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AI Tool Use and Digital Self-Efficacy among Higher Education Students: A Correlational Study

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ABSTRACT

The rapid adoption of artificial intelligence (AI) tools in higher education has created new opportunities for learning, academic writing, research, and problem-solving. However, the relationship between AI tool use and digital self-efficacy among higher education students in Pakistan remains underexplored. This study examined this relationship using a quantitative correlational research design. Data were collected from 300 undergraduate students through a five-point Likert-scale instrument using a multistage sampling technique. Descriptive and inferential statistics were used for data analysis. ChatGPT (96.3%) and Google Gemini (89.7%) were the most frequently used AI tools. Students primarily used AI tools to understand difficult topics, summarize academic content, complete study-related tasks, prepare for examinations, improve academic writing, and solve academic problems. AI tool use showed significant positive relationships with general digital academic confidence ($r = .596, p < .01$), AI-assisted academic self-efficacy ($r = .680, p < .01$), self-regulation and ethical digital competence ($r = .556, p < .01$), and overall digital self-efficacy ($r = .675, p < .01$). Students also reported concerns about AI dependency, privacy and data security, institutional guidance, academic honesty, and content accuracy. The findings highlight the need for AI literacy, ethical guidelines, institutional support, and digital skills to promote responsible AI integration in higher education.

Introduction

Artificial Intelligence (AI) has become increasingly important in the twenty-first century and is transforming teaching, learning, and assessment in higher education worldwide (Kasneci et al., 2023). The rapid development of generative AI tools has reshaped traditional learning by providing students with personalized academic support, content generation, problem-solving assistance, and immediate feedback (Rahman & Watanobe, 2023). The growing use of tools such as ChatGPT, Google Gemini, and Microsoft Copilot has encouraged universities to integrate AI into academic practices, supporting student engagement and innovative teaching approaches (Adeshola & Adepoju, 2023). In this context, digital self-efficacy has emerged as an important cognitive factor, referring to students' confidence in using digital technologies for academic tasks and problem-solving (Bandura, 1997). Students with higher digital self-efficacy may be more confident in exploring AI tools, addressing challenges, and integrating them into their learning processes (Tang et al., 2021). Therefore, the effective use of AI depends not only on its technological capabilities but also on students' digital competence and confidence (Lo, 2023).

In Pakistan, the use of AI tools is increasing in higher education, particularly in teaching, learning, research, and academic support (Ashraf et al., 2025). Students use AI tools for academic writing, literature reviews, programming, translation, data analysis, and problem-solving (Ashraf et al., 2025). Research indicates that students' intention to use AI is associated with perceived usefulness, ease of use, and academic performance (Basit et al., 2025). However, differences in students' digital competence and confidence may affect their ability to use these tools effectively (Basit et al., 2025). Concerns have also been raised about overreliance on AI-generated content, reduced critical thinking, academic dishonesty, and differences in digital competency (Adeshola & Adepoju, 2023).

Although previous studies have examined AI adoption and its educational applications, limited empirical evidence exists on the relationship between AI tool use and digital self-efficacy among higher education students, particularly in Pakistan (Kasneci et al., 2023; Sultan et al., 2025). Therefore, this study aims to examine the relationship between AI tool use and digital self-efficacy among higher education students in Pakistan.

Problem Statement

Students utilize AI tools extensively to enhance learning, research, academic writing, and problem-solving, and these tools are becoming more and more integrated into higher education (Lan & Zhou, 2025; Ogunleye et al., 2024).

Even though the use of AI tools in higher education is expanding, most of the research that has been done so far has been on students' behavioural goals, academic achievement, adoption, and acceptance of AI tools (Ashraf et al., 2025; Syahrudin et al., 2025; Cukurova et al., 2025). Comparatively less attention has been given to understanding how the use of AI tools is associated with students' digital self-efficacy (Zhao et al., 2025).

In Pakistan, research on the educational use of AI tools is still emerging, and there is limited empirical evidence regarding the relationship between AI tool use and digital self-efficacy among higher education students (Sultan et al., 2025). Therefore, this study aims to examine the

relationship between AI tool use and digital self-efficacy among higher education students in Pakistan.

Significance of the Study

The significance of this study extends to the following stakeholders:

This study may increase higher education students' awareness of the importance of digital self-efficacy in using artificial intelligence (AI) tools for academic purposes. It might promote critical thinking, self-directed learning, and academic integrity while encouraging students to use AI tools efficiently, sensibly, and morally.

This study may help teachers understand students' use of AI tools and their digital self-efficacy. It can support teachers in selecting appropriate teaching strategies, integrating AI tools into lessons, and promoting students' digital literacy and ethical use of AI.

This study may provide universities with empirical evidence to develop student support programs, strengthen digital literacy initiatives, and formulate institutional policies that facilitate the effective integration of digital technologies into teaching. It may also help educational institutions enhance students' digital competencies to meet the evolving demands of AI-supported education.

Policymakers may utilize the findings of this study to drive the creation of rules and regulations pertaining to the moral and responsible application of AI tools in higher education. Additionally, it might support institutional and national initiatives to improve digital literacy and encourage the efficient use of AI tools in educational settings.

