mashburn et al. (2025) and Draxler et al. (2023), who note that technological familiarity differs between genders; however, users' ability to generate meaningful and accurate outputs improves with training and familiarity. Together, these correlations suggest that, while GenAI tools are gaining traction across higher education, disparities in confidence, tool selection, and benefit perception remain patterned along demographic and institutional lines, necessitating tailored strategies for equitable integration. With consistent AI literacy training and focused support, an improvement in student confidence and a more balanced utilisation of tools across groups could emerge.

6. Alignment of the Findings to the Conceptual Framework

The results of this study broadly support the proposed conceptual framework (Figure 1), which posits that students' gender, level of study, and mode of delivery shape their engagement with GenAI tools, mediated by perceptual factors such as trust, ethical concerns, and digital literacy.

First, gender differences were evident in both awareness and usage patterns, supporting the framework's assertion that gender acts as a key contextual variable. For example, male students were significantly more likely to use advanced GenAI tools such as GitHub Copilot, Midjourney, and DALL-E for tasks like coding and image generation, while female students showed higher usage of text-related tools such as QuillBot and Grammarly for paraphrasing and grammar checking. This pattern aligns with the mediating role of trust and perceived reliability: the results show that female students expressed greater scepticism towards the accuracy of AI outputs, consistent with heightened ethical concerns reported in the literature. These perceptual differences appear to shape how each gender engages with different types of tools.

Second, the findings regarding the level of study reinforce the framework. Postgraduate students reported higher awareness, more frequent use, and a greater perception of critical thinking benefits, confirming that advanced academic exposure can enhance both AI literacy and perceived usefulness. This suggests that digital literacy (as a perceptual mediator) grows with academic maturity, shaping how students integrate GenAI tools into their work.

Third, the role of delivery mode is particularly insightful. Distance learning students consistently reported fewer perceived benefits, less frequent use, and greater scepticism about GenAI tools. This supports the framework's proposition that structural and contextual factors (like delivery mode) influence students' trust and perceived ease of use, thereby impacting actual engagement. The finding that distance students perceive fewer benefits also aligns with the idea that limited institutional support and lower digital infrastructure may impede AI literacy development, a key perceptual mediator in the model.

However, the study's findings also reveal some gaps. For instance, while the framework suggests that ethical concerns would consistently mediate engagement, the data show that students' awareness of ethical implications was not deeply explored, and self-reported ethical concerns were relatively low beyond issues of trust in accuracy. This indicates that ethical mediation might be less salient for students at present and could benefit from further exploration in follow-up qualitative research to investigate the perceived ethical concerns of using GenAI.

7. Practical Implications

Based on these findings, the following actions are recommended for PHEIs, especially those supporting open and distance learning:

7.1. Implications for educators: Teaching practice and curriculum design

Integrating generative AI (GenAI) into higher education necessitates a multifaceted and inclusive approach involving all stakeholder levels. Educators are encouraged to incorporate GenAI literacy into their curricula through tailored interventions, critical prompt-based assignments, ethical discussions, and differentiated instruction to accommodate diverse digital competencies. Institutions must facilitate this integration through strategic planning that encompasses inclusive policies, targeted training, collaboration with technology providers, and the promotion of ethical standards and gender-sensitive support mechanisms. Students, in turn, require structured pathways to develop GenAI competencies, guided support on authorship and ethical usage, as well as equitable access to AI tools, particularly for part-time and distance learners. For resource-constrained PHEIs, a phased strategy involving the integration of GenAI modules into existing programmes, cost-effective faculty-led initiatives, industry partnerships, and the utilisation of existing platforms presents a pragmatic way forward. Collectively, these efforts highlight the shared responsibility in fostering equitable, ethical, and confident engagement with GenAI in the evolving landscape of private higher education.

8. Conclusion

This study demonstrates that students' engagement with GenAI tools is shaped by a dynamic interplay of contextual variables (gender, level of study, and mode of delivery) and perceptual mediators such as trust, ethical concerns, and digital literacy. By extending the Technology Acceptance Model (TAM) with these mediators and situating it within the under-researched context of South African PHEIs, this research contributes new evidence on how diverse student groups navigate emerging AI technologies. The findings extend TAM by showing how gender, study mode, and AI literacy shape acceptance. Institutions must address structural inequalities through targeted support. The findings confirm existing literature on gendered and study-level patterns in GenAI and AI research tool awareness and use; while highlighting the unique role that mode of delivery plays, an area seldom explored in GenAI research. Notably, distance students consistently report lower

perceived benefits and less confidence in GenAI outputs, suggesting structural barriers that institutions must address to ensure equitable access and use. While students widely acknowledge GenAI's potential for efficiency and academic support, they remain cautious about its accuracy, impact on critical thinking, and ethical implications. This reflects a need for nuanced, inclusive strategies to bridge gaps in AI literacy and confidence. If institutions fail to act, the unequal adoption of GenAI tools risks deepening existing digital divides, inequity in delivery, and unequal access while also further entrenching the educational and technological gap among females. However, when implemented responsibly, GenAI holds transformative potential to promote greater equity in access, learning, and academic support.

Although this study focused on five South African PHEIs, its insights have broader relevance for ODL and higher education contexts globally, where disparities in digital infrastructure, student support, and AI readiness can exacerbate existing inequities if left unaddressed. Future research could build on this work by exploring students' ethical reasoning and lived experiences of GenAI use through qualitative approaches.

9. Declarations

Funding: This research did not receive any external funding.

Acknowledgements: The author gratefully acknowledges all participants for their valuable support.

Conflicts of Interest: The author declares that there is no conflict of interest.

Data Availability: The data are not publicly available due to confidentiality agreements with participants and ethical restrictions imposed by the Institutional Review Board. However, de-identified data can be made available from the corresponding author upon reasonable request, subject to approval by the ethics committee.

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