This study may contribute actual data on higher education students' usage of AI tools and digital self-efficacy, especially in the Pakistani setting. This study may add to the body of knowledge already in existence. Future studies on digital literacy, digital self-efficacy, and AI-supported learning may find it useful.

Research Objectives

Following objectives of research was formulated to:

1. Identify the frequency of students' AI tool usage at higher education.
2. Determine the students' digital self-efficacy at higher education level.
3. Differentiate the students' usage of AI tool and digital self-efficacy based on their demographical variables.
4. Find out the relationship between the students' use of AI tool and digital self-efficacy at higher education.

Research Questions

Following were the research questions of this study:

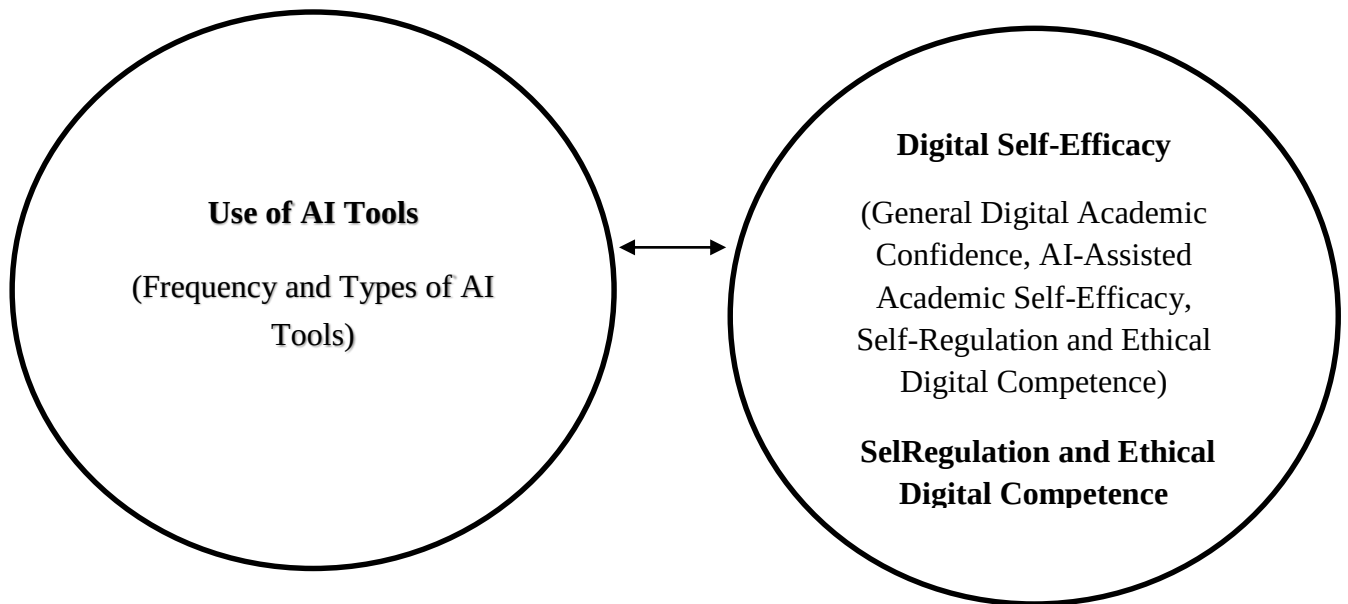
1. What is the frequency of AI tool usage among higher education students?
2. What is the level of digital self-efficacy among higher education students?

3. Is there a significant difference between in use of AI tools and digital self-efficacy among higher education students based on their demographic characteristics?
4. What is the relationship between the use of AI tool and digital self-efficacy among higher education students?

Delimitations of Study:

Due to constraint of time and resources study will remain confined to undergraduate students of faculties of social sciences in public and private university of Lahore.

Conceptual framework



Theoretical and Conceptual Frameworks

Before examining the relationship between AI tool use and digital self-efficacy, it is important to establish the theoretical foundations underlying these concepts. This study is grounded in the Technology Acceptance Model (TAM) proposed by Davis (1989) and Bandura's Social Cognitive Theory (SCT) (1977), with particular emphasis on the concept of self-efficacy. TAM explains individuals' acceptance and use of technology based primarily on perceived usefulness and perceived ease of use (Davis, 1989). In contrast, SCT explains how personal, behavioural, and environmental factors interact to shape individuals' learning, behaviour, and beliefs about their capabilities (Bandura, 1977, 1986). Within Social Cognitive Theory, self-efficacy refers to individuals' beliefs about their ability to organize and perform the actions required to accomplish specific tasks or achieve particular goals (Bandura, 1977). Unlike actual ability or competence, self-efficacy reflects individuals' confidence in applying their knowledge and skills in different situations (Bandura, 1997). Together, TAM and Social Cognitive Theory provide a theoretical basis for understanding how students' perceptions of technology and beliefs about their capabilities may relate to their use of AI tools and digital self-efficacy.

In educational settings, self-efficacy is associated with students' academic performance, motivation, learning strategies, and persistence (Bandura, 1997; Pajares, 1996). Students with

higher self-efficacy are more likely to engage in challenging academic tasks, use effective problem-solving strategies, and regulate their learning (Zimmerman, 2000). Conversely, students with lower self-efficacy may avoid difficult tasks, experience greater anxiety, and reduce their efforts when facing challenges (Bandura, 1997; Pajares, 1996). The increasing integration of AI into higher education has further highlighted the importance of students' confidence in using digital technologies for learning (Kasneci et al., 2023; Crompton & Burke, 2023; Mah & Groß, 2024). Generative AI systems, intelligent tutoring platforms, adaptive learning environments, and automated feedback tools require students to interact effectively with digital technologies to achieve academic goals (Kasneci et al., 2023; Xia et al., 2024). Therefore, digital self-efficacy is relevant to understanding students' confidence in using digital resources for academic purposes (Morales-García et al., 2024; Bewersdorff et al., 2025).

Social Cognitive Theory provides a particularly relevant foundation for explaining how students develop digital self-efficacy through learning experiences, observation, social support, and feedback (Bandura, 1997). Successful experiences with digital tools can strengthen students' confidence, whereas difficulties or negative experiences may reduce it (Mah & Martín, 2024; Zhang et al., 2024). As students successfully use AI and other digital applications for research, academic writing, collaborative learning, and problem-solving, they may develop stronger beliefs in their ability to perform technology-supported academic tasks (Bewersdorff et al., 2025; Esiyok et al., 2025). These beliefs can support students' engagement with digital resources, self-directed learning, and participation in digitally mediated educational activities (Bandura, 1997; Zimmerman, 2000). Thus, Social Cognitive Theory helps explain the development of digital self-efficacy, while TAM provides a framework for understanding students' acceptance and use of AI tools in higher education (Bandura, 1997; Davis, 1989).

The use of AI tools in higher education has expanded rapidly, particularly through generative AI applications such as ChatGPT, Google Gemini, and other AI-supported learning platforms. Students increasingly use these tools for academic writing, information searching, problem-solving, summarization, language-related tasks, and understanding difficult concepts (Wang et al., 2025). In Pakistan, university students have reported using AI tools such as ChatGPT, Grammarly, and Notion AI for academic activities, time management, and task completion, although concerns about excessive reliance on AI-generated content remain (Mughal & Farooq, 2025). Similarly, ChatGPT has been reported to support academic learning and performance among Pakistani university students (Ashraf et al., 2025). Generative AI is also increasingly used by Pakistani undergraduates to support conceptual understanding and other academic activities (Shaheen et al., 2025).

Students' confidence in using AI tools and digital resources is an important factor in their engagement with AI-supported learning (Falebita & Kok, 2025). Self-efficacy significantly influenced undergraduates' use of AI tools and their perceptions of ease of use (Falebita & Kok, 2025). AI self-efficacy positively predicted students' attitudes and actual use of AI tools while reducing AI-related anxiety (Chen et al., 2024). AI use, AI literacy, interest in AI, and positive attitudes were associated with higher AI self-efficacy among university students (Bewersdorff et al., 2025).

Digital self-efficacy refers to students' confidence in using digital tools and resources to accomplish academic tasks. In AI-supported learning, this may involve learning new digital tools, solving digital problems, using AI for academic purposes, and adapting to digital resources

(Jeilani & Abubakar, 2025). AI literacy, AI output quality, self-efficacy, and academic performance were found to be interrelated (Bećirović et al., 2025). However, the benefits of AI tools may depend on how they are used, as purposeful use may support independent learning and academic confidence, whereas excessive reliance may reduce opportunities for independent thinking (Bećirović et al., 2025).

Although research on AI tools in Pakistani higher education is increasing, existing studies have mainly focused on AI adoption, academic performance, AI literacy, student perceptions, and ethical concerns (Shahzad et al., 2025; Shafqat & Amjad, 2024; Umar & Ashraf, 2026). Research in Pakistan has examined students' adoption and actual use of generative AI tools, as well as their perceptions and ethical concerns regarding AI-supported academic activities (Shahzad et al., 2025; Shafqat & Amjad, 2024). However, limited research has directly examined the relationship between AI tool use and broader digital self-efficacy among higher education students in Pakistan, as existing studies have largely focused on AI adoption, perceptions, and academic applications (Shahzad et al., 2025; Shafqat & Amjad, 2024). Therefore, the present study seeks to address this research gap by examining the relationship between AI tool use and digital self-efficacy among higher education students (Shahzad et al., 2025; Bećirović et al., 2025).

This study was based on the positivist paradigm and employed a quantitative research approach to systematically examine the relationships among the research variables. A correlational study design was adopted to investigate the relationship between undergraduate students' use of Artificial Intelligence (AI) tools and their digital self-efficacy without any experimental manipulation. This design was suitable for our investigation as it enables the researcher to determine the strength and direction of the relationships among the variables as they naturally occurred within the higher education context.

The population under study was consisted on pupils of undergraduate enrolled in higher education programmes. These students were selected as the target population because they frequently use of AI tools for academic purposes, including completing assignments, conducting research, preparing coursework, and participating in online learning activities. Their regular use of AI tools made them an appropriate population for examining the relationship between AI tool usage and digital self-efficacy. About 300 undergraduate students from the appropriate department who had not yet graduated represented the target population.

The study involved 300 undergraduate students from the Faculty of Social Sciences. To guaranty sufficient representation of students from various academic semesters, a multiple stage sampling technique was employed. Based on their semester groups, the students were split into four groups: first–second, third–fourth, fifth–sixth, and seventh–eighth semesters. After that, participants were chosen at random from each stratum. This sample strategy helped lower the possibility of sampling bias and guaranteed representation throughout the undergraduate program's several semesters.

Three sections of self-administered questionnaire were used to gather data. The respondents' demographic information, such as gender and semester classification, was gathered in the first section. The usage of artificial intelligence (AI) tools by students for academic objectives was investigated in the second segment. Items measuring the sorts of AI tools utilized in academic activities as well as their frequency of use were included in this section.

Three domains—General Digital Academic Confidence, AI-Assisted Academic Self-Efficacy, and Self-Regulation and Ethical Digital Competence—were used in the third segment to evaluate students' digital self-efficacy. The items centered on students' self-assurance in using digital tools to complete academic assignments and their capacity to use them autonomously, sensibly, and morally.

A five-point Likert scale, ranging from 1 (Never) to 5 (Always), was used to test items measuring the use of AI tools, and a scale from 1 (Strongly Disagree) to 5 (Strongly Agree) was used to quantify digital self-efficacy. The systematic and quantitative analysis of students' use of AI tools and digital self-efficacy was made easier by these answer scales.

Table 1 Demographic characteristics of Students

Characteristics	<i>f</i>	%
Gender		
Male	109	36.3
Female	191	63.7
Semester		
1-2 Semester	63	21.0
3-4 Semester	91	30.3
5-6 Semester	85	28.3
7-8 Semester	61	20.3
Age Group		
18–22 Years	192	64.0
23–27 Years	90	30.0
28 Years & Above	18	6.0
Sector		
Public	72	24.0
Private	228	76.0

Table 1 presents the demographic characteristics of the 300 participants. Regarding gender, the majority were female ($n = 191$, 63.7%), while 109 (36.3%) were male. In terms of academic semester, most participants were enrolled in the 3rd–4th semesters ($n = 91$, 30.3%), followed by the 5th–6th semesters ($n = 85$, 28.3%), the 1st–2nd semesters ($n = 63$, 21.0%), and the 7th–8th semesters ($n = 61$, 20.3%), indicating a relatively balanced distribution across semesters. Regarding age, most participants were 18–22 years old ($n = 192$, 64.0%), followed by those aged 23–27 years ($n = 90$, 30.0%), while 18 (6.0%) were aged 28 years and above, indicating that the sample primarily consisted of younger undergraduate students. In terms of institutional sector, 288 participants (76.0%) were from private institutions, while 72 (24.0%) were from public institutions, showing greater representation of private-sector students. Overall, the sample was predominantly female, aged 18–22 years, enrolled in the 3rd–6th semesters, and studying at private institutions. These demographic characteristics provide important context for understanding the study's methodology and assessing the generalizability of its findings.

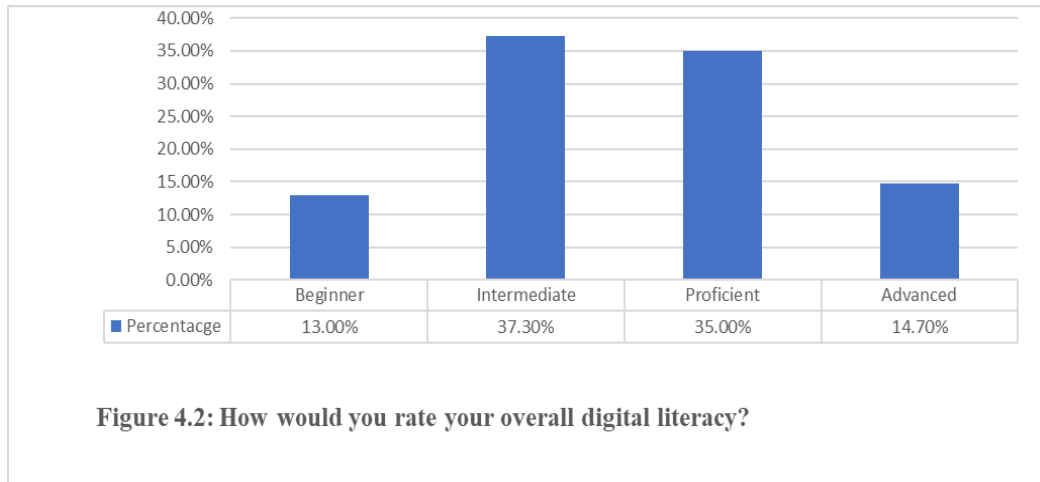


Figure 1 presents the respondents' self-reported digital literacy levels. The findings show that 37.3% of respondents rated their digital literacy as intermediate, followed by 35.0% who reported being proficient. Meanwhile, 14.7% identified their digital literacy as advanced, while 13.0% reported a beginner level. Overall, the findings indicate that most respondents perceived themselves as having moderate to high digital literacy, which may support their effective use of AI tools for academic purposes.

Table 2 Utilization of AI tools usage

Research Tools	Yes	No	Writing Tools	Yes	No
Semantic Scholar	34.0	66.0	Quill Bot	46.3	53.7
Elicit	29.0	71.0	Jenni AI	31.7	68.3
SciSpace	30.7	69.3	Paper pal	25.0	75.0
Notebook LLM	48.3	51.7	Word tune	23.7	76.3
ChatPDF	73.0	27.0	Grammarly	67.3	32.7
Consensus	36.7	63.3	Notion AI	32.7	67.3
Presentation Tools	Yes	No	Slide & Design Tools	Yes	No
Gamma	48.0	52.0	Beautiful.AI	27.3	72.7
Pitch	21.0	79.0	Slide AI	41.3	58.7
Plus AI	28.7	71.3	Slide Go	28.7	71.3
Microsoft Copilot	51.3	48.7	Magic Slides	23.7	76.3
Google Slides	74.3	25.7	Visme	19.3	80.7
AI Learning Tools	Yes	No			
Chat-GPT	96.3	3.7			
Google Gemini	89.7	10.3			
Duolingo	47.0	53.0			
Socratic	20.3	79.7			
Quizlet	33.0	67.0			

The findings on respondents' use of AI-assisted research, writing, and presentation tools indicate varying levels of adoption. Among research tools, ChatPDF was the most widely used (73.0%), followed by Notebook LLM (48.3%), Consensus (36.7%), Semantic Scholar (34.0%), SciSpace (30.7%), and Elicit (29.0%), which had the lowest adoption. Similarly, among writing tools, Grammarly was the most frequently used (67.3%), followed by QuillBot (46.3%), Notion AI (32.7%), Jenni AI (31.7%), Paperpal (25.0%), and Wordtune (23.7%). Regarding presentation tools, Google Slides had the highest usage rate (74.3%), followed by Microsoft Copilot (51.35%) and Gamma (48.0%). However, most respondents did not use Plus AI (71.3%) or Pitch (79.0%), with Pitch being the least utilized presentation tool. Overall, ChatPDF, Grammarly, and Google Slides were the most frequently used tools in their respective categories, while Elicit, Wordtune, and Pitch had the lowest adoption rates.

Regarding AI-assisted slide and design tools, Slides AI was the most frequently used (41.3%), followed by SlideGo (28.7%), Beautiful.ai (27.3%), Magic Slides (23.7%), and Visme (19.3%), which had the lowest adoption. Most respondents reported not using these tools, with non-use rates of 58.7% for Slides AI, 71.3% for SlideGo, 72.7% for Beautiful.ai, 76.3% for Magic Slides, and 80.7% for Visme. In contrast, AI-assisted learning tools showed substantially higher adoption, particularly ChatGPT, which was used by 96.3% of respondents, followed by Google Gemini (89.7%). Duolingo showed moderate usage, with 47.0% reporting use and 53.0% non-use, while Quizlet was used by 33.0% and not used by 67.0%. Socratic had the lowest adoption among learning tools, with only 20.3% reporting use and 79.7% reporting non-use. Overall, ChatGPT and Google Gemini were the most widely used learning tools, whereas Socratic, Visme, and Pitch were among the least frequently used tools across the categories.

Table 3 Frequency distribution of AI Tool Usage

Items	N	R	S	O	A
Frequency of AI Tool Usage					
I use AI tools for study-related tasks. i.e. learning course concept and presentation.	4.3	8.3	23.3	33.0	31.0
I rely on AI tools to complete my assignments.	5.3	19.7	30.3	22.0	22.7
I use AI tools to prepare for examinations.	6.0	12.3	22.7	28.3	30.7
I use AI tools whenever I encounter difficulty in understanding a topic.	3.0	10.3	19.7	24.3	42.7
I use AI tools to receive feedback on my academic writing before submission.	10.7	18.3	29.7	17.0	24.3
I use AI tools to analyze or interpret research data (e.g., graphs, statistics).	10.3	16.7	30.0	20.7	22.3
I use AI tools to generate ideas or creative content for coursework.	6.7	13.0	33.3	22.3	24.7
I use AI tools to prepare slides or visual materials for presentations.	9.7	14.7	29.3	24.0	22.3
I use AI tools to translate academic content from or into another language.	10.7	14.3	30.0	22.7	22.3
I use AI tools to draft or outline my research papers and assignments.	8.0	17.3	30.3	22.7	21.7

I use AI tools to paraphrase or simplify complex academic texts.	7.3	12.3	25.7	28.7	26.0
I use AI tools to check and improve my grammar, vocabulary, and writing style.	5.7	14.3	29.0	24.3	26.7
I use AI tools to summarize academic content.	5.3	10.3	30.3	22.0	32.0
I use AI tools to assist in writing essays or reports.	5.0	13.0	31.3	25.0	25.7
I use AI tools to solve academic problems i.e. difficulties in assignments and research.	5.3	11.7	30.0	23.7	29.3

The table presents the frequency distribution of respondents' use of AI tools for academic purposes, indicating that these tools are widely used across various activities, although usage frequency varies by task. For learning course concepts and preparing presentations, 31.0% always, 33.0% often, and 23.3% sometimes used AI, while 8.3% rarely and 4.3% never used it. For completing assignments, 30.3% sometimes, 22.7% always, and 22.0% often used AI, whereas 19.7% rarely and 5.3% never did so. For examination preparation, 30.7% always, 28.3% often, and 22.7% sometimes used AI, while 12.3% rarely and 6.0% never used it. Understanding difficult topics showed the highest frequency of use, with 42.7% always, 24.3% often, and 19.7% sometimes using AI, compared with 10.3% who rarely and 3.0% who never used it. For receiving feedback on academic writing, 29.7% sometimes, 24.3% always, and 17.0% often used AI, while 18.3% rarely and 10.7% never did so. Similarly, for analysing and interpreting research data, 30.0% sometimes, 22.3% always, and 20.7% often used AI, whereas 16.7% rarely and 10.3% never used it. For generating ideas or creative content, 33.3% sometimes, 24.7% always, and 22.3% often used AI, while 14.7% rarely and 5.0% never did so. For preparing slides or visual materials, 29.3% sometimes, 24.0% often, and 22.3% always used AI, compared with 14.7% who rarely and 9.7% who never used it. For translating academic content, 30.0% sometimes, 22.7% often, and 22.3% always used AI, while 14.3% rarely and 10.7% never did so.

Regarding academic writing and problem-solving, 30.3% sometimes, 22.7% often, and 21.7% always used AI to draft and outline research papers and assignments, whereas 17.3% rarely and 8.0% never used it. For paraphrasing or simplifying complex academic content, 28.7% often, 26.0% always, and 25.7% sometimes used AI, while 12.3% rarely and 7.3% never did so. For checking and improving grammar, vocabulary, and writing style, 29.0% sometimes, 26.7% always, and 24.3% often used AI, compared with 14.3% who rarely and 5.7% who never used it. For summarizing academic content, 32.0% always, 30.3% sometimes, and 22.0% often used AI, while 10.3% rarely and 5.3% never did so. For writing essays and reports, 31.3% sometimes, 25.7% always, and 25.0% often used AI, whereas 13.0% rarely and 5.0% never used it. Similarly, for solving academic problems, including assignment and research difficulties, 30.0% sometimes, 29.3% always, and 23.7% often used AI, while 11.7% rarely and 5.3% never did so. Overall, the highest frequency of AI use was observed for understanding difficult topics (42.7% always), followed by summarizing academic content (32.0%), study-related tasks (31.0% always), and examination preparation (30.7% always). Comparatively, AI use was less frequent for research data analysis, translation, presentation development, and feedback on written assignments. Nevertheless, the predominance of sometimes, often, and always responses indicates that AI tools have become part of students' academic learning, writing, research, and problem-solving activities.

Table 4 Inferential statistics on use of AI tools

Independent samples t-test about Use of AI tools based on gender

	Male (109)		Female (191)		<i>t</i>	<i>df</i>	<i>P</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Use of AI tools	3.50	0.882	3.50	0.853	-.047	298	0.963

An independent-samples t-test was used to determine whether a significant difference existed in the use of digital tools between male and female respondents. Male respondents reported a mean score of 3.50 (*SD* = 0.882), while female respondents reported 3.50 (*SD* = 0.853), indicating nearly equivalent levels of AI tool use. The difference was not statistically significant, *t* (298) = -.047, *p* = .963 (*p* > .05).

Therefore, the null hypothesis was accepted, indicating that gender did not have a statistically significant effect on the use of AI tools among respondents. Both male and female respondents used AI tools at nearly equivalent levels.

Table 5 Independent samples t-test about self-efficacy based on gender

	Male (109)		Female (191)		<i>t</i>	<i>df</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
GDAC	3.6257	.89198	3.6796	.75864	-.555	298	.580
AAS	3.6502	.90103	3.6630	.77737	-.129	298	.898
SREDC	3.6092	.95506	3.7476	.80484	-1.277	195.067	.203
OSDSE	3.6320	.83774	3.6911	.72027	-.644	298	.520

Note: GDAC = General Digital Academic Confidence, AAS = AI-Assisted Academic Self-Efficacy, SREDC = Self-Regulation and Ethical Digital Competence, OSDSE = Overall Students' Digital Self-Efficacy.

An independent-samples t-test was used to determine whether significant gender differences existed across the four dimensions of AI use. The results indicate no statistically significant differences between male and female respondents on any dimension.

For General Digital Academic Confidence, male respondents had a mean of 3.6257 (*SD* = .89198) and female respondents 3.6796 (*SD* = .75864), with no significant difference, *t*(298) = -.555, *p* = .580. For AI-Assisted Academic Self-Efficacy, the mean scores were 3.6502 (*SD* = .90103) for males and 3.6630 (*SD* = .77737) for females, with no significant difference, *t*(298) = -.129, *p* = .898.

For Self-Regulation and Ethical Digital Competence, male respondents reported a mean of 3.6092 (*SD* = .95506) and female respondents 3.7476 (*SD* = .80484). Although females had a slightly higher mean, the difference was not statistically significant, *t*(195.067) = -1.277, *p* = .203. Similarly, for Overall Students' Digital Self-Efficacy, the mean scores were 3.6320 (*SD* = .83774) for males and 3.6911 (*SD* = .72027) for females, with no significant difference, *t*(298) = -.644, *p* = .520.

Therefore, the null hypothesis was accepted, indicating that gender does not have a statistically significant effect on General Digital Academic Confidence, AI-Assisted Academic Self-Efficacy, Self-Regulation and Ethical Digital Competence, or Overall Students' Digital Self-Efficacy. Both male and female respondents showed similar levels across all four dimensions.

Table 6 Independent samples t-test about sector based on gender

	Public (72)		Private (228)		<i>t</i>	<i>df</i>	<i>P</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
GDAC	3.61	.795	3.67	.813	-.554	298	.580
AAS	3.60	.781	3.67	.836	-.681	298	.496
SREDC	3.69	.746	3.69	.898	-.036	141.522	.972
OSDSE	3.63	.697	3.68	.785	-.499	298	.618

Note: GDAC = General Digital Academic Confidence, AAS = AI-Assisted Academic Self-Efficacy, SREDC = Self-Regulation and Ethical Digital Competence, OSDSE = Overall Students' Digital Self-Efficacy.

An independent-samples t-test was conducted to determine whether significant differences existed between respondents from public and private institutions across the four dimensions. The results indicate no statistically significant differences between the two groups on any dimension.

For General Digital Academic Confidence, public respondents had a mean of 3.6139 (SD = .79599) and private respondents 3.6746 (SD = .81368), with no significant difference, $t(298) = -.554$, $p = .580$. For AI-Assisted Academic Self-Efficacy, the mean scores were 3.6007 (SD = .78151) for public and 3.6765 (SD = .83648) for private respondents, with no significant difference, $t(298) = -.681$, $p = .496$.

For Self-Regulation and Ethical Digital Competence, public respondents reported a mean of 3.6944 (SD = .74680) and private respondents 3.6982 (SD = .89865), with no significant difference, $t(141.522) = -.036$, $p = .972$. Similarly, for Overall Students' Digital Self-Efficacy, the mean scores were 3.6304 (SD = .69759) and 3.6820 (SD = .78508), respectively, with no significant difference, $t(298) = -.499$, $p = .618$.

Therefore, the null hypothesis was accepted, indicating that institution type (public or private) does not have a statistically significant effect on General Digital Academic Confidence, AI-Assisted Academic Self-Efficacy, Self-Regulation and Ethical Digital Competence, or Overall Students' Digital Self-Efficacy. Respondents from both institutions showed similar levels across all four dimensions.

Table 7 Independent samples t-test about Use of AI tools based on gender

	Public (72)		Private (228)		<i>t</i>	<i>df</i>	<i>P</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Use of AI tools	3.4315	.93165	3.5269	.84074	-.818	298	.414

An independent-samples t-test was conducted to determine whether a significant difference existed in the use of AI tools between public and private institution respondents. Public institution respondents reported a mean score of 3.4315 (SD = .93165), while private institution respondents reported 3.5269 (SD = .84074), indicating similar levels of AI tool use. The difference was not statistically significant, $t(298) = -.818$, $p = .414$.

Therefore, the null hypothesis was accepted, indicating that institution type (public or private) did not have a statistically significant effect on the use of digital tools among respondents. The results show that respondents from both public and private institutions used AI tools at nearly equivalent levels.

Table 8 Correlations between frequency of AI tools usage and students' digital self-efficacy

	Use of AI tools	GDAC	AAS	SREDC	OSDSE
Use of AI tools	1				
GDAC	.596**	1			
AAS	.680**	.752**	1		
SREDC	.556**	.758**	.781**	1	
OSDSE	.675**	.891**	.945**	.911**	1

Note: GDAC = General Digital Academic Confidence, AAS = AI-Assisted Academic

Self-Efficacy, SREDC = Self-Regulation and Ethical Digital Competence, OSDSE = Overall Students' Digital Self-Efficacy.

Note: At the 0.01 level (2-tailed), the correlation is significant.

The results indicate a moderate positive and statistically significant relationship between Use of AI Tools and General Digital Academic Confidence ($r = .596$, $p < .01$), showing that higher AI tool use is associated with higher General Digital Academic Confidence. Similarly, Use of AI Tools has a positive and statistically significant correlation with AI-Assisted Academic Self-Efficacy ($r = .680$, $p < .01$), indicating that higher AI tool use is related to higher AI-Assisted Academic Self-Efficacy.

Self-Regulation and Ethical Digital Competence also have a moderate positive and statistically significant relationship with Use of AI Tools and General Digital Academic Confidence ($r = .556$, $p < .01$). Likewise, Use of AI Tools has a positive and statistically significant correlation with Overall Students' Digital Self-Efficacy ($r = .675$, $p < .01$), indicating that higher AI tool use is related to higher Overall Students' Digital Self-Efficacy.

General Digital Academic Confidence has strong positive and statistically significant correlations with AI-Assisted Academic Self-Efficacy ($r = .752$, $p < .01$), Self-Regulation and Ethical Digital Competence ($r = .758$, $p < .01$), and Overall Students' Digital Self-Efficacy ($r = .891$, $p < .01$). Similarly, AI-Assisted Academic Self-Efficacy is positively and significantly correlated with Self-Regulation and Ethical Digital Competence ($r = .781$, $p < .01$) and Overall Students' Digital Self-Efficacy ($r = .945$, $p < .01$), indicating a very strong relationship with the latter. Self-Regulation and Ethical Digital Competence also have a strong positive and

statistically significant correlation with Overall Students' Digital Self-Efficacy ($r = .991$, $p < .01$).

Overall, all variables are positively and significantly associated at the 0.01 level, with correlation coefficients ranging from .556 to .991, reflecting moderate to very strong positive relationships. Higher Use of AI Tools is associated with higher General Digital Academic Confidence, AI-Assisted Academic Self-Efficacy, Self-Regulation and Ethical Digital Competence, and Overall Students' Digital Self-Efficacy, while the study variables also show positive correlations with one another. Thus, the proposed relationships among the study variables are supported.

Descriptive and inferential statistical methods were used to analyse the collected data. The demographic features of the participants were summarized, and the degrees of AI tool utilization and digital self-efficacy were ascertained using descriptive statistics like frequencies, percentages, means, and standard deviations. The intensity and direction of the link between the use of AI tools and digital self-efficacy were ascertained using Pearson's correlation analysis. Regression analysis was also done to see if students' digital self-efficacy was significantly influenced by their use of AI tools. The research objectives were addressed and the link between the study variables was methodically examined using these statistical techniques.

This study's objective was to examine the association between the use of Artificial Intelligence tools and the digital self-efficacy of students in higher education. The findings showed that students' academic practices now heavily relied on AI tools, which respondents often used to comprehend course topics, get ready for tests, finish assignments, summarize academic materials, and deal with academic difficulties. ChatGPT and Google Gemini were the most popular tools among the many AI apps, indicating the expanding application of AI in HE. The findings also showed that pupils had a relatively high degree of digital self-efficacy. Most respondents reported feeling confident when using digital tools for academic activities, acquiring new digital skills, managing their academic responsibilities, and carrying out tasks independently. In addition, respondents indicated that AI tools contributed to greater confidence in academic writing, research related activities, comprehension of complex-concepts, and overall academic performance. These results were consistent with Bandura's Social Cognitive theory, which suggests that successful experience with technology can strengthen individuals' confidence in their own abilities.

Moreover, the demographic analysis showed no statistically significant disparities in AI tool usage or digital self-efficacy based on gender or institutional sector. These findings suggested that students adopted AI tools at similar levels regardless of these demographic characteristics and indicated that access to AI tools and confidence in using digital tools had become increasingly common among higher education students. Although students indicated positive experiences with AI tools, they also highlighted challenges linked with their use, including over-reliance on AI, academic integrity, privacy and data security, a lack of institutional supervision, and challenges assessing the reliability and quality of material produced by AI. These results demonstrated that, despite the fact that AI has many educational advantages, HE institutions should encourage the ethical application of AI by offering training, suitable policies, and digital proficiency initiatives.

In conclusion, the results showed that students' digital self-efficacy was positively impacted by the responsible and efficient usage of AI tools. The results supported earlier studies indicating

that digital tools can enhance students' digital skills, confidence, and learning efficacy. However, the results also emphasized the necessity of a balanced application of AI to guaranty that students maintain their capacity for independent thought, critical evaluation, and responsible academic behaviour.

The current study investigated the relationship between undergraduate students enrolled in higher education's degree of digital self-efficacy and their use of AI tools. AI tools had become a significant aspect of students' academic activities. Undergraduate students frequently used AI tools for learning, academic writing, research, examination preparation, presentations, and solving academic problems. Among the AI tools examined, ChatGPT and Google Gemini were the most commonly used for learning, Grammarly was the most preferred AI writing tool, and Google Slides and Microsoft Copilot were the most frequently used for creating presentations. Undergraduate students possessed a high level of digital self-efficacy, and increased use of digital resources was linked with higher levels of confidence in using digital tools for academic purposes. AI tools played a significant role in enhancing students' digital competence and academic confidence. Gender and institutional sector did not significantly influence students' AI tool usage or their overall digital self-efficacy. Similarly, no statistically significant differences in AI tool usage were observed across academic semesters, although a substantial statistical distinction was found in the AI-assisted academic self-efficacy dimension across semester groups.

The findings further indicated a positive and statistically substantial correlation between students' digital self-efficacy and the use of AI tools. Increased trust in using digital resources for academic purposes was associated with greater interaction with AI tools. AI provided significant educational benefits, but students still had issues including academic integrity, privacy and data security, over-reliance on AI tools, lack of institutional guidance, and difficulties assessing the veracity of information produced by AI. Higher education institutions were advised to promote the ethical and responsible use of AI by implementing appropriate regulations, offering training opportunities, and bolstering digital literacy initiatives.

Recommendations

The study's conclusions and findings generated the following suggestions:

1. Higher education institutions may develop and implement clear guidelines and ethical frameworks governing the appropriate use of AI tools in teaching, learning, research, and academic assessment.
2. Faculty members may encourage students to use AI tools as supplementary learning resources rather than relying on them as substitutes for independent thinking, creativity, critical analysis, and their own academic efforts.
3. Higher education institutions may strengthen their digital infrastructure and accessibility by improving online learning platforms and facilitating students' access to reliable and appropriate AI applications, thereby promoting equitable opportunities for AI-supported learning.
4. Students may be encouraged to critically assess AI-generated information by checking its accuracy against credible academic sources. They should also be guided to use AI tools responsibly and ethically to strengthen their academic research and learning skills.

